Dell Magazines
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Reader's Department: **EDITORIAL: CHOOSING TOOLS** by Stanley Schmidt

As members of a technological civilization, we constantly use tools. A very young technological civilization—e.g., an early Paleolithic one—might have only a few kinds of hardware at its disposal: axes and knives, for example, barely sophisticated enough to demonstrate the principle. In such a situation, choice is not a major issue. You can use an axe or a knife, which you'll probably have to make yourself, and your plan for doing so will be approximate and generic. Precision design and variations for special purposes will evolve much later.

As members of a technological civilization that has been around for a long time, we constantly have to choose our tools from a selection that our distant ancestors would have found bewildering and overwhelming. (Sometimes we do, too.) There has been time for a great deal of evolution and specialization, and we've become numerous enough and prosperous enough to encourage it. Our knives, for example, have diversified into tools as different as machetes, scalpels, scimitars, claymores, Swiss Army knives, sabers, and saber saws. Each is optimized for a particular type of work. In picking one for a job in the real world, we often have to make choices based on conflicting requirements—or at least items on a "wish list." In setting forth into the wilderness, for example, we might anticipate situations in which we'd like to have the cutting power of a machete and others in which we'd like the precision of a scalpel. But if we have to carry everything we're going to use for a week, we may settle on a Swiss Army knife because it combines the functions of several tools in a compact, lightweight package, even if it doesn't do some of those jobs quite as well as a tool dedicated exclusively to a single purpose.

But not all tools are hardware. One of the oldest and most powerful is language, which has done more than anything else to make concerted effort and time-binding possible. On one level, any language, such as English, Cantonese, or Esperanto, can be considered "a tool." How do we choose which one to use? Most of us, most of the time, don't even think about it as a choice. We use the one that's prevalent in the culture we're born into, because that's the one that works in that environment. Sometimes we learn to use another for such reasons as an impending visit to a culture that uses a different one.

But how do cultures decide what language to use? At first glance the question may seem nonsensical, until you reflect that, on another level, a language is not so much a single tool as a tool *kit* containing such items as syntactic frameworks, schemes for verb conjugation and noun declension, and writing systems. Whether you choose to view those as small tools within a set, or features of a single tool, cultures do make choices about them, just as surely as individuals must decide whether to regard sharpness, strength, or light weight as the most important feature of a knife. *How* cultures make those decisions varies as widely as the available choices. Some do it by letting an informal consensus evolve through everyday use; others impose conscious control by means ranging from school curricula to periodic national congresses to standardize usage. As the Esperanto example in my list above suggests, on rare occasions individuals or groups even design a language from scratch.

And, just as we might like a tool we're designing or selecting in a hardware store to meet several not quite compatible requirements, so might we like a linguistic tool—such as a writing system—to do several things at once, such as being easy to use, easy to learn, and preserving a cultural heritage. How does a culture decide which qualities are how important?

I was vividly reminded of this dilemma during a brief but fascinating sojourn in Japan. Unlike many Americans, I enjoy learning languages, and have always tried to learn at least a little of the main local one before traveling to any place where it isn't English. Many European languages are closely related, so if you know one it's relatively easy to learn one or more of its "siblings," and several have been widely adopted in other parts of the world. So I've been accustomed to being able to travel around large swaths

of several continents with at least one comforting ability: I could read most of the signs I saw around me, and if I saw a word I didn't recognize, I could look it up.

Not so in Japan. There I was treated to the humbling experience of being essentially illiterate for a full week. I had learned to *speak* enough to be minimally functional in a range of everyday situations, but I could read almost nothing that I saw. Nor could I look it up.

I attribute this uncharacteristic deficiency in part to the fact that the months leading up to my trip were unusually busy, largely because of the need to meet a book deadline before leaving. But even if that had not been the case, I still would have fallen far short of my usual standards—because of the writing system Japanese has chosen to use.

All those European languages I mentioned earlier, and many others such as Turkish and Swahili, have one important feature in common: they all use alphabets. We tend to take this so much for granted that non-linguists tend to think of any writing system they can't read as "a foreign alphabet," but this is not at all accurate. "Alphabet" specifically means a small set of symbols (we use 26, Hawaiian a mere dozen) used to represent the most basic sounds—vowels and consonants—of a language. Some languages do this much better than others. In Swahili the correlation between spelling and pronunciation is simple, logical, and almost perfectly consistent: you can *always* look at a word and pronounce it correctly on the first try, or hear it and know how to spell it. In Polish, difficult as those who haven't studied it may find this to believe, it's almost as good. In French, you can usually look at a word and tell how to pronounce it (though the rules for doing so are hardly simple), but you can't reliably tell how to spell a word from its sound. In English, the correlation is notoriously poor, largely because it has borrowed words from many other languages and in the process incorporated features of many different spelling systems. (George Bernard Shaw pointed out that we could spell "fish" as "ghoti": *gh* as in "laugh," *o* as in "women," and *ti* as in "nation.") Both Irish and Scots Gaelic are just about as bad, for different reasons: some vowels are pronounced as such, while others—and it's not easy to tell which ones—serve only to tell which of two pronunciations a neighboring consonant has.

On a subjective scale of 0 to 100, I'd rate the spelling-to-pronunciation fit of Swahili as about 99, Polish 95, French 45, and English or Gaelic 15. But even the worst of them only requires you to learn a few dozen symbols, and they do have at least an approximate correlation with pronunciation. *Gh* may be pronounced like *g* (as in "gherkin"), or *f* (as in "laugh"), or not at all (as in "dough"); but it is never pronounced like *a*, *b*, *d*, *e*, *m*, *l*, *s*, or a good many other things.

Now compare the situation in Japanese. The closest it normally comes to an alphabet is a *syllabary*, a set of symbols somewhat like an alphabet except that instead of representing a vowel or consonant, each symbol represents an entire syllable, like *ba*, *ko*, *lu*, or *ouch*. In Japanese, the correlation between syllabary symbols and sounds is quite good; but there are many more combinations of vowels and consonants than there are single vowels and consonants. Representing all the different syllables of Japanese requires somewhere between about 50 and something over a hundred different symbols. (English would require many more.) I give such a wide range for Japanese because the exact figure depends on how you count. Some of the symbols that could be counted could also be viewed as predictable modifications or combinations of others. *Ga*, for example, looks just like its unvoiced counterpart *ka* except for the addition of a pair of short apostrophe-like strokes, and other voiced-unvoiced pairs are related in the same way.

It's not even that simple, though. Japanese uses not one, but *two* syllabaries, each doing exactly the same set of things except that one of them is used only for spelling native Japanese words or grammatical elements, while the other is used only for borrowed foreign words. So the two syllabaries together contain a couple of hundred symbols that have to be memorized.

But that's the merest beginning. For complicated historical reasons, Japanese also routinely uses several *thousand* ideographs, complicated symbols adapted from Chinese, often containing many strokes and giving absolutely no clue to pronunciation. Each of these *kanji* represents an entire word, and can often be pronounced in two (or sometimes more) unrelated ways. For example, the word for "mountain" can be represented by a single *kanji* but read as either *san* or *yama*. Some of them do give clues to meaning, in an abstruse sort of way. Some of the simpler ones started life as pictographs, or stylized drawings of things like people or trees; and some of the more complicated ones were created by combining simpler ones, though in no easily predictable way. The upshot is that, for practical purposes, learning them means *lots* of memorization. The Japanese government has published a list of approximately 2000 *kanji* that everyone should know for everyday use, but there are enough additional thousands that an educated adult can go on learning new ones—sometimes after first being puzzled by them—for a lifetime.

From that description, you can see that achieving even an ordinary level of literacy in Japanese requires much more commitment of time and effort than doing the same thing in an alphabetic language. So why isn't Japanese written with an alphabet, instead of a mixture of two hundred-character syllabaries and thousands of ideographs? Certainly it could be. The phonetic structure of the language lends itself quite well to representation by our alphabet, and several slightly different schemes for such "romanization" have been developed and used (mostly in introductory courses and phrase books for foreigners).

The Japanese themselves are aware of the difficulties of their present writing system—the sheer number and complexity of characters, and the fact that many *kanji* can be read in more than one way—and there have been occasional campaigns to replace it with a purely alphabetic system (or at least use the syllabaries for everything). Proponents of such a change point out that a system of writing with a much smaller number of symbols would make it much easier and faster for people to become literate. People would be able to read just about anything after a relatively short period of learning, rather than going through their entire lives memorizing new characters. Certainly I, as a visitor with relatively little time to prepare, would have welcomed such a change. Had Japanese normally been written in *romaji*, I'm confident that I *would* have been able to read a fair number of the signs around me, and to look up unfamiliar words.

Yet all attempts to switch to such a system have failed. Part of the reason is a reluctance to let go of tradition (the Japanese culture has a fascinating, seemingly paradoxical, fondness for both ancient and ultramodern ways, for tradition and innovation). But there's more to it than that. The present system, dauntingly cumbersome as it may seem to someone raised on alphabets, actually has some advantages. *Kanji* tell you nothing about pronunciation, but they often do tell you something about meaning. Sometimes two unrelated words would look identical if written alphabetically (like the English *lead*, which is what a military commander or an orchestra conductor does, and *lead*, element 82 in the periodic table), but each would be represented by a different *kanji*, thus preventing ambiguity. Also, if you've learned enough *kanji*, you may recognize elements of them in a new character you encounter, and thus make an educated guess as to its meaning. (Admittedly we can do something similar in alphabetic languages such as English by recognizing roots such as *pre-*, *cogni-*, and *-tion*.) The argument that switching to an alphabet would promote widespread literacy is probably not very persuasive in Japan, since the Japanese already have very high literacy (though it might still be argued that if they used an alphabet they could spend less time acquiring literacy and more using it to learn other things).

Each system has both advantages and disadvantages. When you opt for the advantages of one, you forgo those of the other. As the saying goes, you pays your money and you takes your choice.

And once you've made your choice, it becomes harder and harder to change it later. Even if the Japanese did decide to switch to alphabetic writing now, the move might let upcoming generations learn to read more, sooner—while simultaneously making much of the older literature inaccessible to them unless

somebody transcribed and republished it. Since the backlog is huge, so is the work that would be required to convert it.

Chinese is in a somewhat similar situation, but there both the disadvantages and advantages of the old system are even more pronounced. Chinese doesn't use syllabaries. It uses *only* the ideographs from which Japanese *kanji* were adapted, but it uses a lot more of them: *tens* of thousands. Thus the burden of memorization is even greater. On the other hand, China is a huge country, with large populations speaking "dialects" so different that, in their spoken form, they're mutually unintelligible. Yet they can all be written with the same ideographs, so people from different provinces can read each other's writings. This doesn't mean that people from different regions will express things exactly the same way, but they do come close enough to be able to communicate in writing. (Really the "dialects" might better be, and sometimes are, considered separate languages, each with its own vocabulary, but with grammars similar enough to be written with a single script.) If each person instead wrote an alphabetic representation of how he would *speak* what he wanted to say, someone in another province would get nothing from it.

Furthermore, the potential for ambiguity in writing Chinese alphabetically is extraordinarily high. There are something like 40,000 characters, each representing a monosyllabic "word," but (in the "Modern Standard Chinese" based on the Mandarin dialect) only about 1600 different pronunciations for them (about 400 combinations of vowels and consonants, each pronounceable in four different tones). There is now a pretty good alphabet (*Pinyin*) for showing Chinese pronunciation, but it's so inadequate for showing *meaning* that it's used almost exclusively as an educational adjunct to the characters.

For one final linguistic example, I've already mentioned the wild variations of spelling in standard English. Back in 1946, Dolton Edwards published in this magazine (then called *Astounding*) an article called "Meihem in ce Klasrum," cleverly setting forth a method by which English could in a few years convert to a much more consistently phonetic spelling system, by redefining the use of one letter each year. But would we really want to? Certainly it would make it easier to spell accurately—but we would lose much of our present ability to figure out what unfamiliar words mean by recognizing Germanic, Latin, or Greek roots and seeing how they're put together.

Again, you pays your money and you takes your choice—and whatever you choose, you may be stuck with for a long time. So it pays to make those choices with as much thought as possible for what features are really important to you, right at the outset. And that's just as true whether you're dealing with languages, railroads, computers, or any other system of interrelated tools.

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Published since 1930

First issue of *Astounding* January 1930 (c)

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Analog Science Fiction and Fact (Astounding), Vol. CXXVIII, No. 7 & 8, July/August 2008. 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.

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Serial: **TRACKING: PART I OF III** by David R. Palmer

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Illustration by William Warren

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"There's a fine line between preparedness and procrastination...."

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Warning: This story has scenes that some readers may find disturbing.

* * * *

Volume I

Mayfly, Trout, Hook

Excerpted from the Journals of Candidia Maria Smith-Foster:

Day I

Yes, Posterity, your Humble Historiographer *does* feel guilty about this—but what was Teacher *thinking?* What did he *expect?* What else could I *do*...?

Oops, forgetting manners. (*There's* a surprise.) Sorry. All right; let's start over:

Hi, Posterity; Candy Smith-Foster here again—Plucky Girl Adventurer, Intrepid Girl Aviatrix, Spunky Savior of Our People, etc., etc.—at your service.

To all appearances (with single, gastrolepidoptrosis-inducing exception), day had begun normally enough—for one of *my* days...

* * * *

F'rinstance, had wakened, as usual, looking forward to almost spiritual fulfillment intrinsic to starting day at chow hall, wrapping self around one of my Adam's routinely world-class breakfasts.

(Hmm ... That sounded possessive, didn't it. Well, am his "discoverer": Adam second living human being turned up during post-Armageddon exploration. Plus boy *is* my favorite proof-of-concept, show-and-tell exhibit for proposition that *Y* chromosomes are A Good Thing. And between times, exhibiting no hint of teasing, Adam does refer to me as "my woman." Not to mention, unblinking gaze, on occasions when holds me close, causes tingly sensations in interesting places.)

Naturally, not *every* morsel of food emerging from kitchens actually product of cleverest-boy-genius-in-whole-wide-world's own incredibly talented hands, but clearly finest of coequals in charge of food preparation these days; ergo, have every confidence will have *influenced* production, thereby assuring, at minimum, all dishes represent gustatory perfection.

Plus, under normal circumstances, Adam times culinary duties to make possible spending most meals with me, breakfast included, which never fails to launch day on endorphin high....

On top of which, being focus of unambiguous love radiating from entire population of recently adopted-into *Homo post hominem* community, all of whom (tiresome but true) owe Yours Truly their lives, does enhance outlook generally.

Normally, positive attitude established by breakfast flows seamlessly into day's *real* fun—classes:

academics (usually one-on-one instruction in college-level math, physics, chem, geology, agronomy, psychology [normal and ab-], etc.); as well as practical mechanics, electronics; regular proficiency maintenance and/or additional type-rating flight training sessions; plus daily advanced karate instruction (currently honing sixth-degree Black Belt skills; seventh still well beyond horizon) coupled with—probably most entertaining of all—personal tutoring in selected elements from *Mossad* field agents' mayhem manual.

* * * *

Apart from routine expectations, however, *this* morning not remotely normal. Awoke to ominous realization that that vague, recurrent disquiet, which, despite fiercely protective, almost crechelike environment in which have been enveloped since medical discharge (following treatment for side effects stemming from most recent round trip across River Styx) was back in force. Last time awoke to such depths of foreboding was morning of Daddy's departure for Washington—the day before *Khraniteli* turned capital, surrounding suburbs, into fine, black, glowing-in-dark ashes drifting in breeze, ending World As We Knew It, as well as reign of *H. sapiens.*

Clearly, in retrospect, from moment eyes opened today, chain of events resembled ballistic curve: foreordained progression, leading directly from bed to Teacher's announcement to Yours Truly's reluctant but immutable decision—thence to current AWOL status.

Well, a girl's gotta do what a girl's ... Etc.

As turned out, however, anarchic decision, subsequent obviously proscribed actions, took healthy bite out of unease dogging heels since morning's first awareness. Perhaps qualms more a function of psychic feedback spawned by own upcoming brash actions echoing back down timeline rather than intangible warning of yet another impending doomy threat.

In any event, Posterity, been some time since our last travelogue, hasn't it. Truthfully, though, hadn't expected—certainly never intended—ever again to do another *travel,* much less *logue.*

And not without justification: Even briefest reflection upon Yours Truly's conspicuously absent vital signs, to say nothing of generally bent, broken, and/or toasted medical condition by conclusion of events chronicled in most recent volumes of *The Journals of the Life & Times of Candy Smith-Foster, Plucky Girl Adventurer,*[1] should motivate thickest observer toward sober deliberation regarding wisdom of such endeavors.

[1: Archivist's note: This is a reference to Volume III, Part III, *Finale,* from the first collection of Candy Smith-Foster's journals, which have been assembled under the overall title, *Emergence.*]

Take, for instance, side effects of saving Adam from wrecked, flaming automobile: Psilly pseudo Walter Mitty had achieved spectacular crash while indulging race-driver fantasies on deserted downtown Baltimore city streets. Ultimately, hysterical strength overuse required to extricate comatose boy from four-wheeled pyre, carry him at a dead run draped over shoulder to van, remain conscious long enough thereafter to suture young idiot's sliced femoral artery, resulted in your Humble Historiographer's heart joining ranks of flatlined.

Granted, own willful disregard of onrushing metabolic burnout symptoms spotlight descriptive limitations of *reckless.* Still, extra effort seemed warranted at the time: Had reason to fear lad might be sole other surviving human being on Planet Earth.

Happily, wasn't. Quite.

However, barely recovered from physiological deficits incurred during *that* girlish prank before found self

in spacesuit, flambeing like lobster while being battered to pulp by unyielding interior structural members of decidedly non-passenger-rated, End of Days-bomb-carrying, *Khraniteli* winged missile during programmed-in, high-*g,* evasive acrobatics portion of incandescent atmospheric reentry. This event, too, capped by cessation of Plucky Girl Adventurer's cardiac functions.

Clearly, campaigns offering such potential direness not to be undertaken lightly. Odds too high that Closing Credits may have to be superimposed over marker under which bones have taken up residence at Our Lady of Perpetual Dandelions Memorial Landfill—or, more likely, just strewn willy-nilly across terrain, wherever carrion-disposal fauna lose interest.

In any event, none of those experiences ranks high amongst memories back upon which your Humble Historiographer looks most fondly—or has any difficulty *not* raising hand, joyously caroling "*Again*...!"

* * * *

But *damn,* Posterity! Really—what *was* Teacher thinking...? I mean, right after breakfast, even before leaving chow hall, practically skipped up, beaming ear-to-ear, gave me big, happy hug, and, straight out of blue, announced, "Candy, the Urals scouting expedition got in last night..."

Okay, I knew that. Actually, *every*body knew that: *Hominem* community, slowly growing around Mt. Palomar blast/earthquake shelter, still in no danger of challenging New York, Moscow, Beijing for title of World's Majorest Metropolis (even after *H. sapiens'* effectively total extinction). As spin-off benefit of settlement's cozy dimensions, airstrip located practically next-door—where seismic-level thrust-reverser sound effects from pair of C-17 Globemaster IIIs (aviation's answer to Monster Trucks) braking to stop just after sundown not that readily overlooked.

So standing alone, beloved pedagogue's breathless proclamation hardly qualified as news, let alone bombshell. Still, enthusiasm level suggested other shoe already in pattern, probably on final, if not actually preparing for touchdown...

And indeed was. Radiating what, for him, equated to gleeful intensity of Olde Tyme TV game-show host introducing prize lineup, Teacher continued, "And while they were there, they acquired information suggesting that your father is probably still alive, as well as where the *Khraniteli* may be holding him."

* * * *

All right, Posterity; *that* part exceeded "bombshell" threshold!

In fact, as joyous revelation's universe-reshuffling internal echoes faded, Terry expressed concern from habitual perch on big sister's shoulder by swinging head around to front, turning cranium upside down, peering one-eyed up my nose. Fortunately, however, this time retarded adopted twin brother limited comment to wolf whistle's long, low, closing diminuendo—as opposed to customary practice of sharing sapient sibling's innermost cerebral contents with world at window-rattling volume.

Shushed silly symbiont by reaching up, gently stroking tiny soft feathers on head, cheeks, upper neck area just under huge clamshell beak.

And focused *ki* flow into effort required to maintain calm thoughts, serene, interested expression as world rocked, spun around me—and abruptly, cause of, solution to, morning's amorphous disquiet snapped into sharpest focus....

* * * *

Even if Terry hadn't felt elder sister turn to stone, Posterity, I knew featherheaded twin unfooled. Birdbrain alone, out of planet's entire remaining population (okay, arguably Lisa, too), equipped fully to appreciate shock Teacher's announcement had delivered. No one doubts anymore: Foster twins share

one-way telepathic rapport. Despite being *Anodorhynchus hyacinthinus* (i.e., Hyacinth Macaw), Terry *can* read my mind—and from quite a distance: last count, 32,500 miles; geosynchronous orbit height plus Earth's full diameter.

All of which demonstrated conclusively a few months ago when Intrepid Girl Astronaut found self trapped in orbit aboard crippled space shuttle (while saving all that remained of Humanity, she tossed in casually). On that occasion, thoughts apparently passed through planet's substance as if so much vacuum.

* * * *

In any event, notwithstanding smarty-mouth id's internal sarcasm, Teacher now had Plucky Girl Savior of Our People's undivided attention. But then, with typical clueless preoccupation borne of Overlapping Deep Thoughts, complicated by Weight of Responsibilities, dear old thing continued blithely, "And at this point, it looks as if it won't take much more than six months to put together another expedition back into the area to check into it...."

* * * *

Really now, Posterity.

As long as Teacher's known me (what?—almost whole life?), could *not* have expected favorite (known to be impulse-control-challenged) student to hear *that*, then just sit around, waiting patiently while Daddy languishes in *Khraniteli* dungeon, no doubt being tortured, probably scheduled for execution—for another *six solid months*...?

Received news with enthusiasm of hungry trout rising to fat mayfly—and reached decision even before Teacher completed recital.

But. While Yours Truly may not be sharpest bulb in quiver (or is that brightest pencil in drawer?), have managed, during short, busy lifetime, to identify certain fundamentally human behavioral principles every bit as applicable to *H. post hominem*s as *H. sapiens;* key among which: Objecting, arguing—even begging—adults to reverse what they regard as well-thought-out decisions generally has single practical effect: Spills beans concerning own intentions; opens door for inconvenient advice—potentially, even, orders: *"Don't do that."*

Clearly, last thing Plucky Girl Adventurer needed at this point was to trigger suspicions.

What *was* called for, however, was factual, mission-specific information: "intel," if you will. So smiled beatifically, hugged, thanked Teacher fervently—then, moment sweet man out of sight, switched on stalker mode, tracked down Danya Feinberg, AAs' number two special-operations reconnaissance/ infiltration/intelligence-gathering/sniper.

Prior to Mankind's End, Danya had been top *Mossad* field operative; specialty, "proactive threat elimination"—euphemism for *assassination.* All too appropriately, since given name translates to *Judgment of God.*

(Which has always bothered me: How could parents have *known?* I mean, really, so soon after birth, to look down at freshly hatched, sweet-faced baby girl happily blowing bubbles against mother's breast, announce to world, with perfectly straight face, "This child will grow up to become the instrument of the *Judgment of God*...")

Moot question, of course. Did. And now, with other AAs, Danya works for Teacher.

Incidentally, number two ranking amongst AA spooks mostly result of coin toss. Wallace Griffin (describes himself as out-of-work Navy Seal) unabashedly admits his field skills fall short of hers, but

even Danni agrees Wallace's gift for strategy unmatched among *hominem* ranks. (In fact, with apparent seriosity, Number Two says world missed unmatched opportunity to experience Genghis Khan redux when Wallace opted not to focus talents on Dark Side.) In any event, according to Teacher, even in *pseudo*military structure, someone has to be in charge.

As suspected, caught up with Danya at base showers. Following return from three-week, living-off-land, intel-gathering recon in Urals, existing mostly as solo marauder/gleaner, Momma Spook spending substantial portion of first morning home reveling in leisurely, luxurious, catch-up soak under virtually inexhaustible, solar-heated, steaming hot water.

Parked Terry on adjacent showerhead feeder gooseneck, turned on water. Manic twin promptly launched into joyous series of upside-down, furiously flapping, bathing gymnastics; continuing objective: Spread as much water as widely as possible, without actually coming into contact with any, except very tip of bill.

Shucked off own clothing, stepped under shower, then paused to regard Danni with usual carefully concealed resentment...

Visualize stereotypical barbarian warrior princess from vintage, heroic, Boris Vallejo cover painting for epic Thud & Blunder novel: Long, flowing, glowingly dark hair. Supermodel's face, with flawless brow, cheekbones, chin; perfect, gleaming white teeth. Eyes so blue, they seem to catch, amplify, reflect light across darkened rooms. Technically, only five-five but *tall* nonetheless, with almost rangy frame boasting deceptively sleek, well-developed musculature, marathoner's utterly dimple/jiggle-free, hard little *glutei maximi,* all wrapped in golden, line-free suntan. Presentation capped by secondary curves whose firmly assertive proportions sneer at Newton's second law....

Total effect (according to Adam) “reduces men to idiots"; and, from own experience, inspires less well-assembled females to engage in thoughtful deliberation regarding pros, cons of pacts with devil. (Eternal damnation ... hey, how bad could it *be*...?)

Eighth Degree Black Belt, unmitigated death in bare feet, since my arrival Danya has taken me under wing; have become, in fact, her favorite pseudo-*Mossad* apprentice. And few aspects of life these days deliver more sheer fun than training under Danni's supervision: very most advanced levels of hand-to-hand combat; nonstandard weapons; plus special-operations skills (infiltration, silently taking out sentries, sniping); undercover work; interrogation; etc.

Danni even managed to introduce element of humor into hysterical strength tap, concerning whose use Yours Truly has become almost phobic (not unreasonably, given death's recurring prominence in medical history): Persuaded me to replace original cumbersome, four-word, self-hypnotic prompt phrase ("chocolate, cabbage, caterpillar, puck") with quicker, more classically appropriate, single trigger word: “Sha-*zam*...!"

Plus, along with other two unofficial sisters, Kim and Gayle, Danni really fun snicker-buddy at whispering/giggling-about-boys get-togethers.

(Okay, okay—obviously, such gatherings chiefly for my benefit. No, don't really believe Kim, Gayle, or Danni [*older* women, all—mid 20s, at least] regard boys as giggleworthy subjects per se. Not even Adam [who really *is*]. Still...)

Withal, no matter how hard I try on occasion, Danni difficult person to dislike. Except when forced unavoidably to compare her to...

Me: Candy Smith-Foster; months short of 12th birthday; still whole inches shy of five feet tall; hardly

more than pro forma female thus far—

Never mind; among pointless exercises in frustration, self-flagellation over unavoidable surely ranks near list's apex....

* * * *

No point beating around bush with Danya, Posterity; respected her too much even to make attempt. Plus (more than peripheralest of considerations), fact that, while superspook *claims* not to be actual mindreader, is *way* too smart for slow-dancing subterfuges; would spot oblique approach in heartbeat. And by this point, not arousing grownup suspicions regarding immediate plans for information's application had taken on vital importance.

So got right to it; wide-eyed, unaffectedly enthusiastic as any other kid who'd just learned long-dead father possibly not: “Danni,” I demanded, “Teacher says you guys heard something about Daddy during your recon. Where is he? Who's got him?"

Mentor regarded me thoughtfully before replying. Does that a lot. Depending upon circumstances, can generate sensations akin to those no doubt experienced by bird trying to stare down hungry snake.

"We don't know that anyone's actually *got* him got him,” Danya began eventually; “at least at this point. While scouting *Serdtsevina Rasovyi,* the base outside their big shelter under the Urals, just north of the Russian/Kazakhstani border, I questioned a *Khranitel* who admitted to being part of the *Bratstvo* group who snatched Dr. Foster out of Washington just before they vaporized it."

Honest, Posterity, really tried to restrain self, but couldn't have held tongue at gunpoint: “So he *is* alive!"

"He was alive *then,*” Danya corrected sympathically. “He didn't die when Washington did; we know that. He—"

"Did your contact tell you where he is?” I pressed.

Danni hesitated again; then: “You have to understand,” she temporized, “this was not a *contact* per se; not a friendly conversation with a helpful local. I made this man disappear from the base in the middle of the night.

"And he was of course a *Khranitel;* by definition, a zealot. He did not wish to tell me anything. I had to...” paused again, obviously trying to choose words with care, “...*encourage* him...” Paused again, eyed me with detectible concern, then finished in rush, “—quite a lot."

Yet another pause. “And while I did want to hear more about Dr. Foster, my mission was to learn what I could about the *Khraniteli*'s current military situation: strategy, assets, technology levels, agent deployment..."

A final pause. “His mention of Dr. Foster occurred early in the questioning. About all this man told me was that they had taken your father back to *Serdtsevina Rasovyi.* In addition to housing their headquarters, that's where one of their larger, better-equipped laboratories is located.

"The *Khraniteli* wanted to pick his brains. Apparently they've come up with the notion of using gene-engineering to try to develop a bug we *hominem*s aren't immune to. They correctly surmise that, as probably the world's leading expert in combating biological warfare before the holocaust, today he's the only real expert in existence on how one goes about developing such microbes.

"By the time I was certain I'd gotten everything from this fellow I could pertinent to my mission objectives, it was ... he was...” Danni trailed off tastefully, eyes averted.

Nodded silently to convey understanding, hint of sympathy for unpleasant necessities. But behind otherwise carefully nonreacting expression, had difficulty not grinding teeth: Whenever so-called grownup topics (e.g., killing, torture, generic mayhem of any description) intrude upon discussions, adults—even Danni, despite ongoing special-ops training's patently lethal focus!—tend to walk on eggs in my presence; act as if somehow, despite short, blood-soaked history, am still vulnerable innocent, needing to be protected from realities of post-apocalypse life, death.

Sweet little self-deceptions like this no doubt helpful to adults' emotional well-being—but damned nuisancy for people who have things to do, places to go, people to rescue. Interferes with efficient information-gathering.

Delays departure.

So bit lip; maintained grateful, cheery smile; thanked her effusively. Finished shower; departed at apparent leisure.

—And immediately set out to track down Wallace Griffin. Happily, found officially number one spook *not* in shower.

("Happily": Though for majority of younger *hominem*s, skinny-dipping down at lovely little creek-fed pond between housing and airfield pretty much routine, Wallace not one of Teacher's actual AAs; not even of their generation; instead, one of those anomalous older *H. post hominem*s who had emerged previously, differences unnoticed at the time by World at Large. Sweetly old-fashioned in so many ways; and, when too much skin involved, age/gender distinctions tend to distract, possibly even distress him.)

Found head spook in office, door open, informally closeted with Peter Bell, de facto number two *hominem* after Teacher.

Peter also (though don't think he knows this) subject of dearest leader's first delicate matchmaking suggestion for me.

This, of course, prior to my meeting Adam: unrivaled electromechanical genius; world-class pianist; *universe*-class chef; amateur EMT (who has restarted my heart *twice* thus far); frighteningly intelligent; side-splittingly funny; ruggedly handsome (for someone who doesn't shave yet—still sticking to age-18 story [but, sh-h-h, early on I found birth certificate; boy really only 13]); and actually (when not crashing cars), world-class driver; pilot, too...

Sorry, Posterity; yes, *have* been told I tend to digress.

Like most fundamentally innocent, older *hominem* males, where Yours Truly is concerned, Wallace can't help himself: Unambiguously dotes upon very ground I tread.

Usually I go out of my way not to, but this was special occasion: Took shameless advantage of slack grownups all cut me (cute little Selfless Savior of Our People, etc.) to interrupt intel*meister*, pump dry: Gleaned everything he'd heard, deduced, divined about Daddy's purported/potential whereabouts. Got away with interrogating him in far greater depth than would have dared attempt with Danya. Even coaxed him into giving me copies of his, Danni's field reports.

Thanked him; hugged 'til eyes popped—

Went straight home.

Despite protests, dropped off Terry. Though would miss baby brother desperately, avians, even large ones (actually, *especially* larger ones), simply too fragile, too vulnerable to impact. Plus birds in general

horribly susceptible to even faintest traces of airborne toxins. (Remember coal mine canaries?) Besides, exotic tropical species tend to be cold-sensitive, and nippy conditions definitely in travel forecast. Withal, unnecessary exposure to potentially fraught situations simply not rational.

(Additionally, in Terry's case, *way* too loud for covert enemy stronghold infiltration, recon....)

However, also had mission-specific reason (*selfish* sounds so negative): Leaving Terry home ensured that, notwithstanding circumstances, as long as manage to remain more or less conscious, even if just barely, will be able to "phone home" from anywhere on planet. Given destination, not to mention likelihood of encounters with indigenes of unrivaled bloodthirstiness, malevolence (those are adversaries' *good* qualities), Terrylink communication might well prove vital: for Daddy, if there (if alive), not to mention Intrepid Special-Ops Girl herself.

Made sure birdbrain's stand provisioned for day. Unworried about featherheaded sibling's care, feeding, need for snuggles during projected absence; knew family would love, care for him. Especially Lisa: Adores him; vice-versa. Plus Kim's baby girl shares my mental connection with him—and thereby is linked to me, though in her case contact seems limited to empathy: sensing emotions, feelings, etc.

Threw together necessities for trip: weapons, tools.—Oh, yeah; also food, water, clothing, toiletries, etc. Loaded swag into van.

Left note: pro forma apology to Adam, Danni, Teacher, Kim, Gayle. Assigned Lisa responsibility for taking care of Terry. Suggested they might consider keeping eye on baby brother; take notes if babbling begins sounding relevant.

Adjourned thereafter to airfield. Noted, with relief, no one around. Skimmed hurriedly through maintenance logs covering *hominem*s' small fleet of STOL turboprop Helio Stallions. Identified plane with "youngest" engine; i.e., fewest operating hours since major overhaul. Preflighted ship; everything came up green.

Transferred duffle, necessities from van. Fired up, lifted off.

Headed north, bound for Canada, Alaska, Bering Strait, Siberia—Kazakhstani/Russian Urals beyond.

Six months *in-bleeping-deed*...!

* * * *

INTERLUDE

Archivist's Note (a)

This semi-stream-of-consciousness opening passage is typical of the journals kept by young Candidia Maria Smith-Foster, as preserved in the *Homo Post Hominem* Genesis Library. Typically, when possible in the field, she has updated them at least daily.

In an earlier volume (informally titled *Seeking*), Candy indicated a preference (only partially, we suspect, tongue-in-cheek) that her memoirs be accumulated and maintained in an institution to be known one day as the Smith-Foster Post-Armageddon Historical Library and Archives. Obviously, it is too soon in the brief history of our budding species' civilization to divert those kinds of resources to the construction of a one-person library. However, if her contributions to the survival and perpetuation of our kind continue at the level of her past activities, such an institution is almost inevitable....

Candy has kept her journals in the condensed, cryptic, "pothook" symbols of the once nearly extinct written language known as Pitman shorthand. And though some of us have come to employ it personally

nowadays, and its use is spreading, we have translated the original texts into English and typeset them for general consumption.

For a classically trained archivist, this has not been an entirely comfortable process...

First, Candy's narration employs a terse, telegraphic-style sentence structure, omitting almost all but the most necessary of pronouns, adjectives, conjunctions, and adverbs, eschewing what she refers to (with perceptible contempt) as “flowery academese."

Then, consistent with that compressed-text philosophy, while she does spell out numbers from zero to ten in accordance with conventional stylebook practice, for eleven and above she employs actual numerical *digits.*

Worse, she not only overuses *et cetera,* a lazy, almost sloppy literary device at best, but insists upon using the abbreviated form, *etc.*, rather than spelling out the full Latin phrase.

Worst of all, with some regularity, she even (heaven help us all) employs actual *ampersands* when stooping to her own, invariably initial-capped, often sideways fractured variations on customary cliches, such as the “Thud & Blunder” novels mentioned above.

Now a personal note: As an archivist who, prior to the holocaust, had obtained his Ph.D. *summa cum laude* in library science from Yale, a university with generally acceptable academic qualifications, I am also accustomed to functioning as a copyeditor, assisting contributors in the production of clear historical records.

Candy, however, has been quite emphatic that each of her words, her every punctuation mark (or deliberate omission thereof), and even her formatting have been chosen with care: Each sentence, phrase, and/or word, initial capped or lower-case, is the precise assemblage of letters which conveys her exact shade of meaning. The actual wording of her instructions in this regard was devoid of ambiguity: “Don't *mess* with my text."

By all accounts, Candy Smith-Foster is a sweet, well-mannered, and particularly well-intentioned child. Each of her instructors report that, in their fields of expertise, she is one of the most attentive, most responsive, and, without exception, fastest learning students they've ever had the good fortune to mentor.

However, in areas in which she herself possesses a demonstrated competence, she does not lack for conviction. And she has a history of getting what she wants, despite the quality or quantity of opposition.

I am an academician. Though a *hominem,* I do not possess a Belt, black or any other color. Accordingly, I prefer that she not become cross with me. Wherefore, I must include this disclaimer:

Other than basic translation, transcription, and typesetting of the text from Pitman shorthand into English—and notwithstanding the inherent redundancy of one of her favorite all-capped, ironic self-descriptives, “Plucky Girl Aviatrix"[2]—nothing in this record has been “messed” with.

[2: Archivist's note: Yes, your archivist did point out to Candy that *aviatrix* is by definition female. She responded that *girl* implies youth, and that therefore *girl aviatrix,* while superficially redundant, is in fact an accurate, if ironic, self-description. Your archivist did not press the issue....]

Now, from a practical standpoint, Candy's merger of Pitman shorthand with telegraphic-style sentence compression and simplified basic formatting cannot be argued with: The result is a compact, easily transportable, original physical record. More importantly, of course, an expert Pitman writer like Candy can memorialize her thoughts substantially in excess of two hundred words per minute, which encourages

detailed journal-keeping, even under the most difficult of field conditions.

This, of course, typifies how many of her previous journal entries were made: One entire volume, for instance, was written sealed in a spacesuit, in darkness relieved only by a flashlight, while riding in the belly of that earlier-referred-to bomb-carrying missile.

Now, the reader will note that these journals are replete with what, at first glimpse, appear to be impulsive, almost reckless decisions, but which, as events develop, are revealed to have been as well thought-out as the press of circumstances permitted.

In this instance, of course, the controlling "circumstances" were that, since Teacher had informed her that it would be another six months before we would be able to mount another expedition into the area where her adopted father was reported to have been held, nothing short of imprisonment, behind actual solid bars, possibly in chains, would have prevented Candy from departing immediately to follow-up on that lead to his whereabouts. And even a cursory review of previous journals would suggest that even *that* might not suffice to stop her for long.

Now, for those who may not have had the benefit of earlier volumes, the background basics: We *Homo post hominem*s are the heirs and successors to *Homo sapiens.* Multiple theories have been offered to explain our abrupt, simultaneous emergence upon the scene at a rate of roughly one of us to every twenty-nine hundred *H. sapiens* births worldwide.

It was Soo Kim McDivott, our discoverer (and world-renowned pediatrician, child psychiatrist, and anthropologist; known, of course, as *Teacher* to every *hominem* the world over) who proposed the current favorite: Since the grandmothers of these children were all born within a two-year span, conceived during the rampage of the great influenza pandemic of 1918-19, the "coincidence" fairly shouts its implications: sweeping genetic recombination due to specific viral invasion, affecting either of the gametes before, or both during, formation of the zygotes which became these grandmothers, creating in each half of the matrix which fitted together two generations later to become us.

In addition to an apparent complete immunity to the full spectrum of "human" disease, we're stronger, faster, more resistant to trauma, and possess quicker reflexes. As well, visual, aural, and olfactory functions operate over a broader range and at higher levels of sensitivity than in *H. sapiens.*

As with all of us *hominem*s, Candidia Maria was born to normal *Homo sapiens* parents. Those parents, the Smiths, were killed in a car accident only months later. Before day's end, she was placed temporarily with Marshall and Megan Foster, who moved formally to adopt her as soon thereafter as the system permitted.

Candy's identification as a *hominem* came about through amusing circumstances: At not quite five years of age, she glanced up and commented that the living-room wall looked "...awful hot." Testing the surface with his hand, Marshall discovered that she was correct; that a wiring fault was on the verge of burning down the house.

Aware of the newly emergent species from his long friendship and professional association with Soo Kim McDivott, the implications of a child whose vision extended into the fringes of the infrared spectrum could not be missed. They had her tested immediately, and indeed she did prove to be an *H. post hominem.*

Regrettably, however, also just before Candy's fifth birthday, Megan's long-in-remission leukemia returned with a vengeance. Medical science was unable to stop it, and she soon died. As a result, the child's bond with Marshall tightened—and vice-versa, we might add: She became, and remains to this day, very much a "Daddy's girl."

Candy's phenomenal rate of intellectual development remains an anomaly. She was reading entirely on her own by age two. By three she understood basic mathematical relationships, and could add, subtract, multiply, and divide three-, four-, and even five-digit numbers.

Teacher suspected that the whipsaw effect of Marshall's original heel-dragging desire to raise a stereotypically sweet, "normal" little girl, "full of sugar and spice," quietly opposed by Megan's determination to supply as much information (over or under the table, as necessary) as Candy could absorb on any subject about which she expressed an interest (and apparently she was interested in *everything*), offers at least a partial explanation of why, according to every benchmark, her progress was well ahead of his experience with members of Teacher's original AA study population—themselves a substantially accelerated group compared to *H. sapiens* norms. Accordingly, upon Megan Foster's death, Teacher moved in next-door and assumed her role as facilitator, while Marshall continued to pretend to act as the public brake.

In addition, as one of the few Tenth Degree Black Belt masters of karate on the planet, Teacher also took her on as his personal martial arts pupil. Under his instruction, her progress in this field was as phenomenal as her rate of education: She earned numerous championships in her age/weight group.

By eleven, her age at the time of the holocaust, she had acquired the equivalent of an advanced high school education with some college. She had mastered math through calculus, some chemistry, had acquired a strong foundation in physics, and had made a good start on college biology. Her progress in karate had progressed to the limits of Fifth Degree Black Belt advancement; Teacher was in the process of grooming her for Sixth when the *Bratstvo* struck.

Candy rode out the bionuclear attack that ended the reign of *Homo sapiens* in the large underground shelter beneath their Wisconsin small-town home, which Doctor Foster had built in secret, both for their protection and as a repository for copies of most of the accumulated science and art of mankind. The attack found her reading down in the shelter, alone except for Terry, her macaw, whom she regards, again we suspect only partially tongue-in-cheek, as her retarded twin sibling.

The day prior to the attack, Marshall Foster, publicly a practicing small-town pathologist, but in fact a covert top government biowarfare consultant, had been requested to go to Washington to discuss the deteriorating world situation. Since Washington was one of the few locations on the planet where surface-targeted missiles were used in quantity, Foster was assumed to have been killed outright, along with everyone else within about a thirty-mile radius.

Learning after the attack that she was herself a *Homo post hominem,* Candy set out across a depopulated America to find us, the now-grown young adults of Teacher's AA group.

At this point it occurs to me that, while I've used the term, *AA group,* several times already, I have yet to clarify what it means.

As a result of Teacher's exposure, early in his career, to the mixed results obtained by those attempting to rehabilitate children lost, adopted, and raised in the wild by animals of various species (real-world examples of Kiplingesque children like Mowgli, the wolf-boy), Teacher found himself drawn to the age-old debate about "nature versus nurture." He wondered whether ordinary parents, upon producing markedly superior children, might somehow tend to prevent the kids' development from exceeding their own attainments; and if that occurred, to what extent the child would in fact be limited.

He began a study directed toward identifying gifted children shortly after birth, before this theoretical environmental retardation could begin to have its effect. Various factors were isolated which, encountered as group, proved intrinsic to potentially superior children.

Once a sufficient population of them had been identified, the study shifted to phase two. The “positives” were assigned to two of four study groups.

AAs (positive/advantaged) were potentially gifted children whose parents were subsidized, guided, and assisted in every possible way to provide an optimum learning and developmental environment. The ABs (positive/nonadvantaged) were potential geniuses whose parents weren't told of their children's potential: controls, in other words.

At the other end of the scale were the BA (negative/advantaged) group: ordinary babies whose parents were encouraged to believe their offspring were geniuses. They, too, received the benefits of AA-type parental support and coaching—but of course the study was double-blind: None of the coaches knew whether they were dealing with AA or BA children.

And, of course, the fourth group were the BBs (negative/nonadvantaged); the true controls: ordinary babies raised by ordinary parents, without interference.

As expected, the AAs did well in school; their progress tended to triple national norms. Further, AA children were well adjusted, with happy, well-integrated personalities.

The BAs did well, too; however, they exceeded national figures by only fifteen percent. Most were happy, but isolated individuals demonstrated behavioral symptoms suggesting they might be being pushed close to or even beyond their capabilities.

Perhaps more intriguing were the ABs, who produced very spotty results: The best of them were extremely good, equaling AAs’ figures in certain cases. However, the worst were *very* bad: The ABs had the highest proportion of academic failures, behavioral problems, and patently maladjusted personalities. Apparently conventional upbringing and education reduced many of them to pathological levels of boredom.

The BBs, of course, showed no variation at all from national curves; they were “just kids."

Thereafter, from the AAs and ABs, we *Homo post hominem*s were identified.

Ultimately, following a series of vague clues, Candy located us AAs, ostensibly by “coincidence": having managed to place herself in a location where, when she heard the sonic boom and glanced up, she saw the contrail of one of the few air expeditions to have been sent out, which led her straight to us.

As an aside, during subsequent testing Candy has demonstrated a much higher percentage of successful “coincidental” trackings-down of hidden people and/or objects than mere luck would explain. This has led Teacher to postulate the existence of a “tracker” gene. Given the largely unknown commodity that we represent at this point, that probably is as good an explanation as any. In any event, when Candy refers to switching on her “stalker mode,” once again, she's probably only about half kidding.

Following that contrail, she found us all gathered at the Vandenberg space shuttle complex, feverishly working to launch the *Nathan Hale,* one of *H. sapiens'* space shuttles, which we had renamed to reflect the tone of its mission.

We had learned that the Holocaust had been a product of Russian-based nested conspiracies:

First, the *Bratstvo,* or Brotherhood, whose devastatingly successful plot to use the Russian military's bionuclear capabilities to wipe out all *Homo sapiens* other than their own membership—as a mere collateral *benefit* of the nearly successful effort to eliminate us *Homo post hominem*s before our new species could get a toehold and emerge from its endangered status.

Then the *Khraniteli,* or Guardians: a group of suicidally fanatical *Homo sapiens,* "true human beings," of whose existence we had never had a clue until Candy uncovered them and warned us, dedicated to the proposition that, not only were *hominem*s not to be permitted to supplant *H. sapiens,* but only humans of the *Khraniteli*'s own ideologically pure membership would be allowed to survive. Concealed and working within *Bratstvo* organization, the *Khraniteli* subtly misdirected their puppets' efforts, leaked their locations, and ensured that the United States' thermonuclear response to the initial attack would eliminate every *Bratstvo* installation and operative.

This left the Earth to the tender mercies of the *Khraniteli*'s own, much more sweeping follow-up purge: Operating through the *Bratsvo*s, they had left a doomsday device in orbit—an unprecedentedly powerful strontium-90 bomb, programmed to commence reentry upon failing to receive a periodic coded signal, the next of which, according to intelligence reports, was due eleven days from then. Unfortunately, it seemed, the contents and radio frequencies were known only to the long-dead fanatics who had triggered the holocaust in the first place.

The *Hale* had been modified extensively in order to reach geosynchronous orbit, twenty-two thousand five hundred miles above the Earth—seventy-five times higher than it had been designed for. The changes left it unable to return to Earth. The crew would reach the missile, disarm the bomb, and thereafter die. Hence the renaming: *Nathan Hale*—"My only regret is that I have but one life..."

At almost the last moment, however, it was discovered that the small, powerful, homegrown robot handler that we had been developing to penetrate the missile and disarm the bomb was not up to the challenge. And because the missile's nine-by-fourteen-inch internal hatches were too small to permit an adult in a spacesuit to reach the detonator and disarm it, suddenly it appeared that our species was destined to join the dinosaurs almost before it had emerged.

At that point, however, Candy stunned us all by volunteering to go on the suicide mission. She demonstrated that her diminutive stature allowed her effortless access to the warhead, and that her mastery of hysterical strength, gained during Teacher's karate training, would enable her to disarm it.

Obviously, there was a chorus of protests over the notion of sending a child on a suicide mission, but even more obviously, if our species were to survive, there was no alternative.

Mission personnel totaled three: Besides Candy, there was NASA astronaut Harris Gilbert, the mission commander, and Kyril Svetlanov, a Russian *Bratstvo* defector. Having participated in the design and construction of the bomb, Svetlanov had apparently experienced a change of heart. He was going up to help disarm it, thereafter to die—a most persuasive gesture of atonement.

However, once they arrived at geosynchronous orbit and matched orbits with the bomb, the Russian's true colors emerged: He knifed Harris in the back, killing him instantly. Svetlanov was in fact a *Khranitel.*

We *hominem*s had been fed persuasive false intelligence about the missile, a delta-winged dart similar in appearance to our own space shuttles, but constructed of the *Khraniteli*'s wondrously strong new material: Purportedly it was programmed to reenter the atmosphere, belly-land on the open ocean, sink to the bottom of the Murray Fracture Zone, seven hundred miles west-southwest of San Francisco, and detonate. This would set off a worldwide paroxysm of earthquakes, volcanoes, and a lethal rain of strontium-90 fallout on all unprotected *H. sapiens* and *hominem*s alike.

In fact, however, the missile was targeted to land just offshore of the Vandenberg launch facility. And though the warhead was smaller than advertised, it was more than powerful enough to trigger a tsunami certain to wipe out all the *Homo post hominem*s of Teacher's AA group, assembled to launch the *Hale* —yes, the misinformation had been tailored specifically to draw us there.

Unfortunately, the data regarding the strontium-90 fallout *was* accurate: Earth would indeed be uninhabitable by unprotected humans of either variety for the next two hundred years. Only the *Khraniteli*, in their huge *Serdtsevina Rasovyi* shelter under the Ural Mountains, massively constructed of the new material and provisioned for the duration, would survive.

Day-by-day, however, and despite her *hominem* heritage, Svetlanov's admiration for Candy's self-sacrificing courage and determinedly cheerful spirit had mounted during the week of intensive prelaunch training. With Harris dead, and after having disabled the radios, he felt reluctant to murder her as well, since he could envision no way that Candy alone could possibly complete the mission and block the *Khraniteli*'s plan from achieving fruition.

But Harris had never entirely trusted the Russian; he had deliberately kept him in the dark regarding Candy's karate skills. And within moments of the mission commander's death, she had distracted and disarmed the *Khraniteli* agent with tears—in her words, "surely most abjectly pitiable performance since Bambi calling for Mother in forest fire"—broken his neck, and resolutely assumed responsibility for the fate of all remaining Humankind.

First, of course, she had to disable the bomb. This was the element of the mission for which she had trained, so—apart from the challenge of navigating a five-mile spacesuited orbital transit between the *Hale* and the missile, for which she had *not* trained—that was not a major problem.

But thereafter, somehow, she had to figure out how to warn us, on the ground, of the *Khraniteli*'s existence and their continuing genocidal intentions. The first solution to occur to her was to retarget the missile's landing site and send a handwritten message down inside it, wrapped in three nested spacesuits for protection against reentry heat.

Incredibly, however, to that point she had been so utterly focused upon warning us that she hadn't even considered her own survival. Only after safeguarding the message did it occur to her that, by riding down inside the missile herself, she might have an outside chance of survival.

Naturally, given the missile's lack of heat shielding, and programmed-in, high-*g* evasive maneuvering, she barely lived through the heat and battering. Only the fact that Adam and Kim had belatedly realized that Terry's increasingly nonstop, almost weeklong "spaceflight news coverage" monologue was in fact a direct line into Candy's thoughts enabled them to follow the reentry drama and be there when the missile touched down at Edwards Dry Lake.

Braving significant scorching themselves, they extracted her from the still smokingly hot vehicle. In-flight pounding against the missile's internal structure had severed her spacesuit's life-support lines halfway through reentry, and she was clinically dead by that point: Both her respiration and heartbeat had stopped.

They removed her from the nested spacesuits and began resuscitation efforts. Ultimately, only Adam's utter refusal to stop performing CPR, when it had become obvious to everyone else that she was past any hope of revival, saved her. Even Teacher, whose launch-site radar had picked up the missile coming in over the Pacific, and who, with his team of AAs, arrived in helicopters shortly after the reentry vehicle had touched down, tried to tell him that she was gone. But Adam persisted, and, to everyone's astonishment, eventually her heart restarted.

Of course, in addition to clinical death, Candy had suffered multiple broken bones and extensive first- and second-degree burns. Months of treatment, physical therapy, and resumed karate training led to her complete recovery...

And to the situation in which we found ourselves at the point at which the current journal commences:

Candy had “borrowed” an airplane, and embarked upon what any reasonable person (lacking knowledge of her determination and skills) would regard as a Quixotic quest to find and rescue her adopted father.

* * * *

Volume II

Grand Theft Aero

Candy's Journal:

Arguably, Posterity, descriptives *borrowed, departed,* perhaps oversimplify circumstances surrounding expedition's commencement. But *needed* plane. And needed at least as much not to be noticed, stopped.

Now, historical record amply demonstrates Plucky Girl Aviatrix's world-class ultralight piloting skills. Not to mention multidozenteen hours logged “flying” shuttle simulator prior to suicide mission to geosynchronous orbit, plus checkout flights in most ships in AAs’ air fleet—okay, *not* the C-17s...

More pertinently, however, only two weeks previously had availed self of propinquitous opportunity to accumulate just shy of two hours’ pilot-in-command Stallion time when Lennel Palindrome (how can parents be *so* cruel?) delivered Adam, Kim, Lisa, Terry, Tora-chan (Adam's cat), Plucky Girl Explorer herself, up to Sequoia National Forest to retrieve my unstoppably Adam-breathed-upon, four-wheel-drive van, boy's own luxurious, much-modified travel-trailer, our various camping/travel gear—including (oh, frabjous day!) his favorite gourmet cooking pots, pans, utensils, plus collection of herbs, spices, other possibly alchemy-based additives which may explain *some* of the difference between his offerings, those of other, merely world-class chefs.

After intense coaxing, cajoling, wheedling, and persuasion (whining imputation, however, rejected as undiluted calumny), Lennel let me fly takeoff, outbound cross-country leg; even coached me through float-down-like-leaf, short-field-mode, practice landing on turf next to runway at destination airfield.

* * * *

Historiographer's note: To ensure accurate Record for Ages (not to mention quell malicious gossip), Lennel's decision to yield controls prompted exclusively by lad's own big-hearted impulses, innately magnanimous nature. Completely unconnected to my rumored promise not to hurt him next time I conducted his Second-Degree Black Belt karate classes....

Mere coincidence, also, that, since equity demanded helping with preflight inspection, refueling upon arrival, postflight maintenance, etc., such activities enabled concurrent sucking of Lennel's brain generally regarding Stallions’ care, feeding, idiosyncrasies, etc.

Now, unlikely as may seem in hindsight, at that point your Humble Historiographer actually had nothing more devious in mind than wallowing in adrenaline rush stemming from controlling big, powerful new toy. Ultralight's maximum takeoff weight, 525 pounds; with full fuel plus Intrepid Girl Aviatrix aboard, tips scales at barely 400. Stallion, on other hand, grosses 6100. Not to mention unmitigated epinephrine thrill—at full throttle, big bird accelerates like rocket, climbs as if laws of physics suspended.

However, at least as compelling, like Mr. Kipling's *Elephant's Child,* Yours Truly always on lookout for opportunities to feed ‘satiable curiosity. Pursuit of knowledge never wasted effort.

Which maxim's truth never more conclusively demonstrated than today....

* * * *

Recently *re*resurrected Helio Aircraft Company's latest edition of Stallion bushplane is big, gangly, awkward-looking bird: only a whisker less than forty feet from prop spinner to strobe-capped tail cone, wingspan slightly wider still. Towers nine feet high on extra-tall, so-called conventional tail-dragger landing gear, supported in front by two huge, fat, soft-terrain-flotation tires.

(Clearly, *conventional* reference in this context purest anachronism: Nosewheel-based tricycle gear, as seen on jetliners, military aircraft, etc. [including ultralight, aboard which Plucky Girl Aviatrix acquired initial experience], has long since replaced tail-dragger layout as norm; but two-big-tires-in-front/small-one-at-rear configuration still preferred by experienced bush pilots for soft, rough, short, unimproved fields.)

Technically, Stallions rated for two-person flight crew plus eight passengers; in fact, since solo pilot suffices for operation, can transport nine actual passengers.

For this trip, however, prior to departure, unlocked, took out, left behind six rearmost seats in favor of resultant unobstructed floor space, bulk cargo room, extra payload weight allowance.

On downside, seat removal provided convenient access to cargo-drop belly doors. When opened, yawning void useful for air-delivering supplies, etc., should such activities appear on agenda. However, on occasions when must walk across, stand on them in flight, doors' presence underfoot generates very real (regardless how psychosomatic) sweaty, achy sensation in soles of feet, palms of hands. (Odd reaction, given fact am not particularly phobic about heights per se.)

From Plucky Girl Aviatrix's perspective, however, Stallion's primary benefit is advanced aerodynamic technology: Pop-out Fowler slats extending virtually entire length of wings' leading edges, combined with root-to-tip flaperons (ailerons doubling as flaps) produce astonishing slow-flight qualities: Minimum controllable maneuvering speed only 37 knots, or 42.5 mph; actual stall lower still. Most planes that size already falling out of sky at 70 or better.

Which slow-flight characteristics, when combined with 750-horsepower turboprop engine, huge, variable-pitch, reversible, three-blade prop, produce incredibly short takeoff/landing ground runs: just under length of football field; hardly more than needed by tiny ultralight. STOL: Short TakeOff/Landing—indeed.

* * * *

Aforementioned sophisticated aerodynamic engineering features combined to produce slightly wobbly takeoff; borderline maladroit performance no doubt exacerbated by haste. Had someone noticed preparations, asked entirely reasonable question, "Candy, what *are* you doing with that plane...?" would have had awkward time coming up with answer sufficiently disarming to send snoop back to minding own business.

(And really hated thought of having to pummel friend to make good escape.)

So took advantage of plane's STOL characteristics to minimize interception probabilities: Took off more or less directly out of hangar door.

Stallions particularly well suited for such highjinks. For all intents, purposes, turboprop warms up instantly. Hit starter, engine spins up to minimum ignition rpm. Light torch—thrill to nifty jet-engine wail as, within seconds, rpms come rest of the way up to operational speeds.

Sound level, however, not exactly stealthy; so prior to engaging starter, had already set prop pitch, flaperons, trim tabs for departure mode: Everything in short-field-takeoff configuration.

Wherefore, advanced throttle to stop, released brakes, eased yoke forward. Tailwheel off ground before Stallion fully out hangar door; plane lifted off without further pilot intervention only two, three seconds later—almost before clearing apron.

Banked immediately to establish climb-out parallel to active runway, just in case actual conflicting traffic might be present. (Not likely; airstrip boasts three, maybe five non-training-session operations per week.)

Once clear of traffic pattern, climbing away from field (with guilt feelings waning in direct proportion to distance covered), didn't take long regain feel for controls. Stabilized, trimmed for standard cruise-climb.

Upon reaching manual-listed maximum-efficiency altitude of 13,000 feet, netting 188-knot (201 mph) cruise, burning roughly 50 gallon per hour, leveled off, switched on autopilot.

Left ship's radios turned very much *off*. Same with pair of borrowed satellite phones. Little doubt what family, friends would have to say. Even less doubt—common-sense arguments, emotional entreaties alike would have no effect on decision.

Redundant GPS units operational; even more satisfying, agreed amongst themselves. Teacher says most GPS satellites can be counted upon to remain on-station, on-line for years to come; long enough, he feels, for *hominem*s, led by AAs, to develop own space program based on lightweight Rutan-pioneered technology; take up global-comm maintenance duties; plus, in time, embark upon further exploration out into Big Dark.

Unbuckled, adjourned to improvised navigational station just aft of pilot's seat. Had "borrowed" one copy of each paper chart covering proposed route up U.S./Canadian/Alaskan west coast, straight across inland Alaska to Bering Strait, along with most of eastern, central, western Asia, eastern Europe. Plus had full collection of applicable GPS-linked 3-D topographical satellite-photo DVDs to load into Garmin moving-map "glass cockpit" big-screen primary flight-information display.

Spread out first chart. Rather than following westerly-then-northerly-curving coast all the way to Seattle area, point at which Canadian coast bends westward further still, had decided to plot inland-angling, less Pacifically scenic but shorter, geodesic "great circle" course.

Quick glance showed route workable: Regularly spaced general aviation fields within reasonable detouring distance on both sides of track.

Returned to pilot seat. Inserted first DVD into Garmin. After brief delay while system loaded, digested data, full-color moving map appeared, with cute little *you-are-here* airplane icon just below screen center. Quick glance out windows confirmed on-screen picture matched geography below.

(Amazing, what scientists can accomplish when not coming up with ever more imaginative ways to eliminate whole sapient species....)

Even without electronic goodies, Stallion's panel more than adequate to fly through soup. However, have no intention whatever of attempting IFR (instrument flight rules) operations. Yes, have demonstrated acceptable degree of proficiency, both in simulators as well as while wearing don't-peek, instrument-practice hood in real planes.

However, absent, at minimum, up-to-date weather information from ground-based air-traffic controller, pilot has no idea whether cloud one is driving through is merely local phenomenon—or perhaps zero-zero conditions exist all the way down to unplanned right-of-way dispute with unyielding minerals. Only way to be certain is to fly only when ground visible, meaning VFR operations for me exclusively, thank you very much.

Planned to fly short legs only, topping up tanks by halfway point whenever possible. If specific airport turns up dry, will have plenty of fuel remaining to move on.

* * * *

Had had variety of planes to choose from back at Mt. Palomar; some smaller, others larger (all the way up to Globemaster IIIs!). However, while Stallion larger than would have preferred, advanced aero technology actually simplifies piloting, maintenance chores; minimizes odds of potential mechanical failures.

Lennel says turboprops *way* more reliable than reciprocating engines. Oversimplifying proposition to almost comical degree, turboprop consists of only one moving part: turbine/compressor shaft. True, that single piece drives gearbox, which slows 125,000-plus-rpm turbine shaft rotation to 2000-2500 rpm-ish prop speed, as well as driving peripherals such as alternators, etc.

Adam agrees with Lennel; says far fewer modern propjet engines and/or gearboxes fail than piston engines' exhaust valves—to say nothing of recips' other eleven moving parts per cylinder (minimum); plus all those components in common, such as crankshaft bearings (or crank itself), connecting rods, camshaft, pushrods, rocker arms, valve springs, magnetos, distributors, sparkplugs, etc.

Of course, regardless which engine type, any failure beyond most minor of causes shifts expedition to Plan B in big way—substantive engine repairs simply beyond 11-year-old ingenue-type capabilities.

Wish *had* Plan B....

And sure wish had dared try to bring Adam. Merrily wicked, irrepressible good humor, coupled with our fundamental compatibility, would have made trip much more pleasant. Plus, of course, boy so *useful:* Even limited to campfire or crudest gasoline-fueled camp stove, routinely produces culinary miracles; and, though major aircraft engine blowup might crowd even his talents (at least without access to fully equipped aviation repair shop), can fix pretty much *any*thing.

However, company simply not in cards. No question, Adam would have responded to invitation with attempt to stop me. Probably would even have stooped to irrefutable common-sense arguments. When that failed to work (as *if!*), favorite boytoy in whole wide world would have dug in heels, shifted to transcendentally superior Male Authority mode: Forbidden Me To Go.

(And according to leading relationship experts, tying, gagging, locking Significant Other in closet prior to departure appears nowhere among top ten recommended couple-bonding strategies.)

Still, would have been nice to be able to count on intelligent, resourceful, fearless backup In The Event Of ... Particularly someone so familiar with the frequently out-of-boxly way Plucky Special-Ops Girl's brain operates—coordinated efforts, when working as team, sometimes leads family, friends, associates to accuse us (probably no more than half-kiddingly) of reading each other's minds.

Hmm ... No way to soft-shoe around it, Posterity; *that* was digression. Back to Stallion:

At least as important as reliability for traveler forced to glean necessities en route, turboprops' diet of choice: Jet-A/JP-4—staple of civilian passenger/air freight industry/military air fleets. Millions of gallons still conveniently available pretty much worldwide, even at modest-sized general aviation and/or military airports.

Toward which end, on-board tool inventory also includes pair of industrial-grade fuel-transfer hand-plumps, with hoses, high-tech filters to remove condensed water, screen out particulates, algae, etc.

In interests of historical accuracy, however, Dauntless Girl Flying Ace must confess: Deserve no credit for equipment's inclusion; not product of own foresight. Each of *hominem* community's planes carries them, since even officially condoned flights mostly involve refueling far afield.

Plus, even more critical for under-five-foot-tall airplane thie—er, borrower, inventory includes lightweight folding stepladder. No kidding: Fuel filler caps on this ship recessed into upper wing surfaces, tippy-tip-tops of wingtip tanks—all over *nine feet off ground*...!

Also brought along additional piece of equipment necessary to accommodate Yours Truly's "special" requirements: Firm, three-inch-thick, foam block on pilot's seat enables vision over instrument panel in level flight. More comfortable, as well as lighter (and surely more professional looking), than phone book, which had used during earlier flight with Lennel.

Lastly, homemade rudder/brake pedal lift blocks, transferred intact from pedals of own van. Neatly mini-C-clamped into place, pads enable leg-length-challenged pilot (hey, I resemble that remark!), falling outside designed-for specs, to steer, coordinate flaperons/rudders for smoothly banked turns; operate brakes when circumstances mandate.

* * * *

Teacher's bomb dropped just after breakfast. Ferreting out necessary details on Daddy's probable whereabouts took almost 'til noon. Packing required another two hours.

All Stallion maintenance logs kept in pigeonhole shelf unit mounted on hangar wall, so plane selection took only minutes. And since unwritten Mt. Palomar "air force" protocol states, "You fly it, you service it," could be certain that, unless red-tagged, all ships present fueled, flight-ready.

Transferring gear (including pedal blocks) from van to plane took half hour.

Lifted off, finally, at about three p.m., leaving only about five hours' daylight.

Night flying? Thank you, no. Hominem vision extension into infrared fringes *not* adequate substitute for runway lights during night landings. (Okay, if had *really* good reason, might be persuaded to take shot during warm, cloudless, full-moon-lit night.) Upon reflection, have decided to flightplan for solid, two-hours-before-sundown cushion, just to be sure.

Flying weather perfect: Glorious, haze-free, clear blue skies, intermittent fluffy, sparklingly white cumulus puffies (a few reminiscent of animals) above, below flight level; gorgeous panorama of forested mountains, rivers, lakes passing beneath, all the way from Palomar to Klamath Falls, Oregon.

Where redoubtable World-Class Ultralight Pilot/Retired Space Shuttle Copilot redeemed self, reestablished confidence eroded during flying-clown takeoff, by floating down, executing (tragically unwitnessed) perfectly squeaked-on three-point touchdown.

* * * *

Excerpts from the Journal of Kim Mellon:

Really, wouldn't you think that by now we'd all have *learned*...

If there's one quality that exemplifies Candy's personality, it's her decisiveness and determination.—Wait. Sorry; that's two qualities. Her resourcefulness, decisiveness, and determination—*Damn,* that's three. And—

Sorry; worry scrambles my brain, and of course I'm practically beside myself at this point, so naturally I sound like a refugee from a Monty Python *Inquisition* skit.

I think what I'm trying to say is that Candy isn't *like* other little girls; not even other *Homo post hominem* little girls.

(At least I don't *think* she is—or maybe I'm just *hoping:* Periodically, the recurring suspicion that one day Lisa may be just like her causes my blood to run cold.)

Prior to saving the world (and before dying even the *first* time), Candy had demonstrated a selfless courage and determination at least comparable to that of ... of...

Of an adult, obviously.

But an adult *what*...?

Sugar? Spice? Everything nice?

A *warrior,* of course. Though still essentially a child in appearance, and in her merry, uncomplicated devotion and loyalty to her friends and loved ones, the innermost core of Candy's soul of souls cannot be other than that of a warrior. Yes, four feet, ten inches in height, preteen—nearly prepubescent, for heaven's sake!—but clearly a warrior:

Repeatedly she's faced death in defense of others; sometimes spontaneously, reacting almost without thought, as when she dived into that flaming car to rescue Adam. But that last time...

With full awareness of the consequences, making a rational, calculated, “needs of the many” decision—displaying a courage which to this day brings tears to my eyes to contemplate—she stepped forward and volunteered to die for her newly discovered people.

And *did.*

But she's also killed. On the first occasion, she was hurried into mortal combat by a sociopath.

The second time, however, the killing was carried out in the coldest of blood: an utterly premeditated execution. Kyril Svetlanov, the *Khraniteli* agent, stood between her and the lives of those whom she had pledged herself to protect. Deliberately, efficiently, she distracted him with childlike tears, got close enough, and then, with a minimum of risk to herself and her mission, she invoked hysterical strength, twisted his neck, and *killed* his treacherous, back-stabbing, sorry *Khraniteli* ass...!

(Wow. Where did *that* come from? I must be even more upset than I realized.)

Anyway, certainly the courage and integrity are inborn, but those life-and-death experiences have ... *changed* her. Since returning from space (and, particularly this last time, from death), Candy has possessed a certain ... perhaps *awareness* would be the closest descriptive of her current outlook, though an adult-level element of *confidence* is part of it.

Now, whether that confidence is best described with the prefix *over* or not ... I'm barely a First Degree Black Belt and I've never died, so, in the language of my engineering background, I lack the training, experience, and/or data necessary to express an opinion.

In any event, I should have recognized the signs: I actually *heard* Teacher tell her that they'd gotten a line on her adopted father. More importantly, I also heard him tell her it would probably be another six months before we could mount another expedition into the area.

Then I bumped into Danni coming out of the showers, and *she* told me how Candy had grilled her for everything she'd heard about Doctor Foster.

However, it was only at dinnertime, when most of us were assembling in the chow hall, and I looked up to see Lisa arriving with Terry on her shoulder, that the dots began to connect, and the first squads of goosebumps started their march up my spine.

"Lisa, honey, how come *you* have Terry? Where's Candy?"

At six years of age and the product of a double dose of *hominem* genes (my beloved, dearly departed Jason almost certainly was one of us), Lisa is one of the most terrifyingly precocious children on the planet. An empath, having demonstrated beyond question her ability to tap into Candy's emotions, both directly and via Terry's mind, and almost as certainly mine and others, getting information from her which she feels might upset us can be an exercise in frustration.

She eyed me thoughtfully before replying. “Candy's not eating with us tonight,” she said carefully. “So I thought *I'd* bring Terry."

Mm-*hmm* ... Not enough content to be a lie, and *so* not responsive to the question. (Daniel Webster would have gotten all misty-eyed with pride.)

I tried again, my voice dripping a warm, uncritical curiosity—knowing all the while that the tone was irrelevant; that she was picking up my mounting apprehension directly from the source: “Where *is* Candy eating?"

Lisa's eyes hooded. Another classic *null-A* pause ensued which would have warmed the cockles of A. E. van Vogt's slannish heart. This was followed by an even more painstakingly less informative reply: “She didn't say."

By this point, throughout the chamber all eyes were swiveling toward us. Conversation, after the briefest upward flurry, began tapering to a halt.

"Around eleven this morning,” Wallace Griffin contributed unhappily into the deepening silence, “Candy dropped by my office and pumped everything out of me but my bone marrow about what we'd gleaned regarding her dad. She even left with copies of our field reports."

"Which would have been right after she'd wrung me dry,” interjected Danya, regarding Lisa with that unblinking gaze so reminiscent of a cobra.

Whereupon, my daughter found that stroking and scritching Terry required all her attention. Clearly no further assistance would be coming from that quarter.

Another pause followed, increasingly pregnant, broken when Lennel Palindrome, our leading aviation maintenance guru, cleared his throat and rose awkwardly to his feet. “If I could see a show of hands of anyone who knows why one of our Helio Stallions executed a remarkably nonstandard departure around three this afternoon?” he asked. “And is still gone....” he finished apologetically.

The dearth of hands in response was equaled only by the depth of the silence that finally had descended throughout the room, unbroken even by the sound of breathing.

The crash of Adam's chair toppling over ended it. Catapulting to his feet, he leaned forward, arms braced on the table, his face suddenly ashen. Wide-eyed, he glared around the room. “She's gone!” he hissed. “You all *know* she's gone! She's going to fly to Russia all by herself, and then, single-handedly, she's going to *storm the goddamned castle*...!"

* * * *

Candy's Journal:

Lovely area, Klamath Falls; could be talked into living here: Pretty town, prettier surrounding suburbs; located at southern end of large, lovely lake, among low, heavily forested mountains, rising higher to west. Whole area situated among eastern flanks of Cascades, some 60 miles south of Crater Lake.

Stallion's resting angle so steeply nose-up, on extra-tall, conventional, tail-dragger landing gear, renders vision straight ahead over nose while on ground effectively *in*visible. So S-turn taxied (snatching alternating peeks right, left, to see what lay directly ahead) over to fixed-base operator facilities.

Identified half-full Jet-A fuel truck. Employed hand pump, filters (ladder!) to refuel Stallion.

Thereafter performed plane's bedtime chores: Checked oil, various fluid reservoirs, battery electrolyte level, tire pressures. Removed aerodynamic contamination represented by bugspot accumulations from propeller's, wings', tail group's leading edges. *Carefully* washed windshield (formed from nearly bulletproof, but ever-so-scratchably soft, Lexan), etc.

Finally taxied over to pretty little grove of trees near airport perimeter. Deployed big T-handle wrench to twist tie-down kit's coiled-spring stakes deep into ground; one under ringbolt in each wing, one at tip of tail; secured plane against unexpected wind gusts with strong, kit-furnished ropes.

In shade under starboard wing, cooked dinner on Coleman camp stove transferred from van; stuffed face until comfortably full. Cleaned up “kitchen” by burying non-breakfast-reusable leftovers.

Then pulled out duffle bag containing clothes, blankets, etc., set down next to big main-gear wheel. Planted tush on bag's cushion, leaned back against side of tire. Closed eyes, composed, sent off wish-you-were-here-touristy message to family via Terrymail.

Wondered how much non-message-quality, random stream-of-consciousness, mental activity baby brother had already passed on. Probably mind-numbing duty for poor Terry-monitor—little doubt Teacher would have posted one already.

Which caused slight twinge of guilt: AAs perpetually short-handed; hated to inflict on them need to divert possibly essential personnel to remote baby-sitting duties. But then recalled: Decision to tiptoe off alone to Urals prompted in part by recognition, acceptance of fact could hardly expect Teacher to divert limited resources for mission just to rescue Daddy—assuming even still alive.

Viewed in which light, Terry-watching becomes bargain: Nets Teacher additional realtime Urals/ *Khraniteli* intel without personnel/materiel costs attendant to mounting, dispatching actual mission.

(Wow, sounds so reasonable, almost believe it myself.)

Settled down, brought journal up-to-date.

And suddenly found self temporarily at loose ends, with too much time on hands, reflecting on plans—and at that point could not avoid facing fact that killings almost certainly lay in future. In fact, assuming don't manage further to martyr self in process, undoubtedly *lots* of killings.

More specifically, lots *more* killings: Yes, Posterity, despite chronologically tender age, your Humble Historiographer has already been forced to kill.

Twice, actually.

At which point, despite best efforts, horrific series of memories from astonishingly violent recent past floated before eyes...

On first occasion, Rollo Jones, brand-new acquaintance, had attacked Terry with big iron skillet. Impact would have crushed delicate avian skeleton like balsa-wood airplane model.

Now, to be fair, featherheaded baby brother started it. But to be even fairer, fact that situation was allowed to deteriorate to that level was fault of no one but Yours Truly. On *so* many levels.

First, ignored portents: Terry hated Rollo. Instantly. On sight. And for years, had *never* known birdbrain to be wrong about people.

Even today, if silly sibling likes someone, invariably new chum proves to be Best Friend material. If not—Wait. Come to think of it, haven't encountered any *not*s since being invited into AA/*hominem* community. (Terry never met Kyril...)

Rollo, an M.D., had been charming, funny, obviously terribly smart. And while at least thirty years older than self, was indisputably handsome, in dignified, gray-templed fashion. Plus much of age difference had been spent surviving variety of hostile environments during Peace Corps tour, among other adventures. By any measure, would have been asset.

Seemingly more important at the time, however, Rollo only third living soul to cross path since Armageddon; really had hoped would become friends. So shrugged off alarm bells sounded by Terry's instant hostility; allowed acquaintance to progress from introduction to tentative, cautious friendship.

That evening, Rollo served dinner for us (Adam, self)—and on that very first "date," proposed (or at least *propositioned*); i.e., suggested practical arrangement, as primitive societies had employed down through ages: Would pledge his loyalty, years of all-around survival experience, medical training—for access to your Humble Historiographer's bed.

In process of deliberating pros, cons; actually on point of accepting, largely for Adam's benefit (having *doctor* join expedition could have been of inestimable value). But just then Rollo came within reach of Terry for very first time since meeting—and birdbrain promptly bit living daylights out of him.

Injury triggered absolutely berserk rage; if hadn't stopped him, Rollo would have killed featherheaded touchstone/ prognosticator in heartbeat. Intervention had required karate, hysterical strength. But pain, frustration at being blocked by child had redirected Rollo's fury from Terry to self.

Still might have restrained attacker without killing, but Rollo big, strong, pretty fast. Hurried me. Ultimately, encounter ended badly.

Reaction to killing was to go catatonic for better part of twelve hours, brood for weeks. Didn't recover fully until Kim (who, with daughter, Lisa, were fourth, fifth live people encountered after Mankind's End) took me aside, administered metaphoric shake, helped set head back on straight.

Then came Kyril: bright, fun, good company; also eminently cuddlable in sweet, fatherly sort of way.

But when dust settled, proved to be *Khraniteli* agent. His people wanted my people dead. Russian stood between me and mine: those whom had volunteered to die to protect.

No anger involved, Kyril's or mine. Nor, on this occasion, stampeded into lethal violence, as with Rollo. Killing Kyril was coldest-blooded, most undilutedly deliberate assassination imaginable: product of thoughtful, if brief, calculation, planning; methodical execution.

No two ways about it: Killing bad. And on indefinable levels, cost of *having* killed almost worse.

However, cost of losing genocidal war worse still. So whatever must do to defend my people,

individually or as a whole, shall accept, pay price, whatever that may be.

Same holds at least as true for rescuing Daddy....

Well, gee, glad we settled *that*.

Finally found self reflecting on curious sense of accomplishment, depth of comfort imparted by simple activity of journal keeping. Though begun originally as mere therapy, to drain off nearly suicidal levels of depression experienced while trapped in shelter right after End of Days, since then have more or less come to regard keeping up journals as responsibility—personal Duty to Future Generations.

Hmm ... Hope Plucky Girl Savior of Our People not beginning to believe own publicity.

* * * *

Day I(b)

Yes, technically, this should be Day II entry, since being written next morning after having put journal to bed—not to mention minor detail that events about to be chronicled took place after midnight.

What*ever*.

* * * *

Having concluded Day I(a)'s journal update, relaxed, leaned head back, rested against tire sidewall, settled in to enjoy gorgeous, colorful, sunset lightshow display over Cascades.

Mind you, may even have rested eyes briefly; perhaps moment here, second there. But certainly not as if *slept*.

However, in view of sunset admirer's certified nonsleeping status, startlement level delivered by gentle impact on lap from what at first impression appeared to be lightweight, inverted, plastic dinner plate seemed anomalous at best.

Eyes snapped wide. As nearly simultaneously as physically possible, looked left, right, and—

Found self locked in staring contest, at point-blank range, with cold, almost luminous, ghostly whitish-blue eyes of

—*Wiley Coyote*...?

* * * *

Kim Mellon's Journal:

Unfortunately, Teacher's attempt at calming Adam was begun with the observation, “Now, we can't just go rushing off half-cocked..."

But Adam, clearly in the grip of that hyperintense, almost berserker-quality state of focused concentration I first saw the day Candy's ultralight engine failed and she went down in the Sequoias, was already dashing out the door.

Unlike the rest of us, he didn't hear Teacher say, “...however, Wallace, I have come to the conclusion that I may be in error. Though Candy's *tactics* at this point are open to question, I think perhaps that her decision was strategically correct. We've done enough information gathering, analysis, and reflection. It's time we moved actively against the *Khraniteli*. If you'd please organize an expedition for that specific purpose."

"My pleasure," said Wallace with a wolfish smile.

"In general," Teacher continued, "I'd like to reduce all their known bases, beginning with *Serdtsevina Rasovyi,* and the research-and-development facility located there. If possible, I would prefer to recover whatever data it may contain. However, regardless of whether that proves possible, I want it neutralized, and everyone connected with it eliminated as a future threat.

"We know that most of the installation is underground, in that huge, so-called indestructible shelter of theirs. If you feel the need to use one or more thermonuclear warheads, so be it.

"Of course, at some point Candy will undoubtedly need assistance in determining whether Marshall really is alive and extracting him, so while we're at it—"

Bouncing up, I forced myself to interrupt (*no one* interrupts Teacher—not that he minds; it just isn't done): "Excuse me, Teacher. I've *seen* Adam in all-out Candy-rescue mode before. He's impetuous, but he's *not* half-cocked: Before he cleared that door, he'd already decided what equipment he was going to need, and I'll bet he knows where every piece of it is located.

"If we don't stop him"—I was already headed for the door myself, accelerating to a dead run—"he'll have it all accumulated, and by sundown we'll be missing another Stallion." Jumping up, Danya and Gayle followed me.

"How *'bout* that," said Terry from Lisa's shoulder. "Ooo," he added so softly that probably only Lisa and I heard him as I raced past her and out the door; "that cloud looks just like a *giraffe*...."

* * * *

Volume III

Sidekick

Candy's Journal:

Okay, Posterity, recognized new acquaintance as Border Collie almost instantly. Or as nearly instantly as possible, considering...

One: Fact that sun had quite unambiguously retired for evening; western horizon's bottommost fringes barely even hinted at pinkish tinge. Which meant Hair-Trigger-Alert Sentrygirl had been dead to world for probably two hours or more; and...

Two: Dog almost entirely black; relieved only by minimal white feet, modest chest blaze, narrow collar, slender stripe from nose to just behind flop-tipped ears.

Utterly motionless in pool of deeper darkness beneath wing created by slightly oblate moon hanging in crystal-clear, star-studded sky, canine effectively invisible at that moment, except for faintest infrared glowing auras detectible from areas where coat was thinnest; brighter glow from naked nose, edges of eyelids, outlining—

Only anatomical feature *really* visible: spooky, light blue eyes—picked out by random moonbeam reflected back under wing from polished metal propeller blade.

* * * *

Kim Mellon's Journal:

Gayle runs faster than I do, but Danya runs faster than *anyone;* she caught Adam only about a quarter

mile from the chow hall. He had almost reached what I suspected was going to be his first stop: the armory.

However, when Danya really wants to speak with you, the sheer radiating power of her personality (even without an awareness of the potential for dislocated joints and broken bones to underscore the effect) makes it difficult to ignore her. Far more quickly than either Gayle or I could have managed, she gained Adam's attention and suggested he return with us to what was obviously about to turn into our first expeditionary planning session.

"Don't you even *think* of skipping out ahead of us and running your own operation," she told him sternly. "Wallace is going to want to arm-wrestle me for you, but I'm asking first: I need your fix-anything, mad-scientist talents on *my* team when we go in."

Danni is *so* good. She couldn't have picked a better stratagem. No hint of the "You young idiot; you're just going to get yourself killed!" mom-style, common-sense approach I probably would have tried—which would have fallen upon the deaf ears of a mission-bent berserker.

No; with a perfectly straight face, Danni addressed him on the level of "us professional rescuers," one to another: Teacher had just authorized a preemptive strike, we were going in to carry it out, as well as to help Candy get her dad out—and, she, Danni, *needed* Adam on her team to make it all work.

I've never encountered anyone, whose construction included *Y* chromosomes and normal concentrations of testosterone, whether *Homo sapiens* or *H. post hominem,* who wouldn't have responded to such a matter-of-fact request for assistance from someone who looks like Danni with other than improved posture, a significantly expanded chest, a piercing, look-of-eagles expression, and a heightened overall aspect of manly determination.

Of course, at least equally important, by "drafting" him as part of her team, giving him mission responsibilities, and letting him know that she and we all are counting on him, Danni has also minimized the likelihood that he'll go charging off on his own.

Which is a relief. I love Adam almost as much as Candy does, and he's a terrifically talented young man. *In his fields.* But the fact is, special-operations skills and hand-to-hand combat simply are not among them. He is nowhere near Candy's level. Heck, even *I'm* better at it than he is. There's no doubt in my mind that, if he tried to go in on his own, he'd get caught in a heartbeat.

* * * *

Candy, on the other hand ... Even before beginning to train under Danya, Candy had much the same focused, thinking-all-the-time quality to her gaze as her tutor; and the more time she spends *with* Danni, the more she reminds me *of* our ex-*Mossadniki*.

Since then Danni has repeatedly confided to me that Candy is a natural-born ninja: Her talent for special-operations work, such as infiltration and stalking, are unmatched. Danya says that, since taking her under her wing, Candy's learned to move with utter silence, and become virtually invisible in terrain offering less concealment than anyone she's ever met.

As a Sixth Degree Black Belt, Candy was already approaching her coach's skill level in hand-to-hand and nonfirearm-type weapons; but according to Danni, our lethal little sister has become an even better shot than she, a *Mossad*-trained professional sniper/assassin, ever was, particularly with the big rifles at extreme long range.

In short, under normal circumstances, the thought of an eleven-year-old girl prowling the Urals, stalking *Khraniteli* in their own territory, would be terribly distressing. In Candy's case, however, similes

involving wolves in sheep's clothing fall almost blood-chillingly short. A more appropriate comparison might be something on the order of a wistfully helpless-looking Golden Retriever puppy—which transforms in the blink of an eye into a tiger. Or perhaps more accurately—a velociraptor....

Danni's only halfway tongue-in-cheek term-of-art for this phenomenon is the *exploding baby bunny surprise:* an adult adversary's momentarily confused hesitation upon the sudden discovery that within this innocent-appearing, small-for-her-age, apparently vulnerable, winsome, preteen girl dwells a supremely well-trained warrior who holds no ruth whatever for our enemies.

Intellectually, based on the above, I know that her chances of pulling it off are comparable to those of Wallace or Danya working alone. Possibly even better, actually, on some levels, because of the Q-ship factor.

Except, of course, for the language: They speak it like natives, but Candy's command of Russian is limited to about fifty words; with, I'm told, an atrocious American accent; most of it having to do with spaceflight and disarming orbiting doomsday bombs—an inventory of dubious utility on her current quest.

All of which raises the question: If she's like this now, what's she going to be like—Heaven help us all—when she grows up?

If she grows up...

* * * *

Candy's Journal:

Dwelling on 300-plus acres located not quite five miles outside Wausippi, small Wisconsin town where Daddy/ Momma Foster—then Daddy/Teacher—raised me, Weldon Helmrick was independently wealthy gentleman farmer. As part of operation, Helmrick ran commercial milking parlor. Sort of. Yes, did raise cows. Yes, did market lactate output (Wisconsin *was* Dairy State, after all) to pay for upkeep on 200-plus really contented (some almost borderline-obese) Holsteins.

Mostly, however, Weldon pocketed huge governmental subsidies for not operating anywhere near capacity, lest someone in government have to figure out how to avoid feeding excess to Third World poor.

(Hmm ... Really must stop getting diverted into these side issues. Not as if matters; those people all dead now—starving victims, soulless governmental dogs-in-the-manger alike.)

Point toward which your Humble-if-Scatterbrained Historiographer was tacking so obliquely, even prior to inadvertent digression into sociological-injustice rant: Weldon's actual motivation for keeping cows in first place was so his Border Collies would have herd of their very own to play with. (Weldon called it “training"; may even have believed it himself.)

Breeding, competing in herding, obedience, agility, tracking, catching Frisbees, plus occasional foray into conformation breed ring, were focus of joyous dilettante agriculturist's lifework.

As well, with such outlook, served as state coordinator for (surprise!), Border Collie Rescue.

BC population at Helmrick homestead seldom dropped below 15, 20: four, five of his own (more when one or more females had puppies on ground), plus 10, 20 rescuees being fostered, resocialized, retrained, in transit from/to old/new homes, etc. In point of fact, Weldon spent virtually every waking moment working, playing with, loving his dogs.

(Fair number of sleeping moments, too, based on Yours Truly's experience with Alpha, oldest daughter.

[Yes—Heaven help them—Weldon named kids in order of arrival, as if two-legged pack members. He and wife had made it up to baby girl Epsilon(!) by Armageddon time.] Seldom did any family member, or overnight guest, experience less than “three-dog night"—and can testify from own experience, actually pretty cozy arrangement during frigid Wisconsin winter nights....)

Alphie one of my best friends. Helmrick farm seriously fun place; spent considerable time there. Got to know Border Collies well; formed favorable impression.

Confession (don't tell Terry): But for potential risk to featherheaded twin posed by sharing abode with 45 pounds of spring-steel- and sinew-powered, obsessive-compulsive canine with herding instincts generally operating at Warp Nine, might well have worked on Daddy to get me BC puppy of my own.

Or, more likely, grownup rescuee. Weldon repeatedly told me would have given us Really Good Deal: his cost for one of his own pups—but free, if chose rescuee.

Weldon had much in common with beloved breed: unreasoning, monomaniacal focus on joys of pursuit of one's passion. In his case, Border Collie ownership. In BCs’ case, monitoring/ controlling movement of any-/everything nonstationary, heading off any single critter departing from group, gathering scattered components of whatever description together in one place, sorted by related subgroups, etc.

Weldon oblivious to demands in time, training, personal attention (beyond what most people could *begin* to devote) required to keep intrinsically hyperactive breed happily, constructively—i.e., non*des* tructively—occupied. Felt *no* one should be without BC of her very own; several would be better....

True, without qualification, BCs are most intelligent quadrupeds have ever encountered. Not just my opinion; according to literature (as well as Weldon), dogs from good *working* bloodlines (as opposed to ruined, bred-for-pretty-only breedring types) have IQs comparable to five-year-old human children (mind-bogglingly *focused* five-year-old human children): capable of abstract reasoning, deducing answers from indirect evidence, operating independently once assigned projects. From own observations, never doubted assertion for a moment.

How*ever*.

Have also listened to many of Weldon's horror stories—"hilarious anecdotes,” in Weldonspeak—of consequences of permitting Border Collies to succumb to ennui; each tale delivered howling with laughter at inventiveness, originality—sheer *scope* of mischief involved...

Narratives of owners who, upon waking from naps, found every single ball in entire house arranged in neat circle at feet. Or every kid in neighborhood tightly huddled in group at geometric center of front yard, most crying, all afraid to move. Or cats all clustered in living room corner, looking really outraged (yes, cats *can* be herded—by BCs).

Another dog, who turned out to be outstanding herding prospect, ended up in Rescue shortly after purchase by misguided housewife-lady owner, who only wanted nice, quiet house pet, but had heard BCs were “really smart.” Two weeks after bringing home nice, quiet (*really* smart) house pet, at last having been worn down by dog's nonstop unblinking do-something-*now* stare (referred to by proud Border Collie cognoscente as The Eye—used by BCs to intimidate, work their will upon [i.e., bully] cows, sheep, goats, livestock generally [as well as cats, neighborhood children]), misguided owner put dog out in fenced backyard.

Alone. In empty yard. With no toys.

Nothing to do; nothing to hold interest—but especially no company; no one to play with...

Owner returned hours later to find vinyl siding all removed from house's rear wall to uniform height of six feet. Apart from pulled-through nail-head holes, siding undamaged; just removed. And stacked.

Likewise, bark stripped to same height from every tree within enclosure; found in separate pile next to stacked siding.

Another farmer returned home to find barn completely jammed full of cows, with Border Collie still determinedly working to pack last few in.

On one occasion Weldon offered absolutely straight-faced opinion: Crop circles actually product of BCs relieving boredom.

And, of course, standard response to “How many Border Collies does it take to change a light bulb?"

"Only one; but while he's at it, he'll take out the garbage, empty the vacuum, defrost the freezer, repaint your house, upgrade your wiring, and defrag your hard-drive."

* * * *

This Border Collie regarded me with almost sapiently aware, analytical expression, hyperalert intensity, joyous expectation of Good Things to Come typical of sound working bloodlines.

Reached out hand, allowed dog to sniff knuckles. Then offered caress followed by scritch.

At first touch, dog trembled momentarily. Then moved forward, pressed against me. Lowered head into lap. Trembled again. Sighed.

Then whimpered.

Well...

No one who knows Yours Truly could have any doubt what happened next: Plucky Girl Adventurer dissolved; dog and I shared good cry together over her long-lost family. Held close, scritched, stroked her all over. (*Her* status confirmed during tummy rubs.)

Presently managed to get self together sufficiently to grope for, locate big, six-cell Maglight. Reset 38,000-candlepower beam from spot to flood.

Inspected collar detected during snuggle session. Unsurprisingly, proved to be high-quality (i.e., expensive) leather, with brass plate, reading...

Fairwinds’ Bagpipe

Supercharged Magneto

Ch OTCh, HCh, MAX, ATCh, TDX, TD

"Well, look at you,” I snuffled damply into dog's ear, reveling in sensation of marvelously soft coat against cheek. “A celebrity overachiever: Breedring, obedience, herding—well, *duh* about *that!*—agility, tracking, even therapy, and, surprise, a champion at everything you do. So what's your calling name, sweetie? *Magneto*—did they call you ‘Maggie'?"

"Maggie” lifted head; focused The Eye upon me with unblinking, suddenly mounting intensity. Opened mouth slightly, uttered soft, almost unvocalized bark.

"Ah-*hah*,"I replied; “‘Maggie’ it is."

BC stood, The Eye intensifying further.

"So what have you been eating all this time, Maggie? Are you hungry? I feel ribs, but there's *some* meat on them, so obviously you're not starving. To stay even that well fed, I'll bet you're a terrific mouser and death on rabbits. Let's see what we can find in the canned, not-running-for-its-life section..."

Took Frisbee from lap, set to one side; stood. Maggie snatched it up, backed up one step, watched intently. Began to drool.

Rummaged through supplies; dug out can of turkey Spam (no sneering, please; *turkey* variety actually pretty tasty). Removed lid, extracted contents onto paper plate, set on ground before her.

Maggie sat; directed The Eye up at me expectantly. Then more intently. Expression grew concerned, then acquired overtones of outright worry.

Suddenly light dawned: Sometimes Weldon trained dogs to wait for permission; sometimes not. Individual decisions generally based upon dogs' intensity levels; in particular, whether setting down dishes involved risk of fingers being swallowed along with first mouthfuls of food. Other breeder/trainers merely considered it investment in canine good manners.

Stroked head, said, "Okay, Maggie; take it." Though a guess, must have been right words, or at least combination included enough of them to appease hungry dog's conscience. She offered single appreciative wave of tail, carefully set Frisbee down next to plate—then didn't so much eat as *inhaled* contents.

Improvised water dish for her from Frisbee. She drank gratefully. Then glanced up at me, picked up Frisbee, dumping remaining few drops. Walked back to my side, lay down. Set down Frisbee. Then *watched* me.

Eyed her thoughtfully in return. Clearly Maggie brilliant, superlatively trained dog. Could be significant asset on sortie like this—though figuring out what cues original owner used in training could prove challenge, given fact that BCs routinely learned upward of 75 individual commands, verbal as well as hand signals.

But also presented complications. For instance, air travel—on longer legs, with autopilot engaged, Intrepid Girl Flying Ace could use onboard potty located in tiny lavatory at extreme rear. Maggie could not. Her endurance levels might well cap flight durations. Plus would need to add appropriate canine food supplies to larder.

Not to mention worrying about her when on ground, lest she get in trouble with local wildlife—or even inadvertently betray me to *Khraniteli* once we get there...

Decided to give it a shot in morning, using some of Weldon's standard commands: *come, sit, down, heel, stay, go out, to me,* etc., along with usual related hand signals.

Then could decide whether to keep her.

Was on point of inviting her inside plane for night when it occurred to me: Didn't even know if new four-legged friend housebroken—having just eaten, drunk, might well, as Terry so colorfully expresses it, perform icky-*pooh* or piddle during night. Given physical perfection, obvious training levels, seemed unlikely in extreme; but if by-products managed to seep below deck, where couldn't be reached for cleanup, would not improve plane's ambiance during balance of trip.

Glanced around; noted weather: lovely cool, clear night. Decided would sleep outside with her under

wing. If still around come morning, would get serious about making up mind.

Pulled out sleeping bag, unrolled, slid inside, cushioned head on pair of folded jeans.

Glanced at BC. Seemingly before “Maggie, here,” cleared lips, dog already in motion: Glided over, moving in that marvelously slinky, head-low, feral gait characteristic of breed.

She lay down close, leaned against me. Put arm over her. She sighed.

Briefly got all teary-eyed again, thinking about how long pup had been on her own, missing her people, after humanity vanished. Poor baby.

Maggie pressed against me, closed eyes, whimpered briefly, sighed again.

* * * *

Indescribably frightful chorus of growls yanked me unceremoniously from dream-free depths of soundest sleep. Found self sitting bolt upright; eyes wide, staring, trying to focus; head snapping right, left, mentally scrambling to collect widely dispersed wits.

Slightly bloated half-moon had set long since; even darker now—but could make out half-circle of black silhouettes made somehow darker-looking by faint infrared glow highlighting noses, triangles of almost bare skin along edges of pricked ears, eyelids outlining occasional baleful, greenish-yellow flicker. Beasties, whatever they were, glided back, forth some 20, 30 feet away.

And between them and me—Maggie: head down, shoulders hunched, looking twice actual size; shifting slightly back, forth; always between closest marauder and me—and making even worse noises than they were.

Eased Glock from low-slung, tied-down, special-ops (personally, regard it as “Lara Croft-style"), carbon-fiber holster as slid out of sleeping bag, mentally apologizing to weapon for earlier uncomplimentary sentiments regarding discomfort intrinsic to wearing heavy, lumpy thing to bed.

(Yes, small-frame Model 23 *is* better fit for 11-year-old's hand than Grownups’ Gun, but even small pistol conclusively bars sleeping on that side, and not much more helpful turning over that direction. Not that silencer in fitted scabbard on other side likely to be mistaken for comfy improvement...)

Groped for Maglight with left hand, gratefully recalling hadn't reset from wide-beam—much more useful at close quarters than spot. Flipped switch as rose to feet.

Dazzlingly white quartz-xenon flood bloomed out, picking out scene's every detail in starkest contrast: Five Big Bads, eyes glowing bright yellow-green in light—even smallest wolf twice Maggie's size, but she never wavered, never retreated single step toward me.

One round in chamber, 15 in extended clip. Decided to risk single warning shot, in hopes flash, bang, sudden explosion of soil beneath leader's nose would disconcert, inspire her/him to lead pack away, seek more cooperative larder.

Because really preferred not to kill wolves if could avoid. Exemplary, mating-for-life, environmentally beneficial species. Excellent parents; take equally good care of own, each others’ children.

And not withstanding childhood lore, not wanton mass murderers of grandmothers or red-hooded children. Generally cull herds; take older, sicker, weaker specimens, or less-well-cared-for babies. (Hello, wolves!—do we *look* like any of above?) Actually, primary diet consists of *mice.*

Had no intentions, however, of participating in menu variation. Nor permitting Maggie to.

Seemed words barely forming on lips—"Maggie, *here!"*—before felt BC pressing against leg; simultaneously squeezed off shot at dirt just below leader's nose.

Hydra-Shok 40-caliber slug drilled into soil, expanded in mere inches' penetration to nearly ten times original diameter. Only direction energy could go at that point was straight up.

Dirt exploded into wolf's face, traveling at many tens of feet per second. Undoubtedly broke skin dozens of places; no doubt burned like dickens.

Regardless, whether because of muzzle flash, pistol's roar, or landmine effect under nose, leader yelped, leaped back.

Instantly I jumped forward to capitalize on broken concentration, yelling universally recognized sound of maternal disapproval—*"Aaaah!"*—and squeezed off two more earth-boring rounds under noses of next largest and/or most aggressive specimens.

Success: Attack terminated. Wolves broke off; retreated back across airfield toward woods on far side.

Dropped to knees, gathered Maggie in arms. Hugged trembling form; scritched The Place; rubbed/stroked head, ears, tummy; generally praised her to high heavens for saving skin. Was rewarded by appreciative slurp up cheek, happily wagging tail.

* * * *

Well, all *righty* then ... One-woman Eurasian supercontinent invasion force may learn slowly, but not complete dunce. Gathered up camping gear, tossed into plane. Threw sleeping bag in through door.

Turned back toward Maggie, intending to lift her aboard (door sill easily four feet off ground), only to watch her soar effortlessly over my shoulder, in through opening, carrying Frisbee. By the time managed to swing self aboard, Maggie sitting smugly in midst of tumbled sleeping bag, tongue lolling in doggie grin.

Closed, secured door. Checked time. Only two a.m.; lots of quality sleeping time ahead.

Pulled bag from under Maggie; BC heroine thought procedure quite funny: Briefly crouched, pounced, tail wagging.

Only belatedly did happy thought occur to me: Maggie not gun-shy; warm pressure against leg never so much as twitched in reaction to Glock's repeated thunderclaps.

However, first things first: Before climbing into sleeping bag, popped out weapon's magazine. Used cute little Glock-supplied, patented pry-tool to squeeze in replacement rounds. Slapped magazine back up into gun butt.

Debated briefly. Only three rounds used. With any luck, would be half past forever before needed to fire weapon again. However, combustion products, barrel deposits should not be allowed to fester. Decided to field-strip, clean in morning. Slid weapon back into holster.

Then dug out M-1 carbine. Older weapon, but fits me better than more modern AR family. And for normal shooting (i.e., targets *this* side of horizon), prefer it to giant, *much* heavier, Barrett 50-caliber super sniper rifle.

Duct-taped two 30-round magazines together side-by-side, ends reversed, overlapping. Slid one end up into receiver. Yanked slide to charge chamber. Set safety. Placed weapon next to sleeping bag. Close.

Then slid in—and suddenly, without seeming to have moved, somehow Maggie lying next to me again, pressed close, chin resting on shoulder. Put arm over her. So close, could feel quivering, panting from residual fear, excitement, adrenaline.

Which pretty much summed up own feelings. Quite some time before fell back to sleep, holding My Dog....

* * * *

Day II (Officially)

Felt all cozy and not-alone this morning as drifted up from slumber. Noted that, though Maggie still snuggled against side, under arm, dog's chin no longer rested on shoulder.

Suppressed smile. From Weldon farm experience, knew where chin was; knew what awaited me upon opening eyes.

Tried to get away with squinty cheat-peek, but didn't work. Very instant eyelids quivered—busted: Maggie kissed me squarely on nose; prevented from expanding attentions only by quick head-turn, deployment of blocking/ scritching hand.

Opened eyes fully to meet spooky, pale-blue, delighted canine gaze regarding me from six inches away. Unblinkingly. Intensely. Just short of manically.

Classic example of The Eye, trying to get me to *get up!* Do *something!* Visible over BC's shoulder, happy tail waved gracefully.

Maggie definitely morning person.

(Though if anything like Border Collies of previous acquaintance, also afternoon person, evening person, night person...)

Before opening door, retrieved M-1. Told Maggie “Wait"; exited first. Performed quick 360-degree scan to make sure wolves not having second thoughts about breakfast. Heard Maggie's feet hit ground behind me as got to *ohk* point in “okay"—and marveled: BC's response time nothing less than incredible.

We adjourned to adjacent bushes. Smiled over Maggie's uncaninely modesty. Then realized: Following wolf encounter, had completely forgotten housebreaking issue. Nice to know would not *be* issue.

Shared some more turkey Spam for breakfast: One can for new mommy, one for no-doubt-soon-to-be-spoiled-rotten kid sister. (Yes, human/dog familial references *do* tend to be confusing—or, if one thinks about them too deeply, downright disturbing.)

Used Maggie's Frisbee for water dish again. She drank, but quickly snatched up when done, dumping balance.

Eyed her thoughtfully. “You're really attached to that thing, aren't you."

BC spun, fixed me intensely with The Eye, projecting: *Do it!* Debated; seemed likely object of stare was she hoped big sister would throw Frisbee for her. Began, “Would you—"

Only to find dog already had executed perfectly aligned front-and-center, “tucked” sit (resembling four-legged version of stiffly “braced” ten-*hutttt!* posture so beloved by dearly departed military establishments), front toenails barely six inches from Reeboks. Arrival comprised of single, eye-blurring, twisting bound.

Nudged me in leg with Frisbee. The Eye intensified, sparkled. Tail wagged.

Grinned down at her. “I'll interpret that as a ‘yes.’”

Accepted proffered disk. Then wondered about her usual Frisbee drill. Did previous owner start her from heel—

Another blur; Maggie now sitting at right side, again perfectly lined up, but also leaning forward, almost quivering in anticipation.

Dog seriously proficient student of body language, I thought. Said, “So am I supposed just to throw it, or should I have you *stay,* throw it, then release you?"

Decided just (she crouched) to throw it.

Unlike majority, who use backhand, away-from-body flip, am sidearm Frisbee ace: Grip rim like pencil, between thumb, index finger; thumb on top, straightened index finger lying along curved inner rim groove. Sidearm motion spins disk off fingertip; generates much faster rotation, more lift, nets *way* more distance. But directional control can be tricky.

Drew back, let fly—and surprised to find Maggie already 50 feet along intended flight path, running flat-out, well ahead of Frisbee but headed for likely eventual landing site.

However, as often happens with sidearm technique, disk begin to tilt, then curve. Instantly, without looking, dog angled in correct direction. Must have been tracking flight path by audio ranging.

Maggie slowed to let Frisbee overtake her. Bore slightly off to one side; only then glanced up, snatched out of air with precise sidelong snap, slid to stop.

Concluded retrieve with another perfect front-and-center stop, practically dancing sitting still with joy, excitement.

Second time, momentarily held her with *stay* command as threw Frisbee. Upon release, Maggie accelerated like rocket, overtook disk maybe 200 feet out. With Frisbee soaring almost horizontally, some six feet above grass, Maggie launched skyward, nailed it midair; then raced back again.

Gave hereditary new Best Friend half hour's worth of Frisbee chasing before announcing “Last one” prior to final throw.

(Another useful Weldonism: Formally declaring game's end just prior to conclusion helps familiarize BCs with concept of *limits;* reduces likelihood of activity becoming endlessly obsessive/ compulsive addiction.)

Thereafter, with M-1 leaning against leg, field-stripped, cleaned, lubricated, reassembled Glock.

Then slung M-1 over shoulder, dug out prybar, canteen; strolled across field to fixed-base operator's facility. Sampled various vehicles; found aged International Harvester station wagon with charged-up battery, nearly full tank.

Checked yellow pages for holistic/organic pet supplies; amazed to find EarthPets outlet in such remote, if lovely, backwater.

Maggie loved riding in car: Not head-out-window type (wouldn't have permitted that in any event; eye injury risk from bug strike outweighs fun), but sat up very straight on seat, watched intently as scenery

went by. Smiled nonstop.

Prybar proved unnecessary; store unlocked.

Surveyed inventory. Scrutinized food labels. Ultimately selected brand with artsy timber wolf logo (friendlier looking than last night's visitors). Came in several flavors; primary protein nutrients listed, respectively, as lamb, bison, caribou, venison, chicken, salmon—and specified actual meat cuts; not hooves, hair—with rice, together with healthful, selected herbal mix.

More importantly, contained no ingredients impossible to pronounce, nor patently toxic preservatives (butylated hydroxyanisole [BHA], butylated hydroxytoluene [BHT], or ethoxyquin) furnished free with nutrition prior to World's End by virtually all Big Name grocery-store dog food manufacturers—despite having been shown in studies to promote liver disease; related also to tumor production, dozens of other ultimately fatal conditions.

Likewise, since health food doggie-din-din oven-baked, not extruded, contains no trapped-superheated-steam-generated, cumulative toxins.

Final additional benefit: Packaged in forever-airtight foil/plastic bags, ruling out hideously toxic aflatoxin mold contamination.

Offered Maggie taste-test on the spot. Bottomless mobile appetite put away heaping cupful; seemed to find flavor acceptable. Fixed me with roguish sidelong version of The Eye, hinting without detectible subtlety that additional samples would be at least as acceptable.

Tossed dozen 50-pound bags into wagon. Figured at three, four cups daily, ought to carry her for expected few weeks' absence (with modest six-month reserve, just to be safe).

Gathered up bunch of containers of chewable vitamins, omega-3 complex fish oil capsules—figured if good for me (Teacher says so), good for new baby.

Also took along dozen plastic canisters of freeze-dried liver. Lasts forever, consists of nothing but little cubes of *(surprise?)* freeze-dried beef or chicken liver. Experience with Weldon's dogs suggests most canines regard flavor as little less than spiritual experience. After test, Maggie concurred here, too.

Collected several easily cleaned stainless steel dishes for water, feeding.

Next, since could foresee circumstances in which might need to limit Maggie's movement for her own safety, picked up selection of short leather leads, couple 25-foot "flexi" recoil reels, spare nylon buckle-on collars.

(Recalled Weldon's multiple-national-obedience-championships-based opinion that no one who actually knows anything about dog training uses choke collars—and *especially* not potentially larynx-damaging metal-chain chokers!)

Finally, picked out nylon seat-restraint harness. Resembled sled-dog harness. Carefully adjusted straps to fit. Locked onto car (or aircraft) seatbelt/shoulder harnesses, would provide whole-body support in sudden stop.

Ultimately, Foster sisters departed Klamath Falls around noon, headed for Bellingham. Only two-hour flight. Last stop before departing Lower 48.

Maggie untroubled by harness; perhaps reminds her of tracking leather. Required her to sit in seat, wear it only for takeoff, landing. Rest of time allowed her to wander cabin at will.

However, appears to like flying every bit as much as car riding. Spent majority of time sitting up in copilot's seat, peering out windows, nudging me for occasional scritch.

And smiling.

* * * *

Bellingham stop uneventful. Landed; fueled, serviced plane; ate.

Then experimented briefly with Weldon's voice commands, hand-signals. Pleased to discover Maggie knew every single one; responded flawlessly, no matter what maneuver asked her to perform.

Pleased but a little surprised: Not unreasonable to expect itinerant, lost-and-found BC to have regarded some of Weldon's commands as puzzling.

"Classical" herding system developed originally in Scotland; command structure tends to serve as boilerplate pattern worldwide. However, by the time trainers have brought dogs to Maggie's level of performance, most will have developed own unique variations on theme.

But apparently Maggie's owner/handler had trained under same grand master who had influenced Weldon; matched/followed Wisconsin dairy-farmer's system to the letter. No foolin'; if had been working with actual sheep, cows, could have had them square dancing in five minutes. Maggie *that* good.

Rewarded BC thereafter by playing Frisbee with her for two solid hours before bedtime. Maggie breathing almost normally by conclusion, eyes still laughing. By contrast, elder sister's throwing arm nearly ready to fall off.

Plan to take off for Ketchikan at first light. Tad over 600 miles; easy three-hour hop. Only challenges relate to potential pitfalls facing unlucky aviatrix in event of engine failure: Canadian west coast pretty much unsettled even prior to depopulation. Road count on nonexistent side of *few*. What towns existed were mostly water-/aircraft-dependent. Far between.

Terrain unforgiving: wrinkly, largely fjordic; multiple "arms of the sea" outlined by jaggedy cliffs, mostly low but heavily forested mountains.

Cruise-line-frequented waterway, euphemistically known as Bellingham-Ketchikan Marine Highway, wanders among mountainous offshore island chain extending from ... well ... Bellingham to Ketchikan. Most popular views from touristy ships related to whale watching, glaciers, scenic cliffs, etc.

But darned little in way of emergency landing accommodations for distressed aviators.

If get to Ketchikan in time to fuel, service plane by noon, Anchorage only four hours' flight beyond. True, slightly longer hop; will burn two-thirds of fuel load as opposed to half. But still well within absolute, no-reserve, 1200-mile cruising range, and can*not* imagine finding less than unlimited fuel at Anchorage.

Of course, if Ketchikan stop should take longer than expected, will just spend night there; move on in morning. Not as if have schedule. Only considerations are weather, daylight.

(Ketchikan. Ketchikan-Ketchikan-Ketchikan. Tee-hee—fun word. Ketchikan...)

Hmm. Guess am really tired.

Good night, Posterity.

* * * *

Day III

Wonder if Northwest Canadians, Alaskans ever tired of being surrounded by gorgeous scenery 24 hours a day. Possible, I guess.

Personally, in no danger of satiation yet. Every time turn head, see something else just too darned beautiful for words: mountains, glaciers, forests, oceans, fjords, lakes, rivers—and *more* mountains, glaciers, forests, oceans, etc....

Ketchikan experience rivaled do-it-yourself NASCAR pit stop: Brim-full Jet-A fuel truck with charged-up battery (even came with own ladder) parked right there on ramp adjacent to fully stocked parts department. Fueling took ten minutes; topping up fluids another three.

Except for potty break, lunch (and hour-long Frisbee session for you-know-who), could have been back in air in 15 minutes.

As was, departed Ketchikan by 11:00; touched down in Anchorage just before 3:00, where found another *Michelin Guide* five-star, stocked-*way*-beyond-frontier-class airport.

Spent three hours prior to dinner, even before Frisbee session, taking advantage of local, fully equipped, bush "airline's" service facilities to give Stallion extra-thorough going-over in preparation for tomorrow's 600-mile-plus flight over trackless Alaskan interior wilderness.

Destination: Wales, small town, smaller airport, at very point of Bering Strait (*Alaskan Airports Guide* describes accommodations as "basic," but promises ample supplies of Jet-A).

Also stocked up with couple dozen cans of turbine oil, gearbox lubricant, plus hydraulic fluid for constant-speed prop, extra fuel & oil filters, igniter components, etc.; sorts of goodies unlikely to be found in abundance if find self nonscheduledly parked in unmarked clearing at heart of Alaskan outback, much less amidst desolation sure to encounter on far side of Strait.

Final step: Uncased, assembled massive Barrett 50-caliber sniper rifle. Had debated whether to bring huge, almost cartoonish weapon at all. Grosses, for heaven's sake, almost half what Intrepid Special-Ops girl does: Manual lists 34.6 pounds. Feels even heavier in field, but that's attributable in part to five-pound contents of Wallace's custom-fabricated 20-shot magazines, stuffed full of five-and-a-half-inch-long, quarter-pound cartridges. Standing on end, rifle only inch shorter than self: 57 inches from butt to muzzle brake.

Under most circumstances, less than ideal weapon for 11-year-old—all I can do just to hold it up, using classic freehand stance: standing, butt against shoulder, front grip supported *(ha!)* by left arm only. Can't begin to steady sights long enough in that position to hit anything at any distance.

On other hand, weight not unmixed curse: All that mass, combined with recoiling barrel and extraction-action assembly cushioned against cleverly opposing spring and buffer mechanism, in addition to remarkably efficient muzzle brake, does sop up incredible amount of recoil. Net effect only little more punishing than 12-gauge shotgun. Which is to say, plenty to dump unprepared 85-pound shooter on duff, as learned first time fired one freehand.

(Danni's imperfectly suppressed smile more annoying than belly-laugh—never happened *again.*)

As practical matter, however, only way can shoot this (only technically portable) personal field-artillery piece accurately is prone or from bench rest, using built-in bipod muzzle support, or, standing, with height-adjustable post-and-crotch pole holding up noisy end.

However, notwithstanding gripes, really have come to enjoy firing Barrett. Under Danni's supervision, have garnered modestly encouraging results: With big scope, no-wind conditions, shooting prone or bench, have repeatedly achieved three-inch groups at one mile; six inches at mile and half.

(Danya does her quietly frightening best to conceal inappropriate pride over preteen apprentice assassin's previously unsuspected aptitude for reach-*way*-out-and-touch-someone-style homicide, but somehow always does seem to come up in conversations with her colleagues.)

However, monstrous bangstick's presence on mission not due merely to anticipated need for long-range slaughter.

Motivation far more basic.

Yes, Posterity; Candy Smith-Foster—Intrepid Girl Adventurer—pathologically, deathly, just plain terrified of polar bears.

(Okay, can stop laughing now. Hey, not kidding—traumatized young person here!)

See, expedition's itinerary calls for spending several nights in *Ursus Maritimus'* territory.

Beginning tomorrow.

Now, to be fair, never been attacked by polar bear. In fact, never actually even met one in person; not even in zoo.

However, over time, neurosis-motivated research has turned up far more information regarding big white eating machines' attributes than ever wanted to know.

And for whatever reason, ever since earliest childhood, giant, flame-eyed, tusk-studded, saliva-dripping, shaggy white phantasms have starred in some of Yours Truly's better, more lastingly psyche-scarring, recurrent nightmares. Few of life's experiences are less restful than whole night spent fleeing in slow motion through pink, baby-blue, and fleecy-white cotton-candy arctic terrain (somehow always in neighborhood of towering, red/white-spiral-striped, candy-cane-style North Pole), with 11-foot-long, 1800-pound, highly intelligent, single-mindedly hungry carnivore nipping unstoppably at heels.

(All right; nipping unstoppably—usually wearing futuristic, wrap-around Foster Grants. Often with WWI flying ace's silk scarf around neck. Sometimes adorned with jaunty beret; alternating with menacingly ghetto-style backward baseball cap. Once showed up on Plucky Girl Psych-Eval Candidate's trail wearing classic Native American full war bonnet.)

But always smiling. Always drooling. Always licking lips.

And never more than three floatingly slow-motion bounds behind....

Practical bear-related consideration for lugging Barrett along on expedition, however, is fact that smallest, least motivated adult polar bear on planet could rip open Stallion's lightweight aluminum structure easier than I used to pop open Happy Meal boxes.

(Ooo ... could have lived long, happily fulfilled life without dredging up *that* image.)

Now, manifestly, odds on hitting charging white ursine freehand at any real distance comparable to winning PowerBall. (Remember? Back when lotteries existed?) But if should spot mobile appetite approaching in time, can use post-and-crotch support.

And even freehand, if target shows too much interest, gets scary close—absodamntively *guarantee* 20 two-inch-long, half-inch-thick, Hydra-Shok-type expanding slugs, each traveling at almost 3000 feet per second, will drain enthusiasm from biggest, baddest, hungriest (most stylishly attired) polar bear in or out of my nightmares.

However, regardless of explanation (rationale? excuse?), no doubt whatever, big gun's presence—assembled, loaded, conveniently at hand—will render tomorrow night's stopover at Wales (and subsequent three, four nights in northern Asia) more restful.

As will Maggie's wonderful, ever-twitching canine nose, marvelously sensitive ears.

* * * *

Day IV

Held off departure until nearly ten to give ground fog time to burn off. (Maggie didn't care: Leap, bound, gambol, frolic—crispy, cool mornings simply *made* for Frisbee.)

Finally launched into horizon-to-horizon crystal clear blue sky, settled down on course for Bering Strait, tiny seaside community of Wales.

Once again, Alaskan vistas simply breath-taking: Air so clear, snow-capped Mount McKinley & Associates in sight for over an hour; from shortly after takeoff to well after passed abeam, receded astern. Much gorgeous mountainscape to admire.

Thereafter, terrain began to descend, level, transition to endless expanses of solid forest, speckled with hundreds of lakes, multiple traceries of rivers.

By focusing attention narrowly (i.e., ignoring virtual nonexistence of safe potential emergency landing opportunities for non-floatplanes), one could regard landscape as very pretty indeed.

Now, technically speaking, turbines' strictly rotary components don't actually *beat.* Addressing issue metaphorically, however, Stallion never missed one. Leveled off at optimum 13,000-foot cruising altitude. Airspeed edged up to 188 knots, though GPS true-speed readings showed Arctic Circle tradewinds cutting into groundspeed by nearly 35 knots, making trip take longer, use more fuel.

Still, well within flightplanning reserves as exited from tip of peninsula dividing Norton Sound from Norton Bay. Actual over-water flight no biggie; hardly twenty miles. From altitude, could have glided to dry landing from any point in crossing.

Comparable, in fact, to contemplated Bering Strait passage: Two potentially wet-feet legs of 24, 22 miles respectively, with pair of small islands, Diomedes, at halfway point. Followed by official Siberian Welcome Station: "All the seal blubber you can eat...." (Okay, yes, made that last part up.)

Anyway, barely an hour later found us circling Wales area at low altitude, admiring ramshackle collection of small buildings comprising pair of adjacent colorful (in desolate, barren, seashore-tundra sort of way) northern Alaskan small towns (Wales, Kingegan), cute little landlocked lagoon, tidy little airstrip...

(Oh, all *right!* Yes, scouting for polar bears. Happy now...?)

Landing uneventful, apart from Maggie's demonstration of how observant she is; how quickly picks up on even subtlest details of Life On (airborne) Road: Fuzzy sister dozed in back as I spent final half hour gradually letting down from 13,000-foot cruise to 500-foot height-above-ground altitude for local wildlife survey prior to landing.

But very moment decided to initiate approach, reached for flaps, trim controls to set up approach, canine cohort returned to copilot seat in single bound; then, without coaching, settled tush on cushion, leaned against seat back, thereby assuming position for convenient harness reattachment.

Mind you, Posterity, only her third flight. Known *people* who didn't learn that quickly....

* * * *

Based on geographic coordinates alone, Wales lies only four and a third longitudinal degrees farther north than Anchorage (65 degrees 37' N vs. 61 degrees 13' N). Turns out, however, geography and weather employ *degrees* in very different fashions—at least 30 real-world degrees *colder* here. Nippy temperatures combined with seriously raw onshore breeze to drill through every gap in clothing, real or imagined, moment set foot outside plane.

Though reasonably confident, following aerial recon, no polar bears immediately in offing, stood armed guard with M-1 in case of wolves, other smaller predators, while Maggie took advantage of convenient modesty bush for postflight relief.

Shivering from head to foot by time made it back inside plane. Rooted through duffle, dug out first planned stratum of warmer clothing: flannel-lined denim jacket, pants; poofy thick socks.

Chilly temperatures hardly unexpected, given locales through which course necessarily leads, so have made advance preparations. As we skirt Arctic Ocean (for roughly next 2,000 miles), will add additional layers to trousseau as goosebumps mandate: longjohns, flannel shirts, sheepskin-lined leather jacket. Several additional layers available, up to all-out Eskimo stealth mode: camo-colored, down-filled, hooded parka, matching pants; insulated snowmobile-type gloves, boots.

Maggie, on other hand, wasn't part of predeparture planning. Eyed her thoughtfully. Notwithstanding fairly widely held opinions of ignorant, uneducated (also questionably sapient and thankfully now dead) keep-'em-fenced-or-chained-outdoors pet owners of yore, nothing inherently coldproof about dogs. In fact, as temperatures approach freezing, hypothermia becomes factor. Below about 20, foot protection becomes increasingly necessary to prevent frostbite.

Resolved to keep close eye on canine companion as mercury sags; improvise stylish puppy jacket from some of my stuff if necessary.

Smiled then. Wondered how temperate-climate-raised, fleet-footed, furry Best Friend would view chasing Frisbees while wearing sled-dog-style, fur-lined booties.

My reflective gaze returned by mischief sparkling from The Eye (technically, both of them). Maggie snatched up Frisbee. Wagged tail. Looked hopeful. Unblinkingly so.

For the moment at least, concerns clearly wasted. Capersome canine obviously finds current brisk temperatures invigorating, if not downright enjoyable.

(Of course, to be objective, Maggie finds *wakefulness* invigorating, worthy of unflagging, gleeful enthusiasm—unblinking stare....)

* * * *

Day V

Despite surroundings, potential unwelcome guest list; despite night spent clutching Maggie in one arm, Barrett in other, managed not to dream of polar bears.

However nattily attired.

Unfortunately, morning turned out to be not only below-freezingly brisk, but proximity to ocean, absence of breeze, combined to produce thick coating of hoarfrost: on propeller, wings, tail group airfoils; fuselage, windshield, windows—everywhere.

With no way to de-ice. Save by hand-scraping every square inch of aerodynamically active surfaces; not to mention windshield—which latter component would have emerged from experience scratched opaque beyond usefulness.

And while personally have never encountered icing conditions during brief if intense piloting career, Lennel, as well as (during week's shuttle training prior to orbital mission launch), Harris and others with real experience, did share war stories; cumulative impact of which thoroughly canalized Plucky Girl Flying Ace's psyche regarding Evils & Potential Consequences of Flying in Icing Conditions. Moral of every one of which could be summarized tidily: *Don't!*

So waited until nearly noon for temperatures to rise sufficiently (if just barely) above freezing; first to melt, then evaporate every nubbin of frost adhering to every square inch of all flying surfaces: wings/flaperons, stabilizers/elevators, vertical fin/rudder, prop, plus windshield (the better to see through you, my dear).

By takeoff, a few patches still remained on ship's belly. But not of aerodynamic significance; not about to wait forever.

Besides, really wanted to get Bering Strait behind us while weather gods smiled, however coolly. Retain unpleasant memories of pre-Armageddon TV special concerning hazards of commercial fishing in northernmost Pacific. Narrator described activities as most dangerous job in world:

Freakish, all but unpredictable meteorological conditions—frequently below-fresh-water-freezing ocean temperatures, together with almost randomly shifting winds; waves so confused, due to many nearby land masses, as to all but moot expression, “weather patterns"—combine to make chances of survival in event of sinking, or even man-overboard, equate to wishful thinking.

Prognosis similarly bleak for passengers of aircraft forced down into wind-tossed, gunmetal-gray, frigid waters.

Nonetheless, with head held high (posture mandated partially by need to see over Stallion's instrument panel), maintained stiff upper lip whole way across.

Though could not help trying to “sit lightly."

While Maggie napped.

* * * *

Volume IV

If Today is Tuesday,

This Must Be Chelyabinsk

Everything in life is compromise. Flight over potentially hostile terrain especially so; “hostile” in this context referring to dearth of relatively level ground upon which to execute emergency landing—issue quite separate from natives’ intentions.

Remaining at 13,000 feet would improve nonscheduled landing prospects, likewise allow overflying modestly upthrust terrain with reasonable degree of safety. However, higher we fly, more we face risk of radar detection—or unfriendly eyeballs, for that matter, particularly if weather conditions at altitude cause

Stallion to emit contrail....

Staying low, on other hand—say 1,000 feet or less above ground—cuts down on naked-eye/microwave detection hazard radius, but also minimizes opportunities to come up with clever solution, identify survivable landing site, in event aircraft suddenly becomes very quiet.

Which brings up related problem: Turbine's wail at cruise, though different from reciprocating engines' drone, most unlikely to be heard on ground from optimum altitude, whereas down low, depending upon wind direction, engine noise audible for probably five, ten miles both sides of flight path.

Contemplated factors, rolled dice, sighed—chose low road.

Downside: Trip going to take lots longer. Will be detouring around, f'rinstance, any bodies of water spanning more than about five miles across, since won't be high enough to glide to safety In Event Of; plus, of course, for same reason, need to follow flattest terrain available; i.e., no adventurous mountain-pass flying....

Accordingly, at halfway point between Diomede Islands and Siberia, started gradual altitude bleed-off. Gauged remaining height; kept enough in hand, as closed on coastline, to be able to glide to dry land from any point in descent. Completed overwater passage's final mile just 1,000 feet above wavetops.

First Siberian soil to pass beneath wheels: easternmost tip of barren, semimountainous wart of tundra projecting toward Americas from equally barren eastern end of Chukchi Peninsula. Crossed surf just north of ghost community listed on charts as Naukan.

Adjusted flight path northwesterly as we came ashore, aiming generally for point where Bering Strait coast bends southward in vicinity of little town named Enurmino.

First, though, course briefly skirted stumpy peninsulette's southern coast. Then, shortly after landfall, Bering coast angled off southward, leaving us headed inland. Route soon converged upon, intersected with, paralleled Chukchi coastline, which served as almost geometrically straight-line VFR navigation aid.

First leg, from Wales, Alaska, USA, to Izba Tynupytku, Siberia, totaled some 400-plus miles, as crow flies. Not, however, flying as crow.

Because not crow. Am, in fact, "the very model of a modern major," er, aviatrix. (Sorry, ghosts of Messrs. Gilbert/Sullivan.) Cutting-edge-advanced, GPS-linked, big-screen "glass cockpit" primary flight-information displays offers many advantages over old-style compass/dead-reckoning/landmarks navigation. Among benefits: emancipation from punctiliously steered compass courses connecting points A, B.

With GPS-linked PFID, always know where we are; never lose basic orientation between self, ultimate objective. Can weave, wander, meander, juke, dido, dodge to, fro to heart's content to stay over relatively favorable potential emergency landing terrain, all the while remaining aware of directestmost course to, distance from, destination.

Following careful chart study, have determined best bet is to hug coast until all significant mountain ranges lie behind us; until can lay nearly great-circle course for south-central Urals without having to cross significantly rough, inhospitable terrain.

Probably not coincidentally, most settled areas in these desolate regions, not to mention airports at which can fuel, service plane, seem to have grown up along coastline, though charts reflected sprinkling of villages along rivers in more inland locations.

Shortly after regaining coast, crossed two more bays opening onto Chukchi Sea. First hardly more than tidal lake; second resembled low-sided fjord. Neither triggered elevated “over-water” blood pressure.

After passing Enurmino, some 50 miles farther east, coast curved more westerly, then broke up into string of low, almost barrier-island-type formations separating bay/harbor on left from Chukchi on right.

Not quite 50 miles beyond that, we hop-scotched out along another sketchy chain of islands leading most of the way across bay sufficiently long, broad to have been named on charts: Ostrova Serykh Gusey.—No, wait; seem to recall *ostrov* means *island.* Name probably refers to rocky landmass near bay mouth.

Transliterated Russian chart identifiers consistently unhelpful in that regard. *Hate* being, in effect, functionally illiterate like this...!

Thereafter course edged back north to coastline, following chilly gray surf along another string of barrier islands, which played out at little town listed as Ryrkaypiy, which marked tip of big, scallopy bight off Chukchi Sea, necessitating brief westward detour.

Arriving shortly thereafter at Izba Tynupytku, first performed low, slow, vicinity flyover, local polar bear survey. Determined none in immediate proximity. Landed, fueled, serviced, tied down plane.

This far north (69 degrees, 15’ north latitude), summer days lots longer. Despite just under five hours’ flight since icing-delayed noon departure from Wales, landing at Izba Tynupytku found sun still well above western horizon. (Actually, more on order of north-north-northwestern horizon.)

So had dinner, conducted protracted Frisbee session by way of apologizing to Maggie for long, boring day; grudgingly endured canine dervish's enthusiastic response to raw, horrid, cutting-to-bone breeze driving off ocean—which, despite all this “Chukchi Sea” nonsense, really is no more than southern fringe of Arctic Ocean.

(Somewhere out across which, according to more authoritative Old Wives’ Tales, Norse gods invented, handed down original concept of *cold.*)

* * * *

Day VI

Good morning, Posterity.

Happily (seldom has adjective been so narrowly focused), though temperatures overnight dipped into teens, relative lack of humidity (despite ocean's proximity) mostly prevented frosted-up wings, windshield: patch here, speckles there; nothing worth delaying takeoff for.

Maggie got me up shortly after sunrise. We had breakfast followed by another Frisbee session. Frisbees fly well in dense air generated by subfreezing temperatures. On other hand, Frisbees thoroughly slimed with dog spit seriously cold to bare fingers’ touch. Thank heavens for foil-pouched Handi Wipes.

Periodically throughout session, checked Maggie's feet. But no signs of frostbite; no diminution of enthusiasm. Guess weather still within BC's operating parameters.

Wish *my* parameters so tolerant. Added several additional layers of clothing, but suspect will never be warm again.

Turbine fired off promptly despite bracing temperatures, then we launched again into blue.

Planned midday destination this time much closer, in as-crow-flies distance: Rauchua, at mouth of good-sized river (do wish chart-makers had bothered to identify smaller landmarks), only about 300 miles in straight line. But huge bay in between necessitates detour; actual flight distance closer to 450.

* * * *

Siberian coastal tundra, even with low mountainscape generally visible on left, Chukchi Sea dominating view on right, not most inspiringly scenic vista have ever overflown. Usually when flying low, candid glimpses of wildlife on ground, opportunity to observe otherwise inaccessible terrain, keeps interest piqued (or arguably, around mountains, *peaking*—or even *peeking:* down into long-gone residents' backyards).

Regardless of spelling, however, flight over tundra generates little interest. Endless flight over rolling, essentially featureless grassy expanse terminating in surf pounding at rocks on one side, blending with age-softened, nondescript big hills/low mountains on other, unlikely to make way to apex of list of Sights Without Which Life is Not Complete.

In fact, staying awake actually became issue. Switched off autopilot; hand-flew for several hours just to keep eyelid margins above pupils.

Was a bit surprised to discover how closely coastal mountains regularly approached water's edge. In places, safe emergency landing sites not as abundant as expected, though nowhere nearly as scarce as along Canadian/Alaskan west coast.

However, turbine continued to wail (more a hum, actually, inside cabin); miles continued to tick off, 200 every hour; and eventually we came upon, then detoured around, huge bay; landed at Rauchua well before noon.

No polar bears there either.

Shortly after takeoff, skinned past mountain-wannabe ridge reaching almost to water's edge at seaside town labeled Dvurechye. Bent course slightly southward at that point to skirt broad bay into which huge Kolmya River system emptied.

Thereafter, terrain became slightly more varied: laced with streams, dotted with lakes. Crossed another major river identified as Alazeva; skirted some more rolling lands. Ultimately dead-centered Shevelela airfield, located at point at which Indigirka River's delta commences.

Landed, serviced, tied down plane. Ate. Frisbeed. Went to bed well before sunset.

* * * *

Day VII

First half of morning's flight was over territory reminiscent of Alaska's northwestern outback: endless expanse of patchy plains, forests, speckled with lakes, streams. We hooked around tip of big V-shaped bay opening onto More Laptevykh (yet another euphemistic attempt to make Arctic Ocean sound warmer).

Hugged coast all the way to town called Sokol, on point of land beginning Lena River delta: massive sprawl of channels, islands, etc., which also ultimately dumps into More Laptevykh.

Performed routine polar bear sweep; landed, serviced plane. Ate, frisbeed Maggie. Launched again.

Terrain desolate as followed Lena's westernmost main channel to exit into More Laptevykh at Ulakhan-Krest. Then headed just south of due west across mostly fertile-looking flatlands, landing some

800 miles later at Chemaya, on Pyasina River, where, slightly cross-eyed after roughly 1,400 miles, over eight hours' flying time, called it quits for night.

* * * *

Kim Mellon's Journal:

If I were a proper mother (or maybe even a decent person), I would never even have considered taking Lisa with us on this mission—I mean, she's *six,* for heaven's sake!

However, unnatural mother and terrible person that I am, it never occurred to me, until much later, even to question the fact that everyone, including Lisa herself, had simply, unquestioningly *assumed* she's going. After all, Terry is full-time mindlinked with Candy; obviously he's going so we can keep track of her. And Lisa, mind- and emotion-linked to *him,* usually is able to clarify Candy's ofttimes cryptic Terry-relayed observations, as well as her sometimes even more ambiguous dictated communications.

In addition, of course, in the absence of our favorite, if most worrisome, adopted sister, Lisa is the primary designated caretaker of Candy's "retarded adopted twin brother." So of *course* she's going.

Actually, she's been more than earning her passage: Almost single-handedly my amazing baby daughter has been monitoring and memorializing Candy's progress via Terry's mindlink during our superkid sister's every waking moment virtually since she left. Lisa hasn't tried to cherry-pick what to record; she has taken down in Pitman shorthand every single word to come out of Terry's beak since Candy's departure.

Like long-departed court reporters of my past acquaintance, her theory is that we can discard anything which, upon leisurely review, we conclude is merely the product of Terry's everyday rambling; however, she points out more than a little snidely, it would be difficult in the extreme to retrieve something that *hadn't* been written down but which we might realize, after-the-fact and only dimly remembered, was in fact Candy-related.

Thanks to Lisa's efforts, we know where Candy is within a fair degree of accuracy, as well as how her expedition is developing. If everything goes as planned—hers as well as ours—we should get there in time to intercept her, keep her out of trouble, as well as retrieve her foster father.

Toward that end, Adam has thrown himself into the operation with an intensity that those who haven't had previous occasion to observe him in one of these nonstop berserker states find at least eye-opening, if not actually a little alarming.

He's joined Kelli Watts and "Watts" Washington Kelly, our two best particle/wave scientist/engineers, and me (I was an electrical engineer Before, specializing in computers), in the care and feeding of the intelligence-sniffing/analysis installations aboard the Globemasters.

If it weren't for the tension, working with Kelli and Watts would be almost too much fun. They're a visually spectacular, pepper-and-salt couple who maintain a deadpan running joke based upon the potential confusion arising from their names: an "assumption" that no one can tell them apart—this notwithstanding their relative pigmentation; she's one of the darkest-skinned people I've ever met, whereas he's an Icelandic blond whose hair, in direct sunlight, is probably visible from orbit.

Apart from the circumstances, watching Adam work with us (them, really) would be a treat, because people who are as smart as he is always bring out the best in him. Somehow the implied competition hones his talents: His concentration intensifies; his eyes become almost predatory; his processing of available information begins to blur the line between deduction and augury.

In this case, in only three days' "tinkering," with hardly more than an opportunity to learn his way around

the hard- and software, he's achieved a significant increase in static suppression and signal isolation, which in effect boosts monitoring range and signal discrimination.

Of course, Adam's primary, unblinking focus is on finding Candy, keeping her out of trouble, or, if things have already progressed beyond that point, rescuing her, so those competitive tendencies are further sharpened by his nearly berserker-level intensity.

Then there's Adam the gourmet chef: Age notwithstanding, the boy is simply one of the finest chefs on the planet. According to Candy, all he has to do is wander through a kitchen, lift pot lids, and sniff contents, and somehow everything tastes better. Originally I thought she was engaging in hyperbole (*no!* —Candy?), but thereafter I personally witnessed the phenomenon, had the opportunity gratefully to sample the result, then found myself almost in mourning over the realization that we'd eaten it all.

Needless to say, therefore, everyone is delighted that he's also helping Kinsella Woodson, one of our food-services magicians, retool the big planes' on-board galleys to feed the couple hundred or so of our people who are going along during what's expected to be a protracted field operation, and he'll almost certainly participate regularly in food preparation.

(At which point I can almost hear Candy interject, "And the crowd went *wild*....")

On the actual mission-planning front, Teacher, Wallace, Danya, and Peter have spent the past several days going over everything we know about the *Khraniteli* and their *Serdtsevina Rasovyi* base, and teasing ever-finer resolution from satellite imagery. In one recent photo I saw, you can tell that, not only is the driver of an open vehicle not wearing a hat, but that he's attempted a comb-over and *really* shouldn't have. However, thus far they have not seen anyone who might be Marshall Foster.

Not counting the thermonuclear warheads, which, regardless of how safely they're packed, we all tend to give a lot of elbow room, it takes a great deal of materiel—weapons, ammunition, selected combat and cargo vehicles, spares for the planes, as well as living supplies—to fill up a C-17, never mind two of them, but provisioning is well under way.

We're scheduled to leave tomorrow at noon. At the C-17s' four-hundred-fifty-knot cruise (which translates to almost five hundred twenty miles an hour in my more old-fashioned frame of reference), the voyage will take about fourteen hours' actual flying time. And though the cruising range of one of these flying behemoths is about five thousand miles, Wallace plans two conservative runs of about twenty-five hundred and three thousand miles each, with refueling stops at Anchorage, Alaska, and Norilsk, a major Russian military base with which he's had experience.

A thousand miles after that will bring us to Kamensk-uralskiy, a civilian airfield located only some hundred fifteen miles from *Serdtsevina Rasovyi,* which he and Danya have selected as our operations center.

Between refueling and maintenance, the stops will add a good four or five hours to the trip.

Still, if everything goes as planned, we should arrive in-theater at about the same time Candy does. Then, eavesdropping via Terry, we'll zero in on her and, as Danni expressionlessly puts it, "invite" her back into the fold and keep her out of trouble while we locate Doctor Foster, if he's there, and clean out that *Khraniteli* nest.

Sure. That's just how it'll work. I mean, it's not as if there's any potential for something to go wrong....

* * * *

Volume V

Welcome Wagon

Candy's Journal:

Day VIII

This is bad, Posterity. Too early in mission to be getting this sloppy. But how else to explain this morning's security implosion?

Maggie woke big sister shortly after sunrise. Stretched, extracted self from sleeping bag. Retrieved M-1, popped open door, descended from ship, performed customary 360-degree, hungry-fauna scan, with usual negative results.

Thereafter, yawning demurely, scratching elegantly, rifle dangling absently from one hand, stumbled over to little environmentally friendly recycling pit excavated previous evening amongst scattered bushes/trees demarking airport's border.

Almost before Yours Truly had managed to undo belt, allow dignity to drop around ankles, Assume Position—and catch breath from initial thrill after brisk Siberian morning zephyr's caress raised goosebumps on skin unaccustomed to such familiarity—Maggie had completed own business without recourse to pit ("Real dogs don' nee' no steenking *pit!*"). Thereafter BC frisked back, companionably plunked down within convenient scritching distance, settled in to wait for slower-starting human metabolism to complete appointed rounds.

Thereafter, while passing ... er ... time, peeled off appropriate length of tissue, and, following brief wrestling match with breeze, managed to fold neatly. Placed roll on ground, laid folded tissue packet on top, with Swiss Army universal appliance weighing it down. Then transferred attention to horizon, concentrated on thinking tranquil thoughts, attaining that all-important thousand-yard stare. Had time to wish had brought book.

Just finishing personal tidying-up phase when noticed Maggie's tail had shifted into high gear; plus BC's attention seemed to have switched from usual fond-if-intense gaze *at* elder sister to characteristically focused working-dog stare at something located beyond my shoulder, when—

"Good morning," offered softly rusty-sounding male voice from somewhere behind me. "I love mornings, don't you? The colors are so bright and vibrant, and every breath is full of the scents of the night."

Only just managed not to fall backward into pit during burst of enthusiasm surrounding abruptly refocused attention. In single motion, readjusted trousseau while scooping up M-1. Spun as rose, one hand leveling rifle, snapping off safety, seeking target, while other hand, in fumbling, distinctly *after* afterthought, buckled belt.

Whereupon, discovered, almost invisible in camos against bushes/trees background, slightly rotund, white-haired, -bearded, somehow elfish-looking individual, seated some thirty feet away on clever one-legged golfing stool/cane, rifle slung across back, faced three-quarters away, currently engrossed in elaborately detailed study of far horizon, apparently in deference to Plucky Girl Adventurer's prior state of dishabille.

"I think," mused new acquaintance wistfully, speech betraying no more accent than someone raised just up street from own house in Wausippi, "that of our regular imports, I miss the softness of that lovely American toilet paper most of all."

With which, apparently picking up my movement from peripheral vision, stranger rotated slowly on golf

seat, like slightly worn, gnome-on-a-stick weathervane. Happy smile lit face as completed turn, our eyes met; not so much ignoring M-1 lined up on center of mass as apparently uninterested.

"Please forgive me," he said in tone conveying more amusement than apology, "for startling you. With my attention directed away from you, I misinterpreted the sound effects accompanying your activities to indicate that you were entirely finished. The intrusion was unintended.

"Let me introduce myself: Long ago, my parents, the Rozhdestvos, named me Otekh. However, by the end of my first few decades of operating the toy factory, people tended to call me *Igrushka Izgotovlenie,* which in English more or less means Toymaker. Then, of course, as I grew older, they began to call me *Otets Igrushkayami,* which translates loosely, though almost as compactly in English, to *Father Toys.* I suspect either translation will roll more easily off your American-educated tongue than either my name or the Russian versions of my nicknames."

Opened mouth to interject question; then realized Father Toys' cheerful rambling covering much of what would have wanted to grill him about anyway.

"Passing through the area late yesterday afternoon, I noticed your aircraft's approach. And may I say," he added, cocking approving eye, "your landing was very smoothly executed. My own sorely missed corporate pilots could have done no better.

"As you emerged, I noted your alertness, weapons, and your evident skill in handling them. It seemed to me that suddenly appearing and approaching might alarm you, to our mutual detriment. So I remained out of sight, and also stayed downwind to be certain that your dog would not scent me. For the balance of the evening I merely kept watch, to be sure neither of you would be surprised by a bear or wolves. In the absence of poachers, the populations of both have begun to recover nicely in this region. This can be a mixed blessing.

"After you reentered your plane at sunset and failed to come out again within a reasonable interval, I assumed you had gone to sleep. I spent the night on a surprisingly comfortable couch in what once was the airport manager's office.

"Early this morning I returned, settled down here at what I hoped you would regard as a sufficiently nonthreatening distance, and waited quietly for you to waken, emerge, and notice me. My hope, by appearing as innocuous as possible, was to get us through introductions without incident."

Russian smiled apologetically. "And indeed, just as I planned, you appeared and promptly headed my way. I thought you had seen me. I was just about to introduce myself—when your sudden swoop placed me in a most awkward social position."

Could not repress giggle. "Not as awkward as mine." Despite best intentions, found self cautiously warming to Father Toys. On subtle levels, reminded me of Harris, Wallace, Teacher, other older AA males.

Grin spread across Father Toys' slightly cherubic features. "I shall not debate the issue. Beyond any doubt, there was ample awkwardness to go around."

But at that point, one of those endlessly fretting, loose-ends-noticing brain cells, with which have been saddled practically from birth, awoke, contributed observation: "Wait. Before I said a word, you greeted me in English; you called me American-educated. How did you guess that?"

Russian's smile widened further. "Never mind the clues represented by the English lettering and numbers on your American-manufactured Helio aircraft. Here you are—forgive me; I mean this as a compliment,

not as condescension—so young but flying a comparatively very large airplane all by yourself. After landing, you immediately fueled and serviced it. By yourself. Only thereafter did you play with your wonderfully clever dog. After you both ate, you went straight to bed without displaying more than a security interest in your surroundings.

"All in all, yours were not the actions of a tourist; someone merely exploring or wandering randomly. Your conduct could hardly have been more businesslike. Obviously, in today's depopulated world, someone of your age, so serious, heavily armed, so obviously capable—you are on a *quest."* Toymaker's eyes twinkled. "—Where *but* America could you have come from?"

Didn't quite scuff toe *aw-shucks*ly in dirt. "Uh ... thank you."

Curiously, something about Toymaker—demeanor perhaps, or maybe appearance—motivated Plucky Girl Quester to remember manners at that point. "I'm Candy Smith-Foster. This is Maggie. It's nice to meet you, Mr. Toymaker."

Which certainly was the case from Maggie's perspective: BC had already migrated to sit at new Best Friend's side, chin on knee, enjoying what appeared to be old gentleman's autonomic scritching in response.

And, though still proceeding cautiously, found was beginning to agree with her: Father Toys one of those people who are just intrinsically *comfortable* to be around.

Obviously invited him to join us for breakfast.

Unsurprisingly, accepted with grace.

To Maggie's delight, company inspired Plucky Girl Flying Chef to go a bit beyond usual a.m. culinary efforts: Pulled out powdered eggs, last of bacon from travel fridge, pancake mix, syrup (not that BC got any of latter goodies); dug out, fired up Coleman.

As we chatted, and I enjoyed cozy sensation of cooking for, sharing with, someone other than self (and Maggie, *always* ready to share), found Danni-implanted interrogation lessons edging toward fore: First impressions notwithstanding, clearly needed to know more about Toymaker before lowering guard all the way.

So by way of "making conversation" (i.e., priming pump), observed, "You said you were 'passing through' the area yesterday afternoon. Are *you* exploring or just wandering randomly?"

Laugh-lines surrounding Father Toys' eyes crinkled with delight. "Wonderful," he responded happily; "you actually *heard* what I said. At your age. I wonder if you can appreciate how rare that was, even among adults, back before people became an endangered species.

"I am, of course, searching for survivors. Originally the process did almost constitute random wandering. However, in the months since I began, I've found there is a tendency for the same factors to affect where people live today as those that influenced the original establishment of most settlements in pioneering days. First, one needs water and reasonably decent soil.

"Hence my presence in Chemaya: The Pyasina"—Father Toys made vague gesture toward broad stream just out of sight beyond trees—"over there, is my second river. I have already enjoyed some success while making my way northward down the Yenisey: I found eighteen people, almost evenly divided between genders, ranging in age from slightly younger than you to about my age. Since transferring my attention to the Pyasina, I have located two more, one of each. I invited them to my home in Mikhaleva,

in Kraznoyarsk, southern Siberia. So far all have accepted.

"I live on a very large farm on the river. In the bad old U.S.S.R. days, it was a collective, so it has accommodations for many, as well as a wide variety of tools, equipment—a broad spectrum of resources. It seems to me that the more of us we can band together, the better our chances of survival, particularly if we can establish a viable, self-supporting settlement.

"Likewise"—for briefest moment Toymaker's intrinsically merry expression faded—"it will be less lonely....

"It appears," he continued in somber tones after a moment's pause, "that fewer than two to three percent of the world's population have survived the plague."

"The actual figure is on the order of three and a half *hundredths* of a percent," I blurted, without thinking.

The Toymaker paused, eyed loose-lipped Intrepid Girl Expert Interrogator thoughtfully; then mischievous smile crept back across features. "So confident a delivery of such a precise number from someone so young ... perhaps there is even more to you than appears on the surface, remarkable as *that* seems."

Okay, Posterity; clearly had blown cover. Decided to throw caution to winds; provide full disclosure, but thereafter drill straight in for key information.

(Hoped revelation would not prove mistake. As just plain likeable as Father Toys appeared to be at first impression, did not look forward to having to terminate relationship "with prejudice"...)

"I suspect there's more to *you* than you suspect, too," I replied obliquely. Fixed him with unambiguously gimlet eye. "Have you ever been sick?"

Heart sank as Russian burst into laughter. "Oh, my goodness, *yes!* Within a day of the holocaust, I became so ill that I thought I would die, too. For a week I could keep nothing down; for a day I couldn't even raise my head."

Barely had time to wonder whether sweet old gent could actually be authentic survivor of heretofore 100-percent-lethal, *H. sapiens*-targeting, airborne bioweapon's ferocity before he dropped other shoe: "You see, one of the problems of growing up the overly-protected son of a post-Soviet-Union-collapse-wealthy industrialist is that one can miss out on key life lessons. For instance, I now know that, no matter how hungry you get, you should *never* eat unrefrigerated mayonnaise...."

Plucky Girl Adventurer only partially successful in restraining unmannerly sputter of laughter at relief that flooded soul at explanation. *Teacher* had experienced similar affliction during attack (though *certainly* not from mayonnaise).

Beloved pedagogue had been under impression at the time (had never been tested) was *H. sapiens* himself; convinced was dying, soon to join rest of species on History's Compost Heap. But symptoms had proved to be result of botulism toxins. Not even *we* are immune to bad food.

So pressed on: "Ever been sick otherwise? Measles? Chicken pox? Mumps? Flu? Colds?"

Toymaker shook head at each question. "Now that you mention it, no, not that I can think of. Ever." Brow furrowed ever deeper. "That does seem odd, doesn't it."

"How did you do academically in school?"

Replied: Russian equivalent of straight *A*'s.

"Did you compete in scholastic athletics?"

Had, and been darned good at it.

"And have you found that your night vision is better than almost anyone else's?"

By now Father Toys regarding me with undisguised amazement, not unmixed with alarm. “Who *are* you...?” he demanded finally.

In response, told him who *he* was: Gave him rundown on heritage as *H. post hominem.* Then told him who started war, to what end; finishing up by bringing up-to-date, to degree possible, regarding threat posed by remaining *Khraniteli*.

Took news well. Better, in fact, than had myself.

"Well, this explains some questions I've wondered about most of my life—and even some I hadn't thought of,” said Toymaker presently, shaking head slowly in wonderment.

"Though it doesn't,” he mused, eyeing me thoughtfully, “explain what a nice girl like you is doing in a place like this—clearly on course for that hellhole, *Serdtsevina Rasovyi.*"

Spontaneous, right-out-of-blue mention of said hellhole caught Plucky Girl Adventurer flatfooted, Posterity. Forgot manners entirely. Without answering *his* question, demanded to know how *he* knew about *Serdtsevina Rasovyi*—never mind unsettlingly accurate characterization!

Father Toys regarded me for long moments before answering. “I have been to *Serdtsevina Rasovyi,"* he said slowly. “The miniaturized sensing, computing, and power-storage technology, and electric motor designs that we developed for our voice- and remote-controlled toys was fairly advanced. Almost a year before the attack, I was ‘invited,’ I thought by the central government, to attend a conference held there. I demonstrated some of our more advanced products for them."

Toymaker's pause continued well beyond point at which could be considered pregnant before continuing. “They were so impressed that they requested data on our technology. In those days, when the government requested information, one provided it.” Expression darkened. “It is not beyond the realm of possibility that some of the technology I gave them that day contributed to the end of Mankind."

Sighed. Then glanced up with worried expression. “And if you please, again, what business do *you* have at *Serdtsevina Rasovyi?"*

Explained about Daddy. By conclusion, Father Toys’ expression was picture of distress. “You are so young; you are so—please forgive my bluntness—*tiny!* What can you hope to accomplish there all by yourself?"

Without going into specifics, replied had picked up specialized training, which ought to be helpful. In afterthought, added was pretty good shot.

During recital, Toymaker's expression metamorphosed from distress to borderline horror to resignation to resolve. “Then perhaps this will be of assistance to you. I was escorted in and around most of that base. I have an excellent graphical memory; I recall the base in detail. Would a map of the layout be helpful to you?"

Indeed; base schematic had not been included in materials Wallace supplied.

Working freehand, Toymaker quickly produced positively draftsman-quality sketch in black ballpoint on

reverse side of nonpertinent aviation chart.

"However," he added darkly, "please understand, apart from the buildings into which I was invited, I have no knowledge of what any of the other facilities are used for."

Finally, with everything aboard Stallion but Foster twins, Father Toys cleared throat self-consciously. Glanced at him inquiringly. Russian's expression clearly unhappy. "Would you like me to come with you on this quest to rescue your father?"

Oh, dear. If caught-with-pants-down situation had been awkward, in many ways this was worse. But Toymaker deserved straight answer. So, in hopes would provide it himself, asked, "Have you been in the military?"

Had; two years' compulsory service twenty years ago. Qualified as marksman on range.

"Have you had special-forces- or commando-type training?"

Uh, had not.

"Have you ever killed anyone in cold blood?"

Toymaker blinked; eyes went round. "*No!*"

Sighed. Or maybe shivered slightly. "I have."

Sudden, visibly horrified comprehension, sympathy appeared in sweet old Russian's eyes as Special-Ops Girl continued relentlessly: "My plan is to sneak in, kill any sentries in the way, find Daddy, and get him out. Unless you have training or experience in that type of operation—"

"I will undoubtedly just get you caught," Father Toys finished thought sadly.

Paused, eyed me reflectively; then rueful smile flickered across features. "I think perhaps it is fortunate that we have become *friends*...."

* * * *

As always, Plucky Girl Aviatrix's actual departure preceded by morning Frisbee. Toymaker proved expert backhand-flip practitioner; BC approved of technique. Approval lasted something over hour.

Eventually though, time to leave. Russian hugged me as if own kin. Finally released, stepped back with brimming, worried eyes—which of course set off your Humble Historiographer as well: Amazing, how quickly bonds form in depopulated world....

* * * *

Chelyabinsk, penultimate destination, selected after due deliberation. Respectable-sized city, though by no means huge. Charts, as well as between-the-lines interpolation of Danya/Wallace's notes/off-the-cuff observations confirmed presence of well-equipped airport.

Location, depth of resources fundamental to strategy:

First, though Chelyabinsk barely 50 crow-flies miles from heart of *Serdtsevina Rasovyi,* Bad Guys' big headquarters/shelter/lab beneath Urals' spine, single entrance to which is drilled into side of valley some 15 miles east of Zlatoust, does lie beyond foothills, far enough back to minimize detection odds, either electronically or, via random malchance (worse luck even than *mis*-), being observed by, stumbling into, some wandering *Khranitel.*

Next, irrevocably final opportunity to service, prepare plane for potentially protracted storage. Servicing needs to be thorough: Last stop prior to tiptoeing on foot into heart of enemy territory in all-out recon/infiltration mode.

Intend to delay refueling until morrow; depart directly from Chelyabinsk's pumps with utterly brim-full tanks, following very-last-second refueling session. Shan't leave even manual-recommended margin for fuel expansion due to heating by outside air—much warmer than nearly permafrosted soil under which tank farm resides.

Stallion's total fuel capacity, including Lennel's custom-fabricated, extra fuselage tank, listed at 360 gallons. By morning, fuel remaining in ship's tanks, following today's final run, should be chilled nearly to temperature of that waiting underground. If heat differential between belowground fuel stores, daytime air, provides expected nearly ten percent expansion, that amounts to close to 35 spontaneously generated additional gallons as fuel warms, expands.

Expect turbine's thirst to account for pretty much whatever excess may come into being from atmospheric warming during short hop from Chelyabinsk to *Serdtsevina Rasovyi,* which means, until point reached where expansion fails to replace that disappearing into engine, fuel level shouldn't drop at all. Of course, overflow vents will bleed off whatever engine doesn't consume.

Takeoff, final 50 miles' treetop-level flight, plus landing, should take (plus-minus) 15 minutes. Turbine consumes 50 gallons per hour, of which roughly 70 percent will be magically replaced during flight—clearly, if scheme works as advertised, will arrive at destination with tanks still brim-full; i.e., no trapped air.

(Mmm ... Why does sophisticated, thermodynamics-based, fluid engineering plan sound so much like excerpt from brochure for perpetual-motion device...?)

Better work, however, regardless whether physics or Alternate Forces responsible. Otherwise, could find self returning to plane following multiple days'—possibly weeks' or even months'—storage to find diurnally repetitious warming, cooling of trapped air has generated a gallon or five of H2O condensate, every drop needing to be drained prior to departure.

Normally, accumulated water not problematical. Presence expected; sump draining part of any normal preflight inspection.

However, if exit happens to be motivated by unscheduled urgency, perhaps with pursuing *Khraniteli*'s bullets parting hair, might forget to drain sumps altogether during abbreviated preflight inspection—i.e., leap aboard, slam door, switch on ignition, push starter button, jam throttle forward, haul back on yoke, hold breath.

Following which, assuming plane actually clears ground, almost certain to fall out of sky soon afterward as fundamentally noncombustible nature of water reaffirmed one more time.

Physics has *long* attention span....

* * * *

Chemaya to Chelyabinsk required long attention span as well. Too far to make in single hop, planned for touchdown at Surgut, on River Ob, for fuel, lunch, Frisbee. In terms of terrain, might as well have been flying over Midwest American heartland: flat to gently rolling terrain; now forested, now grasslands, now moth-eaten, abandoned farmlands; sprinkling of lakes, rivers. Mostly quite pretty landscape.

Arguable, of course, that plentitudinous array of potential emergency landing options contributed to

favorable opinion of vistas. Particularly since had no idea what sort of radar coverage *Khraniteli* might have set up around *Serdtsevina Rasovyi,* even less desire to find out, so, as distance shrank, developed increasing aversion to height. Last two-thirds of flight consisted of progressive letdown from 1,000-foot cruising altitude.

Final hour closing in on Chelyabinsk spent snaking along valley floors, arcing around hilltops, skimming under power lines, wheels virtually brushing forest roofs (dodging *between* higher treetops) during final 100 miles. Flight rivaled better air combat simulator video games; furnished real-world epinephrine levels guaranteed to satisfy most demanding thrill junkie.

Arrived well before dark. Got good start on stem-to-stern aircraft checkover before dusk began to intrude.

We ate, then frisbeed. Gathering gloom appeared not to interfere with Maggie's enjoyment of pursuit; illumination sufficed for her simple purposes: Nailed Frisbee every time, even by the time *I* could hardly tell where it was. (IR vision component useless for frisbeeing; no temperature variation worth talking about.) Border Collie's motion tracker, however, apparently functions independently from visual-light spectrum.

Or maybe BCs related distantly to bats. Actually, have known several who, because of intensity, could be described as “batty.” (Okay, sorry.)

Finally went to bed. Closed eyes, put arm over still happily panting, fuzzy baby sister snuggled against side—then found self wide awake, engrossed in detailed study of backs of eyelids, trying very hard not to brood about fact that only about 15 minutes’ flight remained before parking ship for last time, preferably someplace inconspicuous, covering with camouflage netting (borrowed from AAs’ special forces’ stash), commencing shanks'-mare area recon before—

("Attention, attention; this is not a drill.")

—engaging enemy.

Mmm ... Somehow, Posterity, this all seemed *so* much better idea during planning stages.

Or, put differently, as Sven Nordstrom, Norwegian “political refugee,” slyly deadpan resident philosopher/fireman/EMT, back in pre-end-of-world Wausippi hometown days, was wont to observe in times of stress, “Hoooooh, jeeeez...."

* * * *

Day IX

Palomar to Alaska's tip, 2,900 miles. Bering Strait crossing, 50. Then 4,300 or thereabouts wandering across Asia.

All in all, some 7,300 miles’ flying lay behind us as, two hours after sunrise, following aircraft prestorage maintenance wrap-up, and moments after final, squeeze-in-very-last-chilled-drop, brimmest-full-possible fueling, we lifted off from Chelyabinsk, headed for *Serdtsevina Rasovyi*.

* * * *

Quarter hour later, eased through notch between tree-covered, rounded tops of relatively low, 40-mile-long, five-mile-wide, last-but-one, big-hill-bordering-on-small-mountain just north of Turgoyak. In interests of reduced visual conspicuousity, brushed uppermost leafy branch tips with main-gear tires as cleared summit.

Pulled back throttle, floated downhill at near idle, propeller just ticking over, keeping eyes peeled for suitable landing site/hiding place for Stallion.

Candidate emerged halfway down slope: Well before reaching broad, grassy valley floor, forest cover terminated in smooth, turf-covered hillside clearing, almost pastureland, whose uphill end disappeared into gloom under ancient oak grove, beneath whose sprawling limbs plane surely invisible from air, and pretty well hidden on ground as well, unless wandering indigene happens physically to stumble over it.

Now. Only actual experience with bush-pilot-style uphill landing/downhill takeoff took place months ago during ultralight phase of aviation career. (Oddly, bush-flying techniques not touched on during shuttle simulator training.) But flying is flying; Lennel agrees: Same set of physics governs Stallion's aerodynamic behavior as person-rated toy airplane. No big deal.

In theory.

Lowered flaperons, leading edge Fowler slats popped out. Executed low, slow, gently banked 180, maintaining barely enough altitude to keep from digging in wingtip. Rolled out of turn nicely lined up on clearing, whose lower end was still well above us on hillside.

Added power, raised nose; established gradually slowing climb calculated to intersect rising ground about a third of the way up-slope.

Raised nose higher, slowed further despite adding more power. Increased backpressure on yoke, added still more power. Airspeed bled off as terrain rose faster than climb rate. Skimmed over final hedgerow bordering clearing's lower end as rising ground finally intersected flight path.

Wheels down/terrain up—distinction without difference. Chopped throttle, hauled yoke all the way back at first bump to ensure plane remained fully stalled.

No need for brakes, reversed thrust; uphill rollout complete in less than hundred feet.

Whereupon freshly graduated mountain pilot resumed breathing.

Added power again; S-turn taxied rest of the way uphill to, between trees; parked beneath spreading branches of huge old oaks. Momentary blast of power gave rudder sufficient authority to aid one-wheel brake application in swinging tail around to face Stallion downhill.

Set brake. Killed ignition. Sat back, sighed, feeling flight tension bleed from soul—only to be replaced by mounting preinfiltration apprehension...

Maggie stretched neck, nudged elbow with nose. Reached over, unlocked BC's harness.

Thought about pulling her onto lap for hug, but, as usual, hyperalert puppy had picked up cues; already in motion. Held her for long moments as she leaned against me. Stroked, scritched; thought Beautiful Thoughts—reflected on unlikely state of affairs:

Substantial portions of two continents, plus symbolic spit of (really cold) ocean, now lay behind us; Intrepid Girl Flying Ace had, in fact, successfully navigated almost third of the way around world in furtherance of quest.

Now all that separated us from *Khraniteli* stronghold (and, pleaseplease-*please*—Daddy!) was broad valley, big lake, plus single, modestly prepossessing mountain ridge.

(As well as, for detail-obsessed, whole base full of genocidally inclined, sociopathic fanatics.)

After chocking Stallion's wheels, tying down, covering with camo net, we celebrated with rousing Frisbee session, epicurean repast of Canned Stuff; then early off to bed, perchance to have nightmares....

To be continued.

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Science Fact: **THE CHALLENGE OF THE ANTHROPIC UNIVERSE** by Carl Frederick

In the early 1990s, a creeping realization swept through the theoretical physics community that the probability for the universe to even exist was vanishingly small. Indeed, the only "theory" around that seemed able to explain the universe's existence was Intelligent Design. This was not something physicists and cosmologists liked to talk about.

In 1974, the observation that the universe seemed "fine tuned" to permit life prompted the Australian cosmologist physicist Brandon Carter working at the Paris Observatory to coin the term "The Anthropic Principle." In the "strong form," it maintains, "The Universe, and hence the fundamental parameters on which it depends, must be such as to admit the creation of observers within it at some stage." Although he put a name to the problem, Dr. Carter was not the first to point out the difficulty. In 1957, Robert Dicke (my thesis advisor's advisor, by the way) suggested in *Reviews of Modern Physics*, "The fundamental physical constants, such as the gravitational constant and the charge on the electron, are not random but conditioned by biological factors, central among them the fact that organisms must exist in order for these constants to be measured." More extreme still was the so-called "participatory anthropic principle" of John Wheeler (Dicke's advisor. We theoreticians are very keen on lineage.), which says that "Modern quantum theory, the overarching principles of twentieth century physics leads to quite a different view of reality, a view that man, or intelligent life, or communicating observer participators are the whole means by which the very universe is created: without them, nothing." In Wheeler's very quantum mechanical and non-linear world-view, observations by intelligent observers are vital: observations by beings living billions of years after the Big Bang, he maintains, actually caused the Big Bang to occur in the first place. Strange as this sounds, it echoes ideas common in quantum theory.

The depth of the anthropic problem is, I think, well described by the cosmologist responsible for the Steady State theory of the universe (and noted science fiction author), Sir Fred Hoyle. His appreciation of the almost miraculous coincidences in enabling carbon to be produced in stars caused him to change his very perception of the universe. He wrote, "A commonsense interpretation of the facts suggests that a superintendent has monkeyed with the physics, as well as chemistry and biology, and that there are no blind forces worth speaking about in nature. I do not believe that any physicist who examined the evidence could fail to draw the inference that the laws of nuclear physics have been deliberately designed with regard to the consequences they produce inside stars."

Here we have it then: Intelligent Design in physics. We have come very far (backwards, in my opinion) from that time when Laplace, explaining celestial mechanics to Napoleon, was asked where God fit into his equations. Laplace replied, "Sire, I have no need of that hypothesis."

So, then: *Do* we need that hypothesis? Below, we'll take a short romp through modern theoretical physics and cosmology to seek insights, then attach some numbers to the problem, and finally look to the physics community for possible solutions.

* * * *

This article was prompted by the 2007 Bethe lectures here at Cornell and three weeks later, the Messenger lectures. In the first lecture series, the eminent string theorist, Joseph Polchinski addressed the anthropic principle, leaning largely on the work of Leonard Susskind, who might well be considered the father of modern string theory. Dr. Susskind was, incidentally, one of my professors in grad school (did I mention how keen we theorists are on lineage?). In the Messenger lectures, Steven Weinberg (who won a Nobel Prize for his unification of the electromagnetic and weak atomic forces) also addressed the issue—here in the context of elegance and beauty in physical theories.

The article proper relies on the above two lecture series as well as "The Anthropic Universe," a special

edition of *The Science Show* from The Australian Broadcasting Company, and four books: *Just Six Numbers* by Martin Rees, *The Trouble with Physics* by Lee Smolin, *Many Worlds in One* by Alex Vilenkin, and *The Cosmic Landscape* by Leonard Susskind.

* * * *

A Little Physics...

Starting at the beginning of cosmology: In the beginning, the word was God—but later it was Newton, and then Einstein.

Newton's three laws of motion: 1—Every object in a state of uniform motion tends to remain in that state of motion unless an external force is applied to it. 2—The force on an object is proportional to its mass multiplied by its acceleration (F=ma). 3—For every action there is an equal and opposite reaction.

These "laws" allow us to calculate things—to actually do physics. The laws themselves require other assumptions: That the world is describable, and what has been called Newton's "Zeroth" law. 0—The world can be described with mathematics—particularly continuous, smooth functions.

Newton also experimented with light. Although he discovered that white light sent through a prism gives a spectrum, he believed light was made up of small particles. And these particles passing through the "ether" (the fluid-like substance he thought filled the heavens) he believed stimulated that ether to give off waves. To this very day, physics has this schizophrenia: Is matter waves or particles? (And if *both*, what does that really mean?)

In the cases where there is gravity and/or masses traveling at close to light-speed, Einstein's equations superceded Newton's three laws. Gravity, for Einstein, was nothing more than "geometry," a warping of space. And this led to another example of physics schizophrenia: "Things" versus geometry. For example, can gravitons be considered particles, or are they just convenient ways to talk about geometry (e.g. curvature)? John Wheeler actually had a (not entirely successful) theory, "Geometrodynamics," which considered *everything* as geometry. And, building on Einstein's explaining gravity as geometry, Kaluza and Klein made a good, but ultimately unsuccessful, attempt to explain electromagnetism as geometry in a five-dimensional space-time. String-theory owes much to Kaluza-Klein ideas.

In relativity theory, Newton's zeroth law was still assumed. But, with the advent of quantum mechanics, that law is likely to fall. At some small scale, 10-33cm or thereabouts, space-time seems as if it must be granular. There are several reasons to think so: First, if string theory is "correct," the basic element of space-time is a discrete string. But also, since vacuum fluctuations (see below) imply a fluctuation of mass—and mass in some sense is geometry, then the geometry on the scale of the fluctuations wouldn't be continuous and would hence be granular. If we can't trust the mathematics of continuous functions, calculus (which Newton co-invented) goes away, as do equations in general. What do we have to replace them? Einstein, in his later years, began to question the zeroth law. In his *Out of My Later Years* essays, he wrote: "The spacetime continuum may be considered as contrary to nature in view of the molecular structure of everything which happens on a small scale.... Perhaps the success of the Heisenberg method points to a purely algebraic method of description of nature, that is to the elimination of continuous functions in physics. At the present time, however, such a program looks like an attempt to breath in empty space."

Arguably, theoretical physics explains less these days than it did in Newton's time. And, if math is suspect, can we believe physics at all?

* * * *

...And Some Cosmology

Einstein's “field” equations of General Relativity are deceptively simple...

...and remarkably elegant: The left side of the equation describes geometry and the right side matter. And at a philosophical level, they *are* simple. They explain the force of gravity (and only the gravitational force).

naturally enough, is called the Einstein Tensor. It is a rather complex function of

(the “metric” tensor), which essentially describes the distance between two neighboring points in space-time.

The (mu) and (nu) subscripts range from zero through three and represent our four dimensions (e.g. t, x, y, z). The above then represents sixteen equations (44), but since

is identically

(and similarly for

), and because of the arbitrariness of the four dimension coordinates, there are in fact, only six independent equations. The equations are analogous to Newton's second law equation F=ma (force equals mass times acceleration). At a given point,

is a purely geometrical quantity describing curvature, and

describes the mass distribution at that point. At a point where there is no mass (ignoring for the moment, the quantum “mass” at any point in space-time), the equations reduce to:

describes the mass distribution at that point. At a point where there is no mass (ignoring for the moment, the quantum “mass” at any point in space-time), the equations reduce to:

Again,

describes space-time curvature and is a descriptor of gravity. So, for Einstein, gravity *is* geometry.

Einstein applied his equations to the universe as a whole and found they did not allow a static universe. This came as a shock since the prevailing belief of the day was that the universe *was* static. Einstein found that he could alter his equations with, essentially, a fudge factor as follows (the mass free case):

Lambda, a small, pure number, is the so-called cosmological constant, a provider of a cosmic scale universal repulsion (or attraction). Carefully tweaking that number could provide a static universe—or so Einstein thought. The Russian physicist, Alexander Friedman, however, showed that the solution would be at a point of unstable equilibrium—the equations would still say the universe was expanding or

contracting. And with the Lambda term, the equations predict that the *rate* of expansion (or contraction) would continuously increase.

But then the American astronomer Edwin Hubble observed that the universe actually was expanding. This was a big surprise—the notion that the universe was not eternal and unchanging. The belief in an unchanging universe was so ingrained that Fred Hoyle (along with Herman Bondi and Tommy Gold) proposed the Steady State theory. It accepted the observed expansion, but preserved the idea of an unchanging universe by positing that a hydrogen atom occasionally pops into existence (just one per cubic meter per billion years). But then came strong evidence of the Big Bang, and Hoyle abandoned his theory—reluctantly. He said it was a great theory and he couldn't understand how God had overlooked it.

Einstein though, happily accepted the expansion of the universe and immediately expunged his "blunder," the cosmological constant, from his equations.

For years, most physicists agreed that Lambda was indeed a blunder and its value was exactly zero. That is what I was taught in grad school. But then ideas from quantum mechanics about the nature of a vacuum changed everything.

* * * *

Quantum Mechanics Fills the Vacuum

The Uncertainty Principle says that you can't measure exactly how much energy there is at a point in space, at least not in a finite amount of time (and until it is measured, energy isn't even a well-defined quantity). But the principle says more: Even at a point in a complete vacuum, there *must* be energy (the so-called vacuum or zero-point energy). This energy, according to relativity, can be thought of as mass ($E=mc^2$). And mass has gravity. The equations of general relativity, therefore, can be used to describe this evanescent sea of energy in which we're all immersed. But this sea of gravity is exactly what is described by the cosmological constant.

The cosmological constant then, is, just the manifestation of the universe's zero-point energy. But, oddly enough, the constant could still be zero (or even negative). That is because, due to the weirdness of quantum mechanics, the zero-point energy at a point can be *negative*—as if we live in a hot soup and someone throws in an ice-cube.

Something must carry the zero-point energy, and that something is normal elementary particles—well, not exactly normal particles, as they pop into existence, stay around a very short time, and pop out again. These *virtual* particles appear (in an important example) as particle/anti-particle pairs and an accompanying photon. Soon after they're created, they annihilate.

One important division of particles is into *bosons* and *fermions* (or equivalently, integer spin and half-integer spin particles). Bosons (e.g. photons, gluons, gravitons, in so far as gravitons can be considered particles) contribute positive energy to the vacuum, whereas the fermion (e.g. electrons, muons, quarks) contribution is negative. Each of these virtual elementary particle types gives an enormous amount of energy to the vacuum, either positive or negative, and there is no known reason why the positive and negative energies should cancel or come anywhere near canceling. And yet, to be consistent with astronomical observations, the magnitude of Lambda, the cosmological constant, (the measure of this energy) must be less than 10^{-120} (that's a decimal point followed by lots and lots of zeros followed by a one).

Steven Weinberg wondered how big the cosmological constant could be and still produce a universe like ours—one that allows, for example, *Analog* readers. He found that if the value were just one or two

orders of magnitude larger, the early universe would have been unable to produce stars or galaxies. (A similar problem in the early universe exists for a negative cosmological constant with a value a couple of orders of magnitude away from -10^{-120}.)

The problem is: If the cosmological constant is *not* zero, but instead 10-120 or thereabouts, it is exceptionally difficult to explain how nature managed to tune the value of the constant to just one of those miniscule values that would allow us to exist. A value of zero would solve the problem. There *is* a theoretical way the energy could be zero—supersymmetry. If every fermion (or boson) came with another particle, the same in every respect except in that it was a boson (or fermion), then the energies would cancel. This was such an appealing solution that the particles (even though never found) were named. The particle corresponding to the electron was called a selectron, for a quark the particle is a squark, a gluon gives a gluino, and the neutrino corresponds to a sneutrino (great name, isn't it?).

* * * *

Our Universe Doesn't Cooperate

Even though supersymmetry doesn't seem to apply to our universe, most everyone none-the-less wanted a zero value for the cosmological constant. In fact, Joseph Polchinski confided that he'd quit physics if the cosmological constant turned out to be nonzero. It would strain credulity (even for us science-fiction types) that the value of the constant could have been so well tuned entirely by chance. One would have to invoke the anthropic principle.

In 1998, two separate research groups, The Supernova Cosmology Project and The High-redshift Supernova Search Team, attempted to measure how fast the universe was slowing down—in other words, the change in the rate of expansion.

They used observations of Type Ia supernovas in distant galaxies. This class of supernova is the case where a white dwarf star has a companion. Over time, the dwarf captures gas emitted from the companion until the dwarf reaches a well-defined maximum mass, the Chandrasekhar limit. Then it collapses and goes boom—with the luminosity of four billion suns. The important points are that a Type Ia supernova has a signature and is, in effect, a “standard candle"; all of these supernovae have the same absolute luminosity. So by measuring how bright one of them appears, we can calculate how far away it is. And by measuring the redshift of the galaxy in which it is embedded, we can tell how fast the galaxy is moving away from us.

After examining many of these supernovae at various distances from the solar system, the High-redshift Team reported that our universe was not slowing down. On the contrary, it was speeding up. This implied a non-zero cosmological constant, and its value was about 10-120. Brian Schmidt, one of the team leaders, said his reaction to the result was “somewhere between amazement and horror.” A few months later, the other team came in with very similar results.

Improbable as it is, there is (at least as of this writing) a non-zero cosmological constant. And that means there is a cosmic vacuum energy (which is likely the entire explanation of the “Dark Energy” in the universe). The question is: *Why* isn't it zero?

* * * *

Just How Improbable Is our Universe?

The “Standard Model” of particle physics works pretty well at describing what makes up matter—of the non-dark variety (six flavors of quark [up, down, charm, strange, top, bottom] and six leptons [electron, tau, muon, and their corresponding neutrinos], and the force mediating particles [photons, W and Z bosons, gluons]). The model has about twenty-five free parameters (constants) specifying the masses of

the particles and coupling constants, i.e. the strengths of the forces between them. These twenty-five or so constants are (as best we know) independent of each other; the value of one of the constants doesn't depend on the values of the others.

These constants, for example, determine the likelihood of atoms, the stability of atomic orbits and nuclei. From the values, one can determine, among other things, the amount of hydrogen available after the Big Bang to form stars, the masses and lifetimes of those stars, the ability of galaxies to form, and even the size of the universe.

Many of these constants seem “tuned.” If their numerical values were different by a very small amount, we wouldn't exist. But as we saw above, as scary as the tuning of these constants is, it is the cosmological constant, Lambda, which is the most tightly tuned.

The theoretical physicist and cosmologist, Lee Smolin, looking at the individual tunings of the constants, has estimated that the probability of a universe that can support life to be at best one chance in 10229.

There's yet another cause for some unease about the universe and our place in it. The universe is estimated to be about fourteen billion years old. The Earth seems to have been around for about four and a half billion years. So, as far as age is concerned, the Earth fits comfortably in the universe. Perhaps too comfortably. The universe arguably is not much older than it must be to have an Earth like ours.

* * * *

Which Way Out?

Lee Smolin considers that there are four solutions to the problem, schemas if you will.

1) God tuned the parameters for our benefit. This isn't his preferred answer (or mine either).

2) There are a very large number if universes, in each of which the parameters are chosen randomly. The number of universes is so large that some of the universes would have the “right” values of the parameters—and we are in one of those universes. Neither is this Smolin's preferred solution. He writes, “To argue this way is not to reason, it is simply to give up looking for a rational explanation."

3) There is a “unique mathematically consistent theory of the whole universe.” And as such, we'd have no choice but to accept it. Smolin rejects this as well. “It strains credibility,” he writes, “to imagine that mathematical consistency could be the sole reason for the parameters to have the extraordinarily unlikely values that result in a world with stars and life."

On the other hand, one might hope that a theory would come along and explain the values of all the parameters in terms of just one of them. If the parameters were not independent, that would make the odds rise enormously.

4) The parameters evolve in time—in the Darwinian sense. This is Smolin's belief. (I quote Lee Smolin often. He has a highly informed opinion and is perhaps the strongest advocate for this “schema four.")

* * * *

A good number of very intelligent people have argued for schemas two, three, and four above. At the moment, there is nothing resembling a consensus among physicists. And in addition, the schemas are not mutually exclusive.

Schema four is appealing (to me, at any rate) and deserves an article of its own. But at the moment, the idea hasn't, in my opinion, risen to the point of being a theory.

Schema three also doesn't seem to have a theory attached to it. But it is in the tradition of physics to look

along these lines. *Macho physics*, as George Efstathiou, Director of the Institute of Astronomy in Cambridge, dismissively describes it. He goes on to say, “A lot of theoretical physicists really dislike the idea of an anthropic principle. It's regarded as a bit of a cop-out; that if you can't actually calculate something from first principles, from the theory, that it's a cop-out to invoke the anthropic principle. So the macho physicists’ point of view is to say that there is a theory of everything and we will one day find this theory of everything, and the theory of everything will predict all of the physical constants of nature and it will predict exactly why the universe is the way it is today."

Schema two could also have been considered an idea rather than a theory. Among others, Martin Rees had years ago proposed multiple universes. But in the last few years, a viable theory, the landscape model, has grown up around the idea.

Leonard Susskind coined the term “landscape” for the emerging theory of a populated “megaverse.” The theory itself grew from the work of many. If we were to draw up a “Society of Landscape Architects,” the charter members would certainly include Raphael Bousso of U California, Berkeley, Alan Guth of MIT, Andrei Linde of Stanford U, Joseph Polchinski of Kavli Institute, Leonard Susskind of Stanford U, and Alex Vilenkin of Tufts U.

One should note that there are (at least) two many-universe theories. Hugh Everett in the mid 1960s proposed that at every quantum “decision,” the universe breaks into multiple copies, one for every possible outcome of the quantum decision. Those universes interact, giving rise to quantum interference. This is the “multi-world” interpretation of quantum mechanics (beloved of us SF writers). The other theory, “the megaverse,” is what we are here concerned with. Arguably, the multi-world theory might (in view of Polchinski's D-brane theory) really be a subset of the landscape model.

Many would not consider the landscape a pretty or elegant theory. Indeed, I asked Steven Weinberg about it. He allowed that it wasn't elegant, but it might well be right. Not everyone agrees, though. One prominent string theorist I asked (I won't mention his name as it was an off-the-cuff comment) half-jokingly called it “California science.” And Smolin has written of it, “If an attempt to construct a unique theory of nature leads instead to 10_{500} theories, that approach has been reduced to absurdity,” strong language indeed considering the normal reserve of academic discourse. Still, the theory seems to be the only game in town at the moment. Perhaps a schema three or four theory will come along eventually. But the landscape approach at the very least, in my opinion, provides a way to look a creationist straight in the eye.

* * * *

A Snapshot of the Landscape

In the late 1990s, despite lots of books on the subject being published, string theory was pretty much dead. The theory promised a unique solution (a TOE, Theory of [almost] Everything)—and delivered it. But the solution (a Calabi Yau manifold) didn't seem to describe our universe, and it was supersymmetric (sneutrinos, gluinos, etc.). Soon thereafter, not one, but about a dozen solutions were found—and then a million or so. So there went one of the major promises of the theory: uniqueness. Not long after that, the number of solutions rose to 10_{500} or thereabouts.

The various solutions implied pretty much all possible (discretized) values of the standard model parameters and of the cosmological constant, and even different numbers of physical dimensions. Each of these solutions is essentially a specification for a universe.

One might (almost) visualize these solutions, the Calabi Yau topologies, as hunks of clay with lots of holes in them threaded by fluxes—that is to say lines of force.

For Susskind, the 10_{500}fold abundance of solutions was not a failure, but a stunning success for string theory; the solutions collectively are a "landscape" of possible universes, the "megaverse" as Susskind calls it. It is made up of "pocket universes" (Alan Guth's name for them).

Armed with Guth's (largely accepted) theory of cosmic inflation, particularly eternal inflation, the "landscape architects" were able to generate a theory where these universes would actually be produced.

Alan Guth had theorized that the very early universe (when the entire universe was the size of an elementary particle) would undergo a period of very rapid expansion (a result of a repulsive force acting against gravity, and acting for about 10-35 seconds, ending when the universe was about the size of a marble). Andre Linde (among others) expanded on that, asserting inflation was eternal—that there was not just one Big Bang, but a series of pocket universes, continuously being created. Susskind (using the M-brane version of string theory) avers that most of the 10_{500} universe possibilities will actually come to exist. He encapsulates the idea as, "A landscape of possibilities populated by a megaverse of actualities." The landscape theory is controversial in the extreme. It will be interesting to see how it develops and is accepted over the next few years. And incidentally, Joseph Polchinski did not quit physics.

* * * *

Speculations

I'm reminded of the old Cambridge University exam question "Define the Universe and give three examples." I used to think that was funny.

Just what *is* a universe? Perhaps we could think of universes as isolated, non-interacting space-times. But I'm not sure we can. Some years back, there was a heated argument (that went on for years) between Susskind and Kip Thorne on one side and Stephen Hawking on the other. The issue was whether information is lost when matter falls into a black hole (Hawking said yes). Eventually Thorne and Susskind prevailed—sort of. The resolution was that the information isn't lost. It does come back out, but in a scrambled form where the key to unscrambling it (probably) cannot exist. Strange! (To paraphrase Arthur Dent in the *Hitchhiker's Guide:* Ah, this is obviously some strange use of the word information that I wasn't previously aware of.) The point is that the description of universes is much like the description of black holes. Universes then might be able to exchange information; they need not be isolated and non-interacting (although Alex Vilenkin says they cannot possibly interact). The concept of "universe" then becomes, at least for me, rather fuzzy.

While the richness of the landscape model appeals to me, I must admit to a (probably cultural) bias that if a quantity has a value exceedingly close to zero, then either it *is* zero or there's got to be a good theoretical reason for its near-zero value. Perhaps useful would be an "uberphysics" (hopefully not metaphysics) describing interactions between pocket universes—maybe a physics without Newton's zeroth law. Perhaps the laws governing, say, the value of the cosmological constant are trans-universe laws. Maybe the value of Lambda tends towards but doesn't reach zero. Perhaps Lambda is a kind of normalization—a mechanism whereby universes communicate with each other to attempt to evolve Lambda ultimately to zero.

I would guess that it is not an either/or situation of the landscape, macho physics calculations, or Lee Smolin's evolution ideas. The universe (whatever that means) seems to have the complexity to encompass all three approaches.

There's a paradigm playfully called (Murray) Gell-mann's Law (derived from T.H. White's *The Once and Future King*), which asserts, "anything not expressly forbidden by physics, *must* exist." It was arguably a good guide for hunting new elementary particles. I guess it might apply as much to universes as to particles—or even to theories of physics.

* * * *

Einstein famously said, “Raffiniert ist der Herrgott aber boshaft ist er nicht.” ("Subtle is the Lord, but malicious he is not.")

I wonder.

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Novelette: **THE EXOANTHROPIC PRINCIPLE** by Carl Frederick

Those who ask big questions must be prepared to accept the answers....

Colin plopped the last of the cardboard boxes onto his desk at the Institute for Distant Communication: Alien Intelligence Group. He smiled. If Bing, his new colleague, was to be believed, the IDC:AIG had more syllables in its name than it had research scientists. Not that his presence would make a difference in that regard; he was a mathematician in a den of physicists.

He cast a glance at his bookcase—empty, depressing, like a deserted beehive—then pulled open a few boxes of books and populated a shelf and a half. In one of the boxes, he found his Brigit's Cross plaque. Kicking off his shoes, he grabbed the plaque, climbed onto his desk, and set the Brigit Cross on the molding above the window.

Just then, the phone rang. Colin dropped to his knees and rummaged on the cardboard-strewn desk for the phone. He found and answered it.

"Colin!" came Bing's voice, his excitement apparent in even one word. "I think maybe at long last we've got something. Come on down, if you would."

"Of course," said Colin. "Where?"

"Farcast lab."

Colin chuckled. "As I said, where?"

"Oh, right! One flight down. Room 302."

* * * *

Darting through the door into the Farcast lab, Colin saw Bing Robinson and two others whom he didn't recognize standing over a desk gazing intently at a large computer display. From a speaker on the monitor came a pervasive hum, as if from a defective fluorescent fixture. A chirping sound, like the twittering of finches, interrupted the hum at regular intervals. Although Colin couldn't identify much of the room's instrumentation, he did notice an old line printer in the rear of the lab. Buzzing in rhythm with the chirps, it disgorged a waterfall of continuous-feed paper to the floor. He was surprised that a modern laboratory would still use a line-printer. But then, this lab didn't look particularly modern.

The scene, particularly the hum, brought to mind his visit as a boy to his mother in the hospital. He pushed away the memory and walked forward.

Bing turned at his approach. The others did as well—but only briefly before returning their gazes to the monitor. Bing drew them away to make introductions. Katya Shirova was an experimental physicist and Neville Fox, a theorist. The two were cordial but clearly had other things on their minds.

Bing grabbed a sheet of printout from the desk and thrust it into Colin's hands. The sheet held only rows of dots. Colin stared at them:

... .

... .

... .

"I'll save you counting them," said Bing. "They're three, five, seven, eleven, thirteen, seventeen, and

nineteen." He nodded toward the speaker. "The chirps you hear are that sequence at high frequency. Blips separated by short pauses and longer pauses between the numbers."

"Are you..." Colin struggled to take it in. "Are you saying you're receiving extraterrestrial signals?"

"Certainly looks like it," said Bing.

"Maybe not be so quick with conclusion," said Katya, turning from the monitor. "You remember LGM."

"LGM?" said Colin.

Neville swiveled into the conversation. "LGM. Little Green Men. That's what some astronomers called pulsars when they thought that only an intelligence could be the source of such regular pulses."

"*I* think," said Bing, "that these prime number sequences *are* from an intelligence."

Smiling, Neville glanced at the monitor. "Actually, so do I."

"This is wonderful!" said Colin. "Absolutely fantastic!"

Bing and Neville gave slow, shy smiles, the way children might when given an unexpected compliment. Katya looked pleased as well.

"We really don't have much," said Neville with a self-deprecating shrug. "Some prime numbers, only seven of them." He shrugged. "The sequence repeats approximately every 15.5 seconds. The hum frequency is 142 Hz, almost exactly—"

"The hum?" said Colin. "Is it from the same source?" Again, he pushed that long ago hospital visit from his mind.

"Most likely," said Bing. "Sort of a carrier—or an indicator that we should stick to this wavelength."

"And that wavelength?" said Colin, eager to show he was conversant in SETI matters, "Twenty-one-centimeter, neutral hydrogen, I imagine."

"No, not radio waves," said Neville. "Actually we scan through frequencies and polarizations of coherent gravity waves."

"What?" Colin felt his eyes widen in wonder. "I didn't know you could do that."

"Oh, we physicists can do a lot," said Neville, lifting a cup from the desk, "given enough money—and enough coffee." He pointed at the printout Colin held. "And *voila!"*

Colin looked down at the printout. "Interesting that they don't consider one or two as prime." He blew out a slow breath. "They probably define a prime as an integer with no integral divisors less than itself. Makes Fermat's Last Theorem easier to state."

In thought, he gazed absently at the monitor speaker. "I wonder if the hum frequency is arbitrary."

Katya cocked her head. "Arbitrary?"

"Let's assume it is," said Colin. "And also assume the time between transmissions is also arbitrary. By arbitrary, I mean chosen for convenience, or rather for ease of representation. And further, assume the Axiom of Choice."

Bing and Neville exchanged puzzled glances.

"You know," said Colin, softly as if to himself. "We might be able to deduce something." He fingered an imaginary piece of chalk. "Let's call their basic unit of time a ... a 'woof' and take that as the time between transmissions. A transmission every woof." He looked away at an imaginary blackboard. "Then in cycles per woof, the hum frequency would be 142 times 15.5, approximately." He narrowed his eyes in thought. "Which would be ... 2201." He paused. "Ah, how about this?" he said after a few seconds. "If they picked an easy number for the frequency, as we might pick 100hz or 1000hz then, if we let A be the base of their number system, their equivalent would be A squared or A cubed or perhaps A to the fourth—which would have to be approximately 2201."

Stealing a glance at his listeners, he saw signs of their eyes glazing over. He had to admit taking some small satisfaction in getting that result from physicists.

"So," Colin continued. "Trying base six, we'd have 6, 36, 216, 1296. Nope. Nothing anywhere close to 2201. Trying seven, 7, 49, 343,"—he paused—"and 2401. Closer, but still no cigar. Eight gives 8, 64, 512, 4096. No good. For nine, 9, 81, 729, and"—again a pause—"6561. A strong no. Ten won't work of course. Eleven gives 11, 121, 1331. Not even close—"

"That's fine," said Neville, taking off his glasses. "We get the idea."

"And twelve," said Colin, ignoring the interruption but noting the little furrows of bite marks on the temple-tips of Neville's glasses, "gives 12, 144, 1728. Closer, but no. Thirteen gives 13, 169,"—yet another pause—"and 2197. Ah good. That's only four off from 2201. Well within measurement error, I should think." He let out a long breath. "Yes," he said, with finality. "My guess is that they have a base thirteen number system."

"You're kidding," said Bing.

"It would imply an odd biology," said Neville. "A fingers per hand issue."

"It's the best I can do, I'm afraid," said Colin with a smile to Bing. Again he gazed at the printout. "3, 5, 7, 11, 13, 17, 19," he said, distantly. "It's too bad we can't send them 23 as a reply and see what happens."

"Oh, but we can," said Bing. "Or we will be able to once we've cooled down the Farcaster."

"We just don't have enough liquid nitrogen left to cool the gallium arsenide emitter," said Neville. "Jake, our lab technician, has taken the van and a Dewar to the university to borrow thirty liters or so. He should be back in half an hour."

"What I meant," said Colin with a chuckle, "is send a reply and see how they react—without waiting the, I don't know, the hundreds of years of light travel time."

"Not a problem," said Bing in an amused voice. "Round-trip signal delay is negligible."

"Excuse me?" Colin, wide-eyed, wondered if Bing was kidding.

"I do hope they keep transmitting," said Neville.

"Wait a minute. Wait a minute." Colin felt suddenly thrust into the *Alice in Wonderland* tea party. "What do you mean, the delay is negligible?"

Katya gave Bing a puzzled look.

"Sorry," said Bing. "I didn't have time to brief him yet." He turned to Colin. "Primitive as this place looks," he said, "we're actually doing some cutting-edge physics here."

Colin threw a glance at the printer.

"Our legacy printer?" said Bing. "Yeah, primitive, but there's something comforting about hard copy you can tack to a wall."

"Please," Katya cut in. "Perhaps brief him in your office. I need do transmitter calibration before Jake comes with nitrogen." She smiled at Colin. "I will enjoy to talk later."

Bing stood. "Fair enough." Turning to Colin, he said, "But let's use your office. Mine's a mess. And maybe I can help you move in."

* * * *

"I would have imagined," said Colin as he walked back to his office with Bing, "that having detected an alien intelligence, you'd be much more excited."

"I'm afraid to be excited," said Bing. "We've been burned before. We're pretty sure we've eliminated all mechanisms for pranks now, but..." He shrugged. "Katya almost died from the embarrassment—which is why she's so cautious now. It's lucky we hadn't released the news to the media."

"And that's why you're not doing it now," said Colin. "Yes?"

"That and not wanting the project taken away from us just when we start chatting with our aliens."

"Speaking of chatting," said Colin, "you were kidding, right? When you said the signal delay was negligible."

Bing shook his head. "I wasn't."

For the sake of conversation, Colin slowed his walk toward the stairs. "But Einstein said nothing can exceed the speed of light—not even information."

"Well ... yes and no." Bing gave a grunt of a chuckle. "You have to be very, very careful when making a statement about physics. It's as if the universe takes any little loophole it can find and acts on it."

"But what does this have to do with the speed of light?"

"Well, 'nothing goes faster than light' was first taken to mean matter." Bing spoke in synchrony with his tromping up the flight of stairs. "But the distant galaxies in our expanding universe go, in effect, faster than light. Of course they're going directly away from us so we can't see any light from them." He looked over his shoulder, as if to see if Colin was following him, both literally and figuratively, then went on, "So then people said the idea applied to *information*." They went through the fire door to the fourth floor. "But quantum entanglement," said Bing, scarcely pausing for breath, "implies instantaneous transmission of information of some strange sort. So now one says that no *message* can be transmitted faster than light."

Bing waited as Colin opened the door to his office. "But even here there's wiggle room." Bing followed Colin into the room, took a quick glance around, and then laughed. "And that's not a comment on the clutter in your office."

"You're most kind," said Colin as he cleared off a chair for Bing.

Bing sat. "Anyway," he said with the enthusiasm of a kid, "if the information is stochastic in nature, which

means we're not certain of the message contents, then there's the possibility of superluminal transmission. But the big loophole, the one Project Farcast makes use of, is that if the receiver of the message can't tell *where* the message came from, then it's allowed to have traveled faster than light."

Colin circled around his desk to its chair. “That's a little hard to believe,” he said as he sat.

"It doesn't violate Einstein,” said Bing. “Tachyons and all that."

"Are you saying that tachyons actually exist and you've actually been able to detect and manipulate them?"

"Well, no. Not directly. But Gell-Mann's Law says that if something is not forbidden by physics, it must exist.” Bing laughed. “Gell-Mann proposed it as sort of a joke, but it's predicted a lot of good stuff."

"Stuff?” said Colin.

"Like tachyons. In theory, they interact with, and only with, gravitons. And so...” Bing spread his arms in a pantomimed “ta-da.” “And so using focused, coherent gravitons, we've been able to modulate and demodulate those theoretical tachyons. And so we'll be able to transmit stuff to these aliens—we think."

"You think!"

"It's the best I can do, I'm afraid,” said Bing with a smile.

"But that means you've no idea where these aliens might be?” said Colin.

"Absolutely none. They could be across the galaxy, although probably not—farther is more probable. They could be across the universe or even off in another pocket universe. Especially as the speed of light isn't even a defined concept when going from one pocket universe to another.” He looked quizzically at Colin. “You do know what pocket universes are, don't you?” He didn't wait for an answer, but pointed to the plaque above the window. “What is that?"

"That?” Colin followed Bing's gaze. “That is a representation of Saint Brigit's Cross."

"Doesn't look much like a cross to me."

"Well, it is. Saint Brigit made it out of rushes on short notice.” Colin noticed his new colleague's baffled expression and tried to explain. “We Irish often hang one over a doorway to bring luck.” He lowered his gaze from the cross to the window below it. “Snow,” he said in a tone of disgust.

"Hardly unexpected,” said Bing, “in New York City in January."

Colin glowered at the unwelcome whiteness. “Maybe Saint Brigit will bring the good luck of an early spring."

Bing laughed. “You know,” he said. “Niels Bohr used to tell the story of friends who had a horseshoe over their door for luck. Bohr asked them, ‘You don't genuinely believe in that, do you?’ and they answered. ‘No. Of course not, but we've been told it works whether you believe it or not.’”

Colin forced a thin smile. “My belief,” he said evenly, “might be a bit more spiritual."

Bing looked at first astonished, and then mortified.

"Oh, come,” said Colin in some amusement. “I'm sure you've run into believers before—even among you physicists."

Bing's expression morphed to sheepishness, and then to inquisitiveness. “Look,” he said. “I'm sorry, but I—"

"It's all right.” Colin spoke more abruptly than he'd intended.

"But I wonder,” Bing went on, tentatively. “Do you ... Are you a creationist?"

"You mean do I believe God created the universe? Yes, I do. Absolutely. Without doubt."

"It must be good to believe in something absolutely,” said Bing with an almost wistful expression. “What faith I have, I place in science."

"There are many degrees of creationism,” Colin said almost by rote; he'd had this conversation many times before with scientists. “I believe God's creation of the universe followed the precepts of science. After all, he *created* science."

"But what gives you the certainty?” Bing insisted. “Is it because you believe, as I've heard creationists maintain, that the eye, for example, is too complicated to have happened purely through evolution?"

Colin gave a rough laugh. “The evolution of the eye? Irrelevant! I've no problem with evolution. But just look around you.” He gestured, expansively. “That proves the existence of God."

"What?” There was a challenge in Bing's voice. He gestured as well. “You mean your desk, the bookshelves, the blackboards?” He nodded toward the window. “Or do you mean the Earth, the sky, the flowers, the—"

"To hell with the flowers,” Colin barked out. “I hate flowers. I have allergies. What I mean is the fine structure constant, Planck's constant, the properties of the elementary particles, and most critically, the cosmological constant."

"You know a lot of big physics words,” said Bing in a voice at the boundary between anger and jest, “considering you're a mathematician."

Colin, rising to anger despite himself said, “If the cosmological constant were minutely different from its God-given value, then life and even chemistry would be impossible."

"Ah, the anthropic principle,” said Bing with a sigh. “The idea that the probability of a livable universe developing by chance is essentially zero. The idea that only God could have created such an unlikely universe."

"Yes. Most definitely yes,” said Colin. “There can be no other *logical* solution."

"Look,” said Bing. “You can believe in anything you like—as long as you don't confuse belief with science."

"Damn it, this is science,” Colin growled. “The fine-tuned value of the cosmological constant. There is no possible way it could have happened by chance."

"In fact, there is,” said Bing, clearly suppressing anger.

"Do tell me.” Colin's voice dripped sarcasm. “I'm all ears."

"I'm sorry if I've offended you,” said Bing. “I didn't mean to. Let's discuss this like intelligent beings."

Colin gritted his teeth, then decided he'd not let Bing take the high ground alone in the issue of Christian

charity and forgiveness. “I'm sorry as well,” he said, struggling for a smile. “I'm afraid I have something of a temper. A congenital condition, I'm afraid.” Colin knew he was being disingenuous. He was not about to tell Bing that when his mother was taken from him, his faith had wavered. He'd challenged God to provide a reason to believe in Him and, years later, when he was old enough to understand it, God provided the cosmological constant.

"All right,” said Colin with a sigh. “Let's hear your explanation of how our universe can exist."

"Not my explanation, exactly,” said Bing with no lingering hostility in his voice. “It's Leonard Susskind's formulation of string theory. Susskind says that up until a few years ago, there were only five or six possible Calabi-Yau manifolds: solutions to the string theory equation describing the universe. Now they estimate that there are over ten to the five hundred solutions—a googol to the fifth.” Bing's eyes all but glowed with fervor. “And most of these solutions might actually exist as distinct pocket universes in a vast megaverse. A vast landscape of possible solutions—of universes. Each of these universes could have different values of the physical constants and could even have different numbers of uncompacted dimensions. So, by virtue of there being so many universes, some of them will, by chance, be right for us. And we're in one of those."

"Come on,” said Colin. “Be serious. Different numbers of dimensions? This Susskind is crazy."

"Oh,” said Bing, “you know him then, do you?"

"Do you really consider this physics?” said Colin. “My God! Ten to the five hundreds of universes with differing physical constants—and differing dimensions?"

"Well, all universes have ten dimensions, we think,” said Bing, “or eleven if you accept m-brane theory. But some of them are compacted, folded, too compact to measure. At a scale of ten to the negative thirty three centimeters or thereabouts."

"What the hell is a compacted dimension, really?” said Colin, making no attempt to keep incredulity out of his voice. He was actually glad though, that they were getting away from theology. He was pretty sure Bing felt the same way.

Bing looked at him with a puzzled expression.

"I mean to say that I have only a layman's familiarity with the term. I'm a specialist in information theory and complex analysis, but I'm not a differential geometrist or topologist."

"It's actually easy to visualize,” said Bing. “Imagine this office having a 3-dimensional coordinate system—we'll use polar coordinates.” He touched the tip of his nose. “To specify the coordinates of my nose, you'd need two angles and a radius line from the corner of the room—the origin of the coordinate system—to the tip of my nose.” He twitched his nose like a rabbit. “But string theory says there is no such thing as ‘points’ in space, so that radius has to be thought of not as a line, but as a very thin rod. And with a rod, there's another dimension—the angle around the rod. QED, a 4-dimensional coordinate system. Of course, in a universe of six or seven compacted dimensions, things get a lot more complicated."

Colin stared with amused incredulity. “This sounds like fiction—just another way for some physicists to try to deny the existence of God."

"No,” Bing protested, “just taking the need for God out of physics. You can have God. It's no problem.” He paused. “Although, for reasons of physics, I think any god would be restricted to the particular pocket universe he was in."

"What?" Despite himself, Colin laughed. “No! You're missing the whole idea of God. God is *not* a localized phenomenon."

"Sorry."

Just then, the phone rang. Colin, thankful for the diversion, answered it. When he hung up, he announced, “Jake is back with the nitrogen."

Bing jumped to his feet. “Great! Let's go.” Colin stood as well, but more slowly and with dignity.

"You know,” said Bing, glancing at the door in obvious impatience, “after a couple of years trying, this is the first signal we've ever received. I think you've brought us luck."

"Oh?” Colin couldn't help smiling. “You don't genuinely believe in that, do you?"

"Touche!” Bing chuckled. “Perhaps I do. We physicists tend to be superstitious—ritually superstitious.” He started for the door, but Colin asked him to hold up a moment.

"I've heard it said,” said Colin, solemnly, “that two people can't become true friends until they've had a knock-down, drag-out, shouting argument with each other."

Bing nodded, then stuck out his hand. “Friends?"

Colin clasped it. “Friends!” He paused. “But I still believe."

"No problem,” said Bing. “Belief isn't subject to science or rational thought."

"Descartes was a rationalist,” said Colin. “And he did prove the existence of God—using logic and rationality.” He urged Bing on toward the door. “Simply put, a belief in God is more rational than a belief in science."

"I think that's backwards,” said Bing looking over his shoulder, his serious expression contradicted by a crack in his voice. “You're putting Descartes before the horse.” He darted through the door.

Colin threw a glance to the ceiling. “Give me strength!"

* * * *

Colin, following Bing into the Farcast lab, again heard the hum. Even though it indicated the alien presence was still transmitting, he found the sound disquieting.

He saw Katya fiddling with some equipment next to the display monitor. Then he noticed that the line printer had streamed more paper to the floor. Apparently the prime numbers were still coming through. Neville, standing next to the printer examining the printout, caught Colin's gaze. “Strange, in a way,” said Neville. “The data stream is absolutely constant."

"In what way, strange?” said Colin.

"I would have expected some noise in the data stream,” said Neville, his eyes on the printout, “some suggestion of stochasticity. The fact that it's missing suggests that the source is very distant—implying a total uncertainty of its position."

Bing walked up. “Evidence perhaps that the signal might be from another pocket universe?"

"Quite possibly."

"This is great!" Bing turned to a rack-mounted instrument cluster next to the printer. He peered at a circular dial calibrated in degrees K. The needle stood at 270. "Brr," he said. "It's cold on the roof."

Neville glanced at the dial. "About twenty-six or twenty-seven degrees Fahrenheit. Yes. A bit chilly."

"I thought Jake had gotten the liquid nitrogen," said Bing.

"He's just gone up to the roof with it."

"You really believe in these multiple universes?" said Colin, annoyed for some reason at how matter-of-factly his colleagues discussed the issue.

"I don't *dis*believe in them." Neville gave a tight-lipped smile. "I gather you are a skeptic."

"I've never been called *that* before." Colin nodded. "But pocket universes, higher dimensionality. Yes. I admit having difficulty believing it."

"Well, our aliens could possibly be in a ... in a galaxy, far, far away. Where have I heard that phrase before? But the megaverse is so much larger than our universe, I think the odds of the signal coming from another pocket universe are much greater."

"As I said, I have trouble with the idea."

Neville chuckled. "Then I guess you don't think much of ... oh, I can't remember who did it, but of the calculation that a god cannot exist in only four uncompacted dimensions."

"What?" Colin shot Bing an exasperated glance.

Again, Neville chuckled. "Sorry," he said. "I ran down to my office for some aspirin and couldn't help hearing some of your philosophical disputations through the wall."

"Ah," said Bing, pointing to the temperature dial. "There it goes."

Colin turned his gaze to the dial and watched as the needle vibrated and moved slowly counterclockwise. "How low will it get?"

"Nitrogen boils at 77.2 degrees Kelvin," said Bing.

"It's cooling down now, Katya," Neville called over to the Farcaster control console. "Should be ready in about ten minutes."

"I ready now," Katya called back.

* * * *

Fifteen minutes later, Neville sat gazing at the monitor with his finger on a pushbutton. Colin standing with Bing and Katya behind, noticed that the finger shook.

"This is it," said Neville, softly. "I hope we're..."

"Go for it," said Bing in a voice softer still.

"Udachi!" whispered Katya. "Good luck!"

Silence pervaded the lab—save for the hum. Then Colin heard the chirps and saw the string of primes ending in 19 displayed in white on the monitor.

"Here goes," said Neville. He pushed the button twenty-three times in quick succession. His pulses displayed green on the monitor.

They stared in silence at the monitor. After five seconds or so, Neville said, nervously, "God, I hope I actually sent twenty three."

"You did," said Katya with a smile. "I counted on monitor."

Then, at about the fifteen-second mark, there came a chirp and the monitor displayed:

-.- .-.-. .

"A response!" Neville shouted.

"This is great!" said Bing. "We're communicating!"

"But what it mean, I wonder," said Katya. "Short blips and long blips."

They stared at the screen until, about fifteen seconds later, another chirp came:

.-.-. ..

Fifteen seconds later came nothing. But then after another fifteen seconds, they saw,

.-.-. ...

"What do you make of that?" said Neville.

No one answered.

About forty-five seconds later came the next transmission:

.-.-. ....

"It's got to be a message about time," said Bing after about half a minute. "The short long short long short might mean the LGM will transmit its next message in n time units, and the short short short short is the number of time units."

"Could be," said Neville. "Yes. Delay of n time units. Good."

The next message came a little over one minute later:

.-.-. .....

"Looks like you're right," said Neville. "Each transmission comes with a delay one woof later than the last."

"Yeah." Bing threw a glance to Colin. "Looks like you've added woof to our vocabulary."

"I wonder," said Neville, pointing to the -.- .-.-. . higher up on the screen, "what that initial symbol might mean, the dash dot dash."

No one answered.

The chirps came in at an ever slower pace until, after the delay associated with the .-.-. ..... transmission, they received:

——

"What do you make of that?" said Colin, rhetorically.

After five minutes of no transmissions, Bing said, "Maybe they're waiting for us to respond."

"Quite possibly," said Neville, "but we can only send dots."

"Then I think we should send the next prime."

"Twenty-nine," said Colin.

"Okay." Neville pushed the button twenty-nine times. A few seconds later, an answer came:

-.- ——

After staring at it for a minute or so, Colin said, "My guess would be that dash dot dash means 'acknowledged' or 'correct' and dash dash dash dash means 'over.'"

"I agree," said Neville. He pulled open a drawer and withdrew a lab notebook. "I think we'd better start a dictionary."

"What we send our new friends now?" said Katya.

"I suggest we send nothing," said Bing. "Not until we can send dots and dashes, and at the speed they're sending them to us."

"Agreed." Neville glanced at his watch. "But, damn it, it's after five, and a Friday. I'm sure everyone but us has bailed for the weekend. We'll have to do it ourselves." He furrowed his brow and looked off into the distance. "Bing and I can do the computer programming," he said to no one in particular. Neville stood. "Katya," he said. "Can you whip up something to drive the transmitter from a computer data stream?"

"Da. Of course. I am experimentalist." She glanced over at a lab bench. "Must solder connector and configure microprocessor chip." She headed for the bench. "You must give me data as USB-IV."

"Done," said Neville. "Let's get going."

In spite of the camaraderie of the small group, Colin had no doubt as to who was in charge.

"Neville," said Colin. "I can help with the programming. I'm good at that sort of stuff."

"Terrific," said Neville. He darted to a phone and, with great solemnity, ordered delivery of a couple of pizzas.

"It will take many hours," said Katya. "Will our friends wait for us?"

"Don't think about it," said Neville.

Colin, aware again of the hum, did think about it. In the rush to communicate, he'd almost forgotten the monumental significance of the event. And he wasn't really interested in talking to this alien presence about physics, or even mathematics. He wanted to discuss *important* things with them.

* * * *

Late that evening the Farcast lab lay strewn with empty pizza boxes reflecting bright from the ceiling

fluorescents. The air held a rich amalgam of aromas: pizza, people working hard in close quarters, and the incense-like smell of Katya's rosin-core solder. The soft hum persisted—ubiquitous, constant, uninterrupted by chirps for many hours.

The programming had gone well; now, rather than receiving and displaying dots and dashes, they could display words—that is, after they had deduced them and stored them in the program's dictionary.

"All right," said Neville, "I'll send 'acknowledged' and 'over.' Agreed?"

All agreed and Neville made the transmission.

Almost instantly, came the reply:

acknowledged 5—3 -. 2 over

"Ah," said Neville. "Now we learn arithmetic. Dash dot must be plus, and dash dash represents equals."

"Or maybe," said Colin, "dash dash means minus and dash dot means equals."

Neville stared at the monitor. "Good point," he said after a few seconds. "Let's hope they'll clarify it for us."

"Interesting that the response came so fast," said Bing. "Maybe we're important. Maybe they have a person, creature, whatever, watching our transmissions full time."

"Unless," said Colin, "this is all CAI, Computer Assisted Instruction."

Neville chuckled and then again sent the "acknowledged," "over" pair. Once again, the response was quick.

acknowledged .-.—3 -. 2 -. 1 over

"What's this?" said Neville.

"They're testing us, I think," said Bing. "Dot dash dot might be a question mark."

"Testing? Are they, indeed?" Neville stared at the screen. "Looks like they've done this before. They're telling us that dash dot can't mean equals." He glanced over his shoulder at Colin. "Yes?"

"Yes," said Colin. "So it seems."

Neville entered "acknowledged 6 over."

acknowledged .-.—3 -. 1 over

"Seems you were right, Bing," Neville entered "question mark," "plus," and "equals" into the dictionary definition table. Then he entered "acknowledged 4 over."

acknowledged—= 3 .- 3 over

"I guess you passed the test," said Bing.

Neville nodded. "And now we know minus and zero," he said as he entered the new symbols into the dictionary. "Good progress." He keyed the usual reply.

acknowledged 1 0 = 6 + 7 over

"What's this?" said Neville. “Ah.” He turned to Colin. “You were right,” he said in an astonished voice. “Our Little Green Men have a base thirteen number system."

"Apparently.” Colin was astonished as well, but tried not to show it. *It's good for these physicists to know humility from time to time.* He smiled. “And it does show that, to some degree, the ... the LGM think the way we do."

"Oh,” said Neville, “I wouldn't be so quick to anthropomorphize them."

"The anthropomorphic rather than anthropic principle, maybe,” said Bing, lightly.

Colin shot him a glance before answering Neville. “At any rate, I think it means it's likely we'll be able to comprehend their thought processes."

"Maybe so. Maybe so.” Neville keyed the reply.

acknowledged ? = 8 + 9 over

Neville turned to the others. “More tests on simple arithmetic. Sort of tedious after all the excitement.” He whipped off his glasses and rubbed his forehead. “We can probably be more productive in shifts. Why don't you guys go out for some real food? I'll carry on here until you get back. Then, I'll grab a late dinner."

Bing, Colin, and Katya agreed and headed for the door.

"Oh,” Neville called after. “And bring back some tea for me, if you would. English Breakfast, milk, no sugar."

* * * *

In a booth in Tom's Restaurant, an all-night eatery just around the corner from the institute, Colin, Bing, and Katya waited for their food.

"Without set of common referents,” said Katya, “I not see how we really can communicate with aliens."

"I assume that if our friends really exist,” said Colin, “they've probably done this before. We'll just have to let them take the lead."

"Unless,” said Katya, “technological civilizations very rare and we their first."

Colin nodded. “The blind leading the blind,” he said, thoughtfully. “I hope not."

Bing sighed. “And if they're in another universe, we won't even have a common language of particle properties to help us. I can't see how we could hope to learn any physics from them in that case.” He turned to Colin. “It must be even worse for mathematics, a human-created rather than nature-created discipline."

"To the contrary,” said Colin. “Not that I believe in these multiple universes, but—"

"We not *believe*, either,” said Katya. “It is hypothesis. Theory."

"Fine,” said Colin. “But, even in your hypothetical other universe, I'd expect mathematics to be more—if I may modify a superlative—more universal than physics.” He was conscious of raising his head—angling his nose to an arrogant height. He self-consciously lowered it again. “I look forward to discovering their mathematics—wherever *they* are. And I think we could find something of a shared language based on number."

"To what end?" said Bing.

"Well, for example, I would like to know if they've managed to prove Goldbach's Conjecture."

"I more am interested in real world," said Katya. "Physics."

Bing tapped the top of his water glass with a spoon, exciting standing waves on the surface of the water. "Yes," he said with a sigh, and staring morosely at the waves. "There is so much we could probably learn from them—if only we had the language."

Colin nodded. "Most interesting to me though, would be their philosophy." Bing smiled, softly. "Belief in God?"

"Why not?" said Colin, defensively. "It's an important question."

"I not believe existence of God is important question," said Katya.

"Me neither," said Bing.

"What?" Colin swiveled to glare at Bing. The man was like a child. Most physicists were like children. "How can you say that? It's the *most* important question."

"But not to you, surely," said Bing. "You already believe you know the answer."

The comment hit home. Colin never could expunge a tiny twinge of doubt. When, as a boy, his mother had been taken from him, he couldn't accept that it was the will of God. God couldn't be that mean. He remembered the hospital room and the hum of the heart monitor—and how he felt when the hum stopped. The overwhelming loss. The silence. He felt himself begin to sweat.

"More important question is," said Katya, looking on him with an expression of compassion, "where is food?" She smiled genially—Colin realized Katya was trying to lighten the mood, to ease the pain she'd somehow detected—then Katya waved toward an approaching waiter. "Easy answer. Here comes food now."

Colin smiled. *This Katya has a true soul.*

"It's not an important question to me," said Bing as the waiter placed a platter of fries and a cheeseburger in front of him. "Because I can't believe in a god so small-minded that he'd send someone to hell just because the guy didn't believe in him."

The waiter gave him a funny look and hurriedly moved more plates to the table.

Bing picked up a French fry and pointed at Colin with it. "And anyway, isn't it more honorable to do good things in the world because it's the right thing to do, rather than to do them because if you don't you'd wind up as toast?"

"That's not the way faith works," Colin said in a louder voice than he'd intended. "God is ... the compass for the world."

The waiter took her tray and hurried away.

"Dear God, if there is a god," said Katya, her face and voice showing gentle amusement, "thank you for food"—she picked up a fork—"and thank you for restaurant."

Colin forced a smile, but inwardly, he fumed—convinced that Bing's atheism was easy, not struggled

with, a physicist's limited view of the universe. Colin couldn't help feeling superior; *his* belief came with constant effort, constant questioning.

Obliquely, Colin glanced at his dining companions bantering with each other like kids. He gestured at the two of them with a fork. “You guys are more alien to me,” he said, “than even our LGM."

Katya raised her eyebrows and turned to Bing. “I think I am insulted,” she said with an expression of mock hurt.

"No, Katya,” said Bing, lightly. “I'm sure it was meant as a compliment. That's the way *I* take it, anyway."

Colin gave in; he couldn't help laughing. “Hopeless!” he muttered under his breath.

* * * *

Neville leaned back and took a sip of his English Breakfast tea through the little hole of the paper-cup cover. “They've taught me their multiplication and division signs and also decimals,” he said in a tired voice. “Or should I call them thirteenimals, perhaps?” He took a second sip. “So far, very conventional arithmetic. I'd expected something more ... more alien."

"Where are we now?” said Bing.

Neville nodded toward the monitor. “See for yourself."

The last line of text on the screen showed:

delay woof 100

"That 100 is 169 in decimal,” said Neville, “a delay of almost forty-five minutes."

"I wonder why?” said Bing.

"We'll know soon enough.” Neville glanced at the time display at the lower right of the monitor. “In about ten minutes."

"Maybe their sense of time is different,” said Katya. “Maybe they need more time than we to think."

"Interesting idea,” said Neville.

Ten minutes later, the hum was interrupted by a burst of chirps. The monitor showed:

* * * *

* * * *

"Whoa!” said Bing. “What's this?"

"I think,” said Katya, her eyes on the screen, “maybe they send raster."

"Yes.” Neville slapped the desktop. “You're right. Acknowledged here should be a carriage return.” He turned to Bing. “Can you get this back from disk and modify its output—sending it to the screen as well as the printer?"

"Easy.” While Neville stood and stretched, Bing replaced him at the keyboard.

After a few minutes, Bing blew out a breath. “This should do it,” he said, hitting the Enter key. The screen cleared and then displayed:

* * * *

* * * *

over

Bing stood and stepped to the side.

"Gentleman," said Neville, sitting again at the console. "To the resolution limit of the data, I declare this a circle."

"Thirty-nine by thirty-nine pixels," said Colin, having counted them.

Neville glanced around. "All right then," he said. "Let's see what else they have for us." He entered "acknowledged" and "over." The monitor showed another jumble of dots and dashes with carriage returns, and the line printer spewed paper at a furious rate, littering the floor with an ever-growing pyramid of paper.

"Perhaps a finer raster." Neville turned to Bing. "Yes?"

"Yes." He leaned in over the keyboard. "I'll switch the display from text to graphics mode."

As Bing keyed the changes, Neville said, "May as well turn off the printer also. No need to waste any more trees."

Bing nodded. After a minute or so, he said, "Done! I'll redisplay from disk." He pushed a button with a flourish and the monitor displayed another circle, this time at a high resolution. "Over" appeared at the bottom of the screen. This circle looked perfect. Bing again relinquished the chair to Neville.

"I always think there is something mystical about circle," said Katya.

Colin nodded; he'd felt that way as well. "My guess," he said, peering at the perfection on the monitor, "is that the raster is 2197 by 2197. 1000 by 1000 base 13."

"Could be," said Bing, staring at the screen. "Close to that, at any rate."

"Fine, then," said Neville. "Next!" He keyed "acknowledged" and "over."

A flurry of raster images scrolled up the screen faster than the eye could follow. They seemed to be a sequence of circles: smaller to larger and then to smaller again, terminating as usual with "over."

Once more, Bing replaced Neville at the keyboard. He called up the set of images from disk and displayed them one by one—giving something of the effect of a circle coming close and then receding.

"Any thoughts?" said Neville.

"Da," said Katya, after a few seconds. "It look like it is maybe representation of sphere."

"I concur." Neville looked to Bing and Colin. "Do you agree?"

"Yes."

"Definitely."

"Right," said Neville. He entered "CR over."

Another rush of circle-like raster images danced up the monitor screen. They kept coming and Colin wondered if they'd ever stop. After almost a minute of dizzying scrolling, Bing, by unspoken, tacit agreement, replaced Neville once more at the keyboard.

When the scrolling finally stopped, Colin felt dizzy from having watched it. He sat. Neville and Katya did as well.

"This," said Bing, with emphasis, "might take a little longer."

* * * *

More than an hour later, very late into the night, Bing sat up straight from the keyboard and stretched. "It's a raster of rasters of rasters," he said in a weary voice. "A sequence of spheres." He splayed his fingers over the keyboard before resting them on the home-keys. "Here, I'll show you—sphere by sphere."

After the demonstration, Neville said, "A sequence of spheres small to large and then to small again. I wonder what it means."

"Maybe is something about time," said Katya. "A movie. Sphere come close then go away."

"But why?" said Neville. "What could they be trying to—"

Bing gasped.

Neville turned to him. "What?"

"That's not a time evolution," said Bing at a whisper. "I'm pretty sure it's—"

Katya gasped as well. "You are right, Bing," she said almost as softly. "That is only answer."

Neville looked at the monitor where only a dot showed in the middle of the screen and a question mark and "over" at the bottom. "My God!" he said in a loud whisper. "Intellectually, I knew this was possible, but I didn't really believe it."

"What?" said Colin, his speaking voice sounding loud in the lab, which, save for the pervasive hum, was otherwise silent. "What's going on?"

"It's not a time evolution," Bing repeated. "It's a representation of a 4-dimensional sphere."

Instantly, Colin saw the truth in the statement—and he knew he would have deduced it himself had it not been unwelcome news. It meant they were communicating with beings from a world of four space dimensions—from another universe. And that meant the megaverse was real and not just some theory of a deranged string theorist. That in turn meant the anthropic argument was moot. *We are not necessarily in Leibniz's best of all possible worlds—not even the best of all possible universes.*

Stunned, he became aware of the sound of speech.

"Four space and one time dimension—at the minimum," said Bing in a voice filled with awe. "From another pocket universe. Susskind was right." He shook his head slowly, as if trying to clear it of disbelief. "That certainly explains the clean, non-stochastic data." He stood. Everyone stood. To Colin, the standing seemed almost an act of reverence.

Neville pointed to the question mark at the bottom of the screen. "It's our turn again." He rubbed his chin. "They're asking for our dimensionality, I presume." He looked from face to face. "Agreed?"

No one had any other explanation.

"I can pull up their 3-sphere off the disk and send it back to them," said Bing. "It'll just take a minute."

"Excellent!" said Neville.

Bing sat and leaned in over his keyboard, engaging in a flurry of programming. His energy contrasted with the overall air of happy exhaustion. A minute or so later, he looked up over his shoulder at Neville. "Just give the word."

"The word!" said Neville with a smile.

With an exaggerated motion, Bing hit "enter."

Again, a sequence of rasterized circles scrolled off the screen—this time in green, a transmitted rather than received data stream—ending with "over."

"Their turn," said Bing.

Neville nodded.

In silence, the four stared at the monitor screen—and waited.

For a long couple of minutes, they waited. Then the screen scrolled up a line and displayed at the bottom:

delay woof 200

"Oh, no!" Bing cried out. "Now an hour and a half delay. Why the hell do they need to take so long?"

"I do not like to wait either." Katya rubbed her eyes and suppressed a yawn.

"Once more," said Neville, his eyes locked on the message, "it looks like maybe we've given them something to think on."

"I could really use a nap," said Bing. "I wish I'd kept my sleeping bag in my office." Colin checked his watch. "It's nearly dawn."

"I'm wiped!" Bing said with a long breath. "Adrenaline has its limits."

"Now that you've mentioned it"—Neville also suppressed the contagious yawn—"I'm not exactly ready to run a marathon either." He brightened. "Why don't we go down to Tom's for an early breakfast? We have the time. We have a lot of time."

Bing and Katya murmured their approval of the idea and started toward the door, but Colin said, "I think, if you don't object, I'll stay here and mind the store."

Bing looked at him for a long moment. "How do you like your coffee—or do you prefer tea?"

Colin chuckled. "Coffee, please. Black. And thanks."

Colin walked the others to the door then returned to the computer console. He knew he needed food as much as the others, but he needed time alone more—time to acclimate himself to the idea of the megaverse and to try to shoehorn the concept into his belief structure. And most of all, he needed time to test the structural strength of his faith now that one of its supports, the anthropic principle, had crumbled away.

He turned his eyes to the monitor, to the message:

delay woof 200

Staring at it, he gradually accepted the idea that he, Bing, Katya, and Neville had actually made contact with a people from a 4-1 space-time. These people must be superior, great, large; their 4-space could hold an infinity of his 3-space universes. These LGM were something bigger than himself. He yearned to talk to them—to ask them important questions.

He grew aware then, of the hum and listened to it with a feeling akin to veneration. The hum: a mantra, a hymn sung by a universe. He closed his eyes.

He started at the sounds of his colleagues returning. His first thought was that they'd forgotten something, but then he accepted that he'd used the time in timeless meditation. But it had not been *sufficient* meditation; he hadn't found answers to any of the big questions. He stared at the monitor—a portal to another universe, a world of creatures much closer than he to the infinite. *Over time, they will point me toward those answers.*

Colin stood from the console as the others approached. Breakfast had clearly worked; his colleagues seemed re-energized and exhilarated.

"Back and with minutes to spare," said Bing handing forward a large coffee. Colin received it with thanks.

"Anything exciting happen while we were away?" said Neville.

"No."

"In ... in three hundred seconds something will happen," said Katya. "Exciting something. We make history!"

The four stared in silence at the monitor until, some three minutes later, the screen scrolled up one line and displayed the message:

delay woof 1 / 0

"What?" said Bing. "What the hell does that mean?"

"I think this is not good," said Katya.

Suddenly the lab became deathly still. It took a moment for Colin to realize that the hum had stopped. Silence. He shivered. *Again, the silence.*

"I don't understand," said Bing, clearly crestfallen.

"Delay of one over zero," said Neville little above a whisper. "Infinity. I can't believe it. I can't believe they don't want to talk to us."

"I think it means our three dimension world can teach them nothing," said Katya. She raised a finger then pointed it at the monitor. "But," she said, smiling, "We know you are out there now. We not alone. And if talk to us mean so little, there must be many many out there."

"I guess it shouldn't have been a surprise, really," said Neville, softly as if to himself. "What could *we* learn from *two*-dimensional beings? To them, we'd be gods."

"What do we do now?" said Bing.

"We keep searching." Neville sighed. "As long as we have funding, we keep searching."

"Gods," Colin whispered.

Bing turned to him, heavy concern showing on his face. "Colin. What's wrong?"

"Nothing," Colin managed. "*Nihil*. Nothing." Afraid that his visage would contradict him, he turned away. "I need to take a walk."

* * * *

Walking eastward in the predawn, Colin bore the January cold like a penance. A patina of unblemished snow lay on the silent, residential street. He remembered a quiet snow from the past; as a child, he'd prayed for a cure for his mother but his prayers were answered with silence—as from a hum that went dead.

Colin felt a snowflake hit the corner of his eye. It felt like a cold tear. He felt both eyes grow moist. Impelled by snowflakes, he cried for his lost compass, his dead mother—and his god.

As he walked, the sky grew ever brighter until, as the upper edge of the sun's disk breached the horizon, he was engulfed in a fiery brightness. Emanating from the sun, light poured through the narrow street he trod, bouncing from the white snow, reflecting from the apartment buildings, coruscating from the windows. Stunned at the landscape bleached white by the searing brilliance, he stood in silent awe.

He had read about this: Manhattanhenge—the day when the sunrise aligns with the cavern-like streets of the city. And as the sun rose higher, so did his spirits. As his intellect reemerged from the morass of emotions and memory, he suddenly stopped feeling sorry for himself. Neville was right. We keep searching.

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Novellette: **SAND AND IRON** by Michael F. Flynn

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Illustration by John Allemand

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Sometimes there are higher priorities than understanding....

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It began on an unnamed planet around an unnamed sun, in an unnamed region distant from the Rift. That was a bad sign to begin with, for what can come from nameless places but something unspeakable? It was a bad place to break down, a bad place to be, far off the shipping lanes, on a little-used byway of Electric Avenue known as Spider Alley. But it was just the sort of place where a baling-wired, skin-toothed tramp freighter might find itself. When there is little to lose, there is much to gain, and the secret shortcuts of the Periphery have a way of finding profit.

And this at least can be said about such forgotten corners: it is in such places that the flotsam and the jetsam of the galaxy wash up. It is there that treasures and horrors are hidden away, for safekeeping—or for safeguarding.

* * * *

One such bit of flotsam was the free trader *New Angeles*, out of Ugly Man and bound for the Jenjen Cluster with a cargo of drugs and exotic foodstuffs that the folk there do not make for themselves. The jetsam had been there much longer. How much longer, no man could say.

There were contractual dates, penalty clauses, maintenance budgets. It was the sacrifice of the latter on the altar of the former that had brought the ship to this place. Something had blown—it doesn't matter what—and *New Angeles* had drifted into a side-channel and into the subluminal mud.

...and alfvens aren't really designed to entangle at Newtonian speeds. One hard yank on the fabric of space to slide off the ramp of Electric Avenue without becoming a aerenkov burst, a few more tugs to get below the system's escape velocity. Past that, engines tend to smoke and give off sparks. Here on the edge of nowhere there was no Space Traffic Control, no magbeam cushions to slow them, and the unwonted deceleration strained *New Angeles* to the limit. The twin alfvens screamed like tormented souls until the ship finally entered the calm of a Newtonian orbit.

By the grace of physics, every strand of Electric Avenue is tied to a sun, but there is no guarantee of planets to go with it, or at least of useful ones. As the ship shed velocity circling the star, the crew imaged the system from various points, searching anxiously for parallax, until ... There! A planet! Hard acceleration to match orbits; and a long, slow crawl across Newtonian space, during which each crewman could blame another for everything that had gone wrong.

The planet was the sort called a marsbody: a small world of broad, gritty plains and low, tired hills that barely interrupted the eternal westerlies. The winds blew at gale force but, the air being thin, the storms were but the ghosts of rage. Orbiting the planet, the ship's instruments detected sand and iron, and with silicon and heavy metals, a man could make most things needful. So a downside team was assembled, equipped with backhoe and molecular sieve and sent below in the ship's jolly-boat while the engineers and deck officers waited above in various states of patience.

In one state was the chief engineer, Nagaraj Hogan, who whiled his time in certain recreations based on the laws of probability—to the benefit of his assistant, who had found those laws highly malleable.

In the other state fidgeted Captain Amos January, who, like a sort of anti-Canute, spent his time not sweeping back the tide, but urging it forward. He was the orifice through which all the pressures of budget and schedule were concentrated and directed at the crew—though with little more consequence than the spiritless wind on the planet below. January owned that most treacherous of countenances, for he was a hard man with a soft man's face. Who could take seriously anything he said? The lips were too full, the cheeks too round, the laugh lines too prominent. They belied the harshness with which he often spoke.

There comes a time when fatalism conquers logic and conquers even common sense. The crew of *New Angeles* had reached that point, and perhaps had reached it long before. They *ought* to have worked with more passion on the repairs, but why hustle to meet the next disaster?

Because the ship would miss the delivery date, January fumed. Micmac Anne, his Number One, thought that if the folk in the Jenjen had sent all the way to Ugly Man for the drugs, they would hardly return them because they were a trifle stale.

January turned to her from the ship's viewer, his cherub's face flushed with anger. “The groundside party has shifted the dig!"

Anne verified the mining party's location. “Two hundred double paces to the west-southwest,” she acknowledged. She did not see that it much mattered, but the captain was given to fits of precision. “I'm sure they had a good rea—"

"They're digging in the wrong place! The mass densitometer showed the ore closest to the surface *here*!” His finger stabbed the map projection on the viewer. “Greatest benefit, least work."

"The least work,” she reminded him, “was to cannibalize part of the ship. That's what Hogan recommended."

"Cannibalize the ship! Oh, that's a wonderful idea!” January cried, and for an instant Anne almost believed he meant it, so happy was his countenance. “And after a few rounds of that,” he continued, “there'd be no ship left to repair."

Anne thought it might also mean less ship to break down, but she forbore expressing that thought.

"Someone should put a bug up their asses,” January said. “Hogan can't spend his whole life playing cards."

Anne sighed and turned away. “All right ... I'll just—” But January stopped her.

"No, you stay up here, keep on top of things. I'll have Slugger take me planetside in the gig."

His Number One, who had been turning toward the radio and not toward the boat davits, hesitated. Amos had decided that the Personal Touch was needed. This was a mistake, in her opinion. On the radio, his voice, pure and hard, might have transmitted some of his urgency. Delivered in person, it never would.

* * * *

Slugger O'Toole grounded the gig near the jolly-boat, and January was out the hatch before the sand beneath had even cooled. It was the sort of planet where skinsuits will do. The air was thin and cold, but could be gathered into breathable quantities by the suit's intelligence. The breather made talking difficult, and gave the voice a squeaky texture—not a good thing, under the circumstances.

Striding across the gritty plain, he saw that the work party had moved the backhoe and sieve over into

the lee of the low ridge that bordered the sea of sand. Further, having seen the gig land, they had stopped to watch the captain's approach. This was one more straw on January's personal dromedary. Did they think they could dally here forever?

The backhoe had been digging in a drift just below a cleft in the face of the ridge. Atop it, half-turned in her seat, Maggie Barnes waited. The engine hummed in idle. Every now and then, its insolators twitched a little to follow the world's sun. Maggie—she liked to be called Maggie B.—was a short, thick woman with unwomanly strength in her shoulders. Her skinsuit was a sky-blue, but of a different sky on a far-off and almost forgotten world. Here, the sky was so pale it was almost white.

Tirasi, the system tech, tall and thin and with the look of a cadaver awaiting its tag, stood by the smelter with his arms crossed. The molecular sieve had already processed the needed silicon—mining sand had been no problem—and awaited now only some heavier metals. Occasionally, he tweaked a knob, as if fearful that the settings would otherwise all run amok. The deckhand Mgurk waited with a shovel planted in the sand, hands draped over the handle-tip, and his chin resting upon the hands. His dull-red skinsuit nearly matched the oxide sands, and he wore his hood pulled so tight that the goggles and breather mask were all that could be seen.

The sight of so much work not being done further aggravated January, who greeted them by squeaking, “You were supposed to be digging over there!"—indicating the vast open and featureless expanse of the desert.

Maggie B. had not known why the captain had dropped planetside—Anne had stayed out of it, and *New Angeles* was now below the horizon—and a variety of possible reasons had suggested themselves, chief among them that Hogan had aroused himself and found another source of metal and, therefore, no further work was needed by the surface party. To be told she was digging *in the wrong place* was so unexpected that she laughed aloud.

It must be a joke, right?

No, it wasn't. So she threw up her first line of defense. “Over there, it itches!"

Itches! Yes. The constant winds carried fines of sand and, while the air was too thin to carry much force, the continual spray on the skinsuit tickled.

"Tickled,” said January, suspecting some trick.

"Over here, we're in the cliff's wind-shadow."

"But the ore body is buried deeper here!"

Now, by this time, it would have meant more work and more time to return to the original site and start over. The hole was by now already half-dug. Maggie snapped at him. “Makes no damned difference where I dig!"

Now, that may have been the last moment of sanity in the universe, because it should have occurred to all of them that if it made no difference, why had she moved in the first place? In fact, it did make a difference, and a damned one at that. But that came later. In truth, she had simply felt an urge to move the machine.

"You're wasting my time, captain,” she snapped and, as if to prove this point, she put the backhoe into gear.

One more scoop and the claw tips of the bucket made a peculiar, almost musical screech that set their

teeth on edge. Even Mgurk roused himself, lifted his chin, and peered into the pit.

Something dull and metallic lay beneath the sand.

"The ore body," said Maggie in quiet satisfaction, and gave January a triumphant look.

"Must be a meteorite," said Tirasi. But January knew immediately that was not right. This close to the surface? With no sign of an impact crater?

"Who cares?" Maggie said, and drew the backhoe for another scoop. Again, that singing note called out. Mgurk cocked his head as if listening.

"It's smooth," said January when more of the body had been revealed.

"It's bloody *machined*," said Tirasi, who had abandoned the smelter to kneel at the pit's edge. Maggie Barnes hopped off the backhoe and joined him.

"Nonsense," January said. "Rivers will smooth a stone the same way."

Tirasi swung his arm wide. "See any rivers nearby?" he demanded. "Water ain't flowed here in millions of years. Nah, this here's a made thing." He pulled pliers from his tool belt and tapped the object. It rang, dull and hollow, and the echoes went on longer than they should have.

January squeaked, "Johnny! Bring that shovel over and clear this out a bit. Johnny? Johnny!" He looked up, but Mgurk was nowhere in sight. "Where has that lazy lout gone now?"

It was a fair question, given that for many leagues in any direction lay nothing but gritty, open desert. Johnny had an aversion to hard labor and showed wonderful imagination in its avoidance; but where in all those miles could he have hidden himself? January used the all-hands channel on his radio. "Johnny, get your lazy carcass over here and help us dig!"

He heard static on the bounceback—a burst of noise that might have had a voice in the center of it. It seemed on the very edge of forming words.

O'Toole answered from the gig. The sudden excitement of the group at the site had attracted his attention. "Johnny's after wandering off t' the cleft," he told them. "What's going on?"

Maggie Barnes told him. "We found us a prehuman artifact!"

* * * *

What else could it be, a machined object, buried under the sand on a forgotten world? The works of man are wondrously diverse and widely spread, but where you find them you generally find men as well; and none had ever ventured here. "Let's not count chickens," January chided them. But for once his Santa Claus countenance did not lie. There might be riches here, and he knew it as well as they did. Yet caution led him to say, "Not every prehuman artifact—"

But he was talking to the wind. O'Toole was already clambering down the ladder from the gig, and Tirasi had leapt into the pit to brush sand away from the buried object. "Big," the system tech muttered. "Big."

Too big, January noted of the portion thus far revealed. The boats would never lift it, not all of them combined. "Not every prehuman artifact," January tried again, "has made money for its finders. House of Chan had the Ourobouros Circuit for most of a lifetime and could never make it do anything. After Chan Mirslaf died, they sold it as a curio for half what they spent experimenting on it."

"Hey," said Tirasi. "This thing's translucent!"

"And the Cliffside Montage on Alabaster sits in the middle of a plain, visible for leagues, so the Planetary Council can't even fence it off and charge an admission fee." January sighed and crossed his arms.

"Well, cap'n," said Maggie B., proving someone had been listening, "we won't know till we know what it is, will we?"

O'Toole arrived from the gig and paced round the circumference of the pit, whistling and exclaiming. A big, blocky, thick-fingered man, he always moved with unexpected grace and dexterity, even when—or especially when—he had hoisted a few pots of beer.

"So let's not get our hopes up before we know what we have," January said. "How many prehuman discoveries have been nothing more than empty chambers or the shells of buildings?"

"There was an entire city on Megranome," Maggie recalled. "And, near as we could figger, it was formed as a single structure, with no seams or joints. We used to go over there when I was a kid and play in the ruins, pertending the prehumans was still there, hidin' 'round the next corner." She laughed, then turned suddenly, as if startled, and her gaze swept the open desert. "Wonder where they all went to. The prehumans, I mean."

January shrugged. "Who cares? No matter."

"We usta call 'em 'the folk of sand and iron.' Nobody knew why. Makes our reason fer stoppin' here a little weird, don't ya think?"

"Stuff and nonsense," said January. "They were gone long before humans went to space."

O'Toole had finished his circuit of the pit and had returned to where they stood. "Don't ye believe it, cap'n," he said. "They tell stories. On Die-Bold, on Friesing's World, 'specially on Old 'Saken. Hell, half the Old Planets have stories o' th' prehumans."

Maggie B. nodded vigorously. "Some of them old legends are so old they been forgot."

January snorted. "Myths, you mean. Legends, fables. I've heard them. If any two of them describe the same creatures—if any two stories even fit together logically—they'd be the first two. We don't know when the prehumans were around, or for how long. We don't know if they ruled this quarter of the galaxy or only roamed through it. There's probably a tall tale to cover every possibility. People can't tolerate the inexplicable. So they tell a story or sing a song. All we've ever found were their artifacts. No human ever saw them in life."

"They mayn't been even life as we know it," said Maggie B. "Mebbe, they was fluorine life or silicon life or somethin' we ain't never figgered on."

"Silicon, eh?" said O'Toole. "Now, I'm not after hearin' that one. Hey, maybe they nivver disappeared. Maybe, they just crumbled into sand and..." He waved his arm over the surrounding desert, "...and maybe that's all what's left o' th' fookin' lot uv 'em." The quickening wind stirred the sand, lifting and tumbling granules as if they were dancing.

"And maybe," said Tirasi from the pit, "you can jump down here, Slug, and help me dig the bloody thing out!"

Tirasi always managed to slip under O'Toole's skin, not least of all by abbreviating the man's nickname. Physically opposite, they were much alike in spirit, and so repelled each other, as a man spying himself in

a fun-house mirror might step backward in alarm. From time to time, they debated whether “Slugger” or “Fighting Bill” was the weightier epithet, with the question still undetermined. Slugger was a bull; Fighting Bill a terrier. The pilot leapt into the pit with the system tech, and they both dug and brushed the sand off the artifact using their hands.

January shook his head. “And Mgurk has the shovel, and he's not about. Maggie, you dig some more around that thing. See how big it is and—maybe—you'll find that ore body while you're at it.” This last was intended sarcastically, to remind them why they were beached on this forsaken world in the first place. The artifact wasn't going anywhere and, if they didn't complete the repairs, *New Angeles* wasn't, either.

Maggie moved the backhoe a little farther off and began to probe for the edge of the artifact. Her digger came down too hard into the sand and struck a still-buried portion of it. It rang like a great bass bell, a little muffled, but loud enough that the two men in the pit clapped their hands to their ears. January, who had been searching for some sign of Mgurk's dull red skinsuit, noticed the sand vibrate into ridges and waves half a league away.

About where the mass detector had located the “ore-body's” closest approach to the surface.

January had a sudden vision of the artifact as a buried city, like the one aboveground on Maggie's home world, all of one piece, honeycombing the entire planet, and that Tirasi and O'Toole would grub about it forever, brushing the sand from it, inch by inch.

"We ought to go look for Johnny,” he began uneasily, and then stopped with his words in his throat, for three dull clangs reverberated from within the buried shell. Tirasi and O'Toole started and scrambled back from it. Maggie made the sign of the wheel across her body and muttered, “The Bood preserve us!” After a few moments, the clangs were repeated. “Ye turned it on somehow,” O'Toole told the system tech.

"Or you did,” Tirasi answered. He began to brush furiously at the sand that covered the thing, clearing a space. Then, shading his eyes with his hands, he pressed his face to the translucent surface. “I can see inside, a little. There are shapes, shadows. Irregular, ugly. Can't quite make them ... Aah!” He scrambled back in alarm. “One of ‘em moved! It's them! This is where they all went to! Holy Alfven help me!” He began to clamber out of the pit, but O'Toole grabbed his arm. “You were right about the ‘ugly,’” he said, pointing.

And there, with his face pressed to the inner surface of the shell, was Johnny Mgurk and the shovel with which he had been beating the walls.

* * * *

The entrance was in the cleft, of course, obscured by the shadows in a fault in the southern face—a darker opening in the darkness.

New Angeles had come back over the horizon by then, and January informed Micmac Anne what had happened, cautioning her not to tell Hogan and Malone lest, transfixed by visions of easy wealth, they abandon ship and drop planetside in the lighter.

January thought at least one of his crew should stand guard outside the entrance. In case. In case of what, he couldn't say, which did nothing to win their assent. The others thought he wanted to cut them out of a share in the treasure, which by now had in their minds achieved Midas-like proportions. All was decided when Mgurk appeared in the entry and said, in his execrable Terran argot, “Hey, alla come-come, you. Jildy, sahbs. Dekker alla cargo, here. We rich, us.” And so they all hurried after him.

January was the last to enter, and the clambering footsteps of the others had faded before he reached the point where the cave became a tunnel with a flattened footpath. He passed an enormous white stripe on the wall, three man-lengths high and a double-arm's-length wide. January had barely registered the peculiar dimensions when it struck him that it was the edge of a sliding door nestled into a slot in the rock. Yes, there was the matching slot on the other side of the passage. Pulled out, the door would seal off the entrance. January was impressed. That was one thick door.

And made of marshmallow.

No, not marshmallow, he decided, pressing it experimentally, but some highly resilient material. He pushed, it yielded. He released, and it sprang back. Elastic deformation. He pushed as hard as he could, and his arm sank into the door up to his elbow. It would submit to a chisel or a drill bit in exactly the same way, he decided. A jiu-jitsu material, strong because it yielded.

As soon as he relaxed, the material snapped back, ejecting his arm with all the stored energy with which he had pushed and nearly dislocating his shoulder. Jiu-jitsu material, indeed, he thought, rubbing his shoulder. Best *not* try chisels, drills, lasers, or explosives. It would absorb all the energy, and then give it back. His curiosity ran high; but not that high.

Whatever had required such a barrier must be of inestimable value. He rubbed his hands in anticipation of the wealth waiting below.

Yet, one thing troubled his mind. A door so thick had been meant to bar entry against the most determined explorer. He could not imagine that little Johnny Mgurk had simply rolled it aside. Perhaps the lock had failed over the eons and the system had been designed to fail-open.

But why design a "fail *open*" mode into an impassable barrier?

As he continued deeper inside, the rough rock walls smoothed out into an off-white ceramic. Faint veins of pale yellow ran through it, though whether decorative or functional, he couldn't say. Here artistically sinuous, there fiercely rectangular, they could be either, or both. But if decorative, he thought, prehuman eyes had been attuned to finer color contrasts than humans.

Or they'd had lousy interior decorators.

The passage wound down a spiral ramp and some freak of geometry cut off the sounds of the crew's voices, leaving a radio silence within which a persistent static hiss rose and fell irregularly, like a snake trying to speak. The dry air, the constant, sandy wind ... The planet must be an enormous ball of static electricity.

He came at last to the chamber that the backhoe had uncovered. Through the translucent ceiling drifted the light of the pale sun. It was an oval room of gray sea-green accented with undulating curves of slightly darker shade. The walls seemed to swirl about in unending stillness. Had the effect been meant for beauty, January wondered, or just to make people dizzy? But if prehuman technology was unknowable, their aesthetics were unfathomable.

Arranged irregularly about the room, eleven pedestals emerged seamlessly from the floor. All but one were faerie-thin, and all but four were empty. In a separate chamber, entered as through the languid petals of a fleshy white lotus, a twelfth pedestal, also empty, swept in a graceful exponential arc from the floor. Amidst this peculiar corn-field his crew darted with great exclamation.

At the farther end of the room, but offset from the tip of the oval, another white, spongy door sat half-open. Through this opening, January could make out a long, dim corridor receding into the

blackness.

"You try lifting the bleeding thing, you think you're so strong!" That challenge, issued to O'Toole by Bill Tirasi, drew January's attention. His four crewmen stood before the first pedestal, upon which a single, jet-black egg the size of a clenched fist balanced precariously.

It seemed made of glass, but glass so deep that light could not make it to the center, for it appeared much thicker than its size would warrant. Myriad pinpricks gleamed within. Perhaps light had tried to penetrate the blackness, had given up, and scattered into its component photons.

O'Toole was not given to such fancies. Smirking over Tirasi's failure, he laid hold of it and lifted. His muscles bulged, his eyes stood out. But it did not move. He grunted, gripped it in both hands and still it would not budge.

Yet the balance was so delicate, it ought at least to roll.

It did not. Pushing and pulling had no more effect than lifting. Tirasi scoffed. "Heavier'n it looks, eh, mate?" O'Toole's glower deepened. "Sure, it must be bolted to the fookin' stand."

"I'd bet your whole year's share of profits," Terasi said, "that thing's made of neutronium. Compressed matter..." He sighed. "Imagine the profit potential in *that!* A bloke could get stinking rich once he learned the secret."

"Then he'd have to spend his life here," January said, and the others started, for they hadn't seen him enter. "There's not a ship on the Periphery that could lift a neutronium egg."

"That egg, big-big," said Mgurk.

"Nah," O'Toole mocked him. "'That egg, small-small.'"

"That egg, full of galaxies," Mgurk answered. "Yes, yes."

"Oh, right," said O'Toole. But Tirasi scowled and, because he was an instrument tech and carried on his person a wide and wonderful assortment of instruments, pulled out a magnifier and studied the egg with it. "Bloody hell," he said after a few moments. "Those light spots are made of millions of smaller lights." He upped the magnification. "They must be the size of molecules, arranged all in swirls and clusters to look like galaxies. You got good eyes, Johnny."

Maggie B. borrowed the magnifier from him and studied the egg. "That's right purty. Those prehumans must've had eyes as good as Johnny here to enjoy something so hard t'see."

"If they had eyes," said Tirasi. "Maybe they had other senses to appreciate it."

Maggie B. scratched her head. "So, this here place was what, a museum, an art gallery?"

Behind vault doors thick enough to defy all creation? January did not think this a gallery, though it might have been a vault to safeguard priceless treasures. The proudest possessions of the prehuman empire? Assuming the prehumans had had empires, or possessions, or pride. Four treasures only, and one too heavy to take away. Yet the building seemed to extend far out into the sea of sand, and might penetrate deeper into the world. Treasures beyond number might lie elsewhere in the complex.

And they could spend a lifetime searching for them.

January turned to the pedestal beside him and studied what at first seemed to be a pale red brick sitting

on end, about a forearm high and just over a hand-grasp around. Of the many things which on this world might be rare, January did not think to number sandstone. Unlike the Midnight Egg—they had named the first treasure already—this was nothing more than a geometric slab whose proportions were, to human eyes, the least bit off. Yet, what made one combination of height, length, and breadth pleasing, and another unsatisfactory? The prehumans may have apprehended matters from another perspective, and esteemed this the most beautiful object in the room.

He rubbed the side of the stone and was surprised that, despite its rough appearance, it was smooth, and cool to the touch.

"Maybe," said O'Toole, "if we can't lift the fookin' thing, we can chip off a wee slice, something small enough to take. Even a chip could make us all rich."

"Hey," said Mgurk. "You-fella, no break him. No diamonds, those." And the Terran put his left hand in front of his face and wagged it side to side three times quickly, a gesture that the crew had learned to read as vigorous defiance.

O'Toole balled a fist. "You gonna stop me, Johnny? You and what management company?"

"Johnny," said Maggie B. "If them ain't diamonds, what are they?" O'Toole rolled his eyes. As if a Terran would know!

"Galaxies," the deckhand answered. "Whole universe in a ball. Story, they tell ut in Corner of Abyalon, when me a kid. King Stonewall, he want alla-alla galaxies, *jildy*. So his bhisti science-wallahs press universe small-small. But Stonewall fear touch ut. An he smash ut, universe ends." Mgurk pointed to O'Toole. "You chip, you break sky. Big trouble." And he arced his arm over his head.

"Aaah! Those old stories ain't worth shit." O'Toole was unimpressed by tales of an imaginary pre-human "king." But he stepped away from the pedestal.

January raised his eyebrows. "A whole universe compressed into a ball that small? No wonder it's so heavy."

Tirasi snorted. "Rot! It's too damned *light* to be a whole universe. I don't know what stories they tell in the Terran Quarter on Abyalon, Johnny, but that just doesn't make sense."

Mgurk shrugged. "Pukka tale. Here ball; just like tell story."

Maggie B. pursed her lips. "How can the universe be inside a ball inside the universe? That's like finding *New Angeles* inside a cargo hold of *New Angeles*! It ain't..." She hesitated, searching for a term to express the *ain't-ness* of it. "It ain't *topological!*"

O'Toole made a disgusted sound. "I thought we come down here to get rich, not stand around discussin' kiddy stories and fookin' philosophy. C'mon, Bill, there's three more things to check out here."

Tirasi took one more look at the Midnight Egg, captured an image of it, and folded his magnifier. "If we can't take it with us, it doesn't matter what it is." He announced this as if excuses were needed, and followed the pilot to the next pedestal. Mgurk said something about foxes and grapes that January did not catch.

January was about to follow the others when he noticed that the sandstone block beside him seemed now twisted into a half-spiral. Curious, he took it off the pedestal—it proved lightweight and comfortable to hold—and tried untwisting it; but it was "rock solid" and had no give to it. And yet, imperceptibly, the thing had altered its shape, like a dancer turning his upper body while leaving his feet planted.

Whatever, it wasn't moving now. He increased the sensitivity of the skinsuit's perceptors, but could detect no movement in the thing. January took some comfort that the stone was not actually squirming in his hand.

The next artifact was what they finally called the Slipstone. It seemed to be a chunk of blue coral, irregularly shaped into tendrils and cavities, and about the size of a man's head. Like the Midnight Egg, the Slipstone seemed to go on forever: each tendril, each cavity, when magnified, resolved into further tendrils and cavities. “Fractal,” was how Maggie B. described it and, since she was the ship's astrogator and Electric Avenue was a fractal network, they accepted her word for it.

They could not pick it up, either.

It proved immovable, not because of its weight, but because it was frictionless. They could get no grip on it, not with hands, not with tongs, not even by first covering it with the sandy grit that they had tracked with them into the chamber. How could something so irregular be so slippery?

"It doesn't make bleeding sense,” Tirasi complained. “If it's frictionless, how does it stay put on the pedestal?"

Maggie B. shrugged. “Same way that other pedestal could support an entire universe."

A joke, thought January as he watched their hapless efforts with a growing sense of his own frustration. (Had they forgotten there was also a ship to repair?) The Slipstone was a joke like the Midnight Egg was a joke. One was very small, but very big. The other was very rough, but very smooth. Was this place the repository for prehuman practical jokes? A collection of alien whoopee cushions and joy buzzers?

Even the door was a paradox. Soft and yielding, but impenetrable.

Neither Maggie B. nor Johnny could recall a prehuman legend involving anything like the Slipstone; and the others came from worlds where such fables were never told, or at least never mentioned. “Oh-for-two,” Tirasi grumbled, finally conceding defeat in his effort to grasp the Slipstone. “What's the point of finding a bleeding treasure trove if—” He waited out a burst of static on the radios. “—if you can't pick any of it up?"

His answer was a sudden howl of pain from O'Toole, who was dancing away from the third object, holding his right hand. “Sunnuvabitch!” he cried. “Sunnuvabitch, sunnuvabitch, sunnuvabitch!"

"Heard you the first time,” Tirasi laughed, reaching for the golden object, cupped on a pedestal of pure white. “But we've known that about you for ... Bloody son of a bloody bitch!"

Now it was Tirasi nursing his hand and dancing a little. Mgurk cocked his head, “Hey, that piece one budmash lotah."

Maggie B. pursed her lips. “I wouldn't touch that, cap'n, was I you."

January bent close to study the artifact. It was shaped like a discus bisecting an oblate sphere. Saturnoid, was how he would describe it. Many gas giants were saturnoid, some with quite spectacular rings. January wondered if this were a compressed gas giant. *At least it won't be as heavy as the Midnight Egg...*

The surface had a cool metallic look, whether actually metal or not, and was smooth and shiny and golden. It seemed to glow from within, and waves of yellow and red and orange passed through it. “Those look like flames,” January said. “Was it hot?” he asked the two men, but another static discharge covered his words. “Did it burn you?” he asked when he could.

O'Toole had calmed down somewhat. “Like a million needles sticking my hand.” Tirasi pulled a pyrometer from his scrip with his left hand and gave it to Maggie B., who examined the object's surface.

"Ambient temperature,” the astrogator announced.

That made the object rather more cold than hot. “It looks like it's burning up inside,” January mused aloud. But fire was a chemical reaction. It could not have continued for eon upon eon without consuming eons of material. *Of course, maybe this pot is all that's left.* There were chemical reactions that oscillated between different colors, and the appearance of roiling flames might be a consequence of such a reaction. But could such oscillations remain undamped over so long a time as these objects must have sat here?

They called this one the Budmash Lotah, which Johnny explained meant an evil-doing brass pot in the Terran patois.

January gave up. He could not grasp the natures of these objects. There was nothing in his experience from which he might analogize. Each was beautiful in some manner, but the only other thing they had in common was that they could not be moved.

That's why all the other pedestals are empty, he suddenly realized. Whatever else was once here could be removed, and so they had been. But when? And by whom? Leaving, what? A display of ... immovable objects? Earth, water, fire...

He wondered where the irresistible force was.

"Hey,” cried Mgurk, “come-come, look-see.” The Terran was standing by one of the empty pedestals and passing his hand slowly through the air above it.

"Now, what?” Tirasi complained. He and O'Toole joined the Terran.

Maggie B. turned to the captain, who had not moved. “What is it?” she asked.

January waited out a growl of static. “Something's missing."

"Holy Alfven!” said Tirasi, and O'Toole turned to the captain. “It's a fookin’ ghost."

"You have to look at just the right angle,” Tirasi explained when the captain and Maggie had joined them. “Johnny, stand away. The light has to be ... *There*, do you see it?"

January nodded slowly. He could make out the billowing of yellowed clouds against a ruddy background, as if a slice of orange sky many leagues deep had been captured and set on a pedestal. “It's a whole-gram,” he guessed.

"Yah?” said Tirasi as he viewed his gauge in disgust. “A projected image *with mass*?” He showed January the readout. *"And* with a temperature *and"*—passing his hand through the image—"with a texture. Cool, smooth, and I can feel that it's hollow."

"You can feel it,” Maggie B. said, “but you can't pick ‘er up.” Tirasi nodded. “Like grabbing smoke."

"Why am I not fookin’ surprised?” said O'Toole. He was answered by another outbreak of static.

The second chamber was right beside the pedestal and January idly felt one of the soft, spongy leaves that ringed the entry. It seemed made of the same material as the door of the vault.

At that point, Tirasi and O'Toole noticed their captain's possession of the sandstone block. “Well, now,”

said O'Toole with a glower. “And are ye cutting us out on the only bit of loot we can actually walk off with?"

January, surprised, looked at the sandstone block in his grip. It had fit his hand so comfortably that he had quite forgotten he was holding it. The stone was thicker at the ends now, and curved in a slight arc—and he had not felt even the smallest movement.

It was an exceptional piece, he realized. An exception not only to the beauty of the other items, but also to their immobility. A cuckoo in the nest. *And why wasn't it taken when the rest of this vault was plundered?*

Tirasi nudged the pilot. “Greedy sod, ain't he? C'mon, Slug, let's explore the rest of this place. Might be there's more stuff in the next room."

January suddenly knew. Those fleshy “leaves” were not the petals of a decorative flower that ringed the entrance to the second chamber. They were segments of another of those marshmallow doors. Something had pierced the door in the center, and it had peeled outward in pie-slice sections. From the arrangement of the pieces, the door had been pierced from *inside* the chamber. And there was nothing inside the chamber but an empty pedestal.

"Wait!” he said, and to his surprise the others stopped and turned expectantly. January looked again at the shredded door. What had sat on that pedestal, sealed off from the other objects? The irresistible force? How long had the door resisted it? Millennia? Eons? But it had failed at last.

Where was it now? It could not have gotten off-planet, surely. No, it must still be loose somewhere on this world.

Waiting for a ship to happen by.

"You're absolutely right, Bill,” he said. “There may be other relics somewhere in the complex, but for all we know that corridor...” Pointing toward the half-open door at the end of the room, half enticed by the dark at the end of the tunnel, half expecting *something irresistible* to come pouring through it. “...for all we know that corridor leads nowhere but to a dead end deep inside the planet. That would fit, somehow. But we need to get off this world, now."

O'Toole scratched his ear, cast an uneasy glance at the corridor, and said, “Sure thing, cap'n. But I hate to leave without getting *something* out o’ this."

The lack of objection surprised January. “Something's happening,” he told them. “Have you been listening to the static on the comm channels? It's getting stronger. There's a storm brewing, and a big one. Look.” He wanted desperately for them to understand. “We can't take these other things with us, but we can still cash in. Think what people would pay to come see them. They have to come through the tunnel, so we can control admission. But...” And here his voice became lower, more urgent. “We must leave *now*. We don't have the supplies to stay and explore every pocket in this entire complex. We need to get a stake, so we can come back and do this proper and controlled."

Maggie B. pursed her lips, thinking. “Who you thinking might stake us?"

January took a deep breath. “The Interstellar Cargo Company...” He hesitated, waited for the objections; then, when none were forthcoming, stammered on, “The ICC's a damned pack of jackals, and ships like ours only get their leavings; but we may be able to work out a deal with them. If we're going to do a seismic survey, map the complex, conduct a grid-by-grid search in an orderly manner, document our discoveries, we're going to need more resources than the poor old *Angel* can earn in our

lifetimes."

A moment of silence passed. Then Maggie B. said, “Right, then. There'll be time between here and the Jenjen to cook up a plan to protect our rights."

Tirasi nodded. “An’ we'll be able to show ‘em that thing—” He indicated the now S-curved sandstone block in January's hand. “—and the videos we took of this place."

"But if ye show ‘em yer rock,” O'Toole warned him, “be fookin’ careful, or they'll be taking it off ye. That bein’ yer honor's very own stone, not theirs."

The display of unanimity and agreement was so unexpected that January waited a moment longer for the objections. Then Johnny Mgurk cried, “Chop and chel, sahbs. We go jildy. Hutt, hutt! Big dhik.” And the spidery little man led then up the tunnel.

January half-expected to find the main door now shut, trapping them inside, but it was still rolled into its slot in the wall. The five of them tumbled out into the rocky cleft, blinking at the light, noticing that it was already dimmer.

Through the growing static on the radio, he heard Micmac Anne calling. “...swer me! *Angel* ca ... Jan...! C ... in, Amo...!"

January flipped the responder. “Tell me thrice,” he said three times. The ship's intelligence could create a coherent sentence by splicing the fragments that got through the random static.

"Amos!” said the reconstructed Anne. “There's a storm coming your way, a big one. It started over your eastern horizon, and we've been tracking it since ... There's lightning. Lots of lighting. Lots of *big* lightning. I've never seen anything like it. It's coming right down on you. Amos, get out of there now!"

They had already reached the excavation site. Maggie B. began to mount the backhoe, but January said, “Leave it. You heard Anne. The wind won't be much at this pressure, but the sand can clog our breathing masks. And the lightning..."

He could hear it now. Thunder like galloping hooves. Underneath—a steadier tympani of deeper booms, like the lumbering gait of a giant. Black dust clouds loomed on the eastern horizon and lighting flashed within them like fireworks. The clouds seemed a-boil, rolling toward them. Johnny began to run toward the jolly-boat. “Shikar storm!” he wailed. “Hutt, hutt!"

"Shut yer food-hole, ye Terry slob!” O'Toole cried, bounding past him to the gig. Terasi had fallen behind, staggering with the molecular sieve in his arms. “Drop it,” January ordered him. “Drop it and run for the jolly-boat.” The system tech threw his precious machine to the sand and sprinted.

Maggie was already firing the jolly-boat's engines when O'Toole and January reached the gig. O'Toole popped the hatch and clambered in. January paused at the foot of the ladder and looked behind. Terasi and Mgurk were sealing up the jolly-boat. He nodded and entered the gig.

"We'll worry about our orbit after we have one,” he told O'Toole, as he slid into the number two seat. “Lift! And lift now!"

So, they did.

Both boats reached the stratosphere ahead of the advancing storm front. Lightning crackled below them. Yet part of the storm had broken through the tropopause—lowering thunderheads looking for all the world like billowing giants made of smoke. A tremendous bolt arced *upward* into space. O'Toole

cursed.

"Climb, Slugger," January told the pilot. "Climb as fast as you can. Climb, even if you dry-tank the gig. Annie will pick us up in the lighter if she has to."

"Aye, cap'n." Sweat was pouring off the man. His fingers might leave dents in the pilot's yoke. "We're heading east to west, an' that's a bad climb f'shure; but we're stayin' ahead o' those sand clouds. 'T isn't ourselves I'm worrying over, y' follow, but what that jolly-boat is a slow climber."

"Where are they now?"

"So far, so good." O'Toole gusted a sigh and seemed to relax microscopically. "But that's what Wheezer Hottlemeyer said whan he was after passin' the second floor, and him falling out av a noine-story buildin' at th' toime."

And a skybolt turned the viewports blue. The gig shuddered, and one of the panels sparked and died.

"Are we hit?" January cried, half rising in the two-gees. "Did it get us?"

O'Toole laid a beefy hand on January's wrist, touching the sandstone as he did. "Don't ye be worryin', cap'n darling'." And January relaxed, weirdly comforted, confident now in the pilot's abilities to see them through. "Aye, an' there's the jolly-boat, too!" the pilot cried, a triumphant shout, finger stabbing the 360-sensor display, piercing its ghostly green wireframe images. "Hoigh, th' *Roger*. All bristol, down there?"

"Hoigh, *Aloe,"* Maggie replied. "Skin of the teeth here, Slugger. There was one bolt, I thought it was gonna peel the paint right off the skin, and leave its autograph. Hell, mebbe it did. Storm's well below us now. Looks like we made it, you damned Paddy! Now we gotta find the *Angel*."

"Shure," said O'Toole, "an' ut'll be a story for to tell our grandkids."

"I don't even have kids yet," Maggie said.

"Well, then, let's you an' me make some while there's still time!"

The pilot and the astrogator instructed their respective boats to lock onto the *New Angeles,* plot a suite of orbits, and report back with projected transit times and air and fuel usage. When the engines cut out and the gig entered low orbit, O'Toole grinned and turned about to face January.

And the smile faded. Slugger clasped his fists together into a ball and shuddered. "*She* can joke, but I know how close that was." He sucked in a deep breath. "It weren't normal, cap'n. That storm. It was coming at us east t' west, an' that's aginst th' prevailin' winds. Yessir, 't was, and I nivver heard tell uv a storrum doin' that. An' maybe a planet dry like that an' all can work up a monster static charge, but, Jaysus, cap'n, that storrum was bigger'n the planet, I'm thinkin'."

January glanced that the prehuman artifact in his hand. It was twisted along its length like a screw. He had ordered the others to abandon backhoe and molecular sieve, but he had hung on to this. It really was quite pretty when you got used to it.

"I'm guessin' th' toorist attraction notion is off th' table now."

January laughed with nervous release. "By the gods, yes. But, maybe we can sell this ... this dancing rock for enough to replace the gear we abandoned. Looks like Hogan'll have to cannibalize the ship after all. I don't think we should go back and try to salvage the equipment."

"Jaysus, no! I'd ruther be back home on New Eireann awaitin' for th' Big Blow. Our equipment'd be all lightning'ed over by now, anyways, the backhoe and Bill's toy. Nothing lift uv thim but slag. But I shure hope the storrum didn't hurt those other things—the Midnight Egg, the Slipstone, the whatever heathen name Johnny gave the pot..."

"The Budmash Lotah."

"Yeah. I don't know for why Johnny don't speak fookin' Gaelactic like th' rist uv us."

"I don't think they were hurt, the Unmovable Objects. And, Slugger? I don't think that was a natural storm, either. I think the prehumans made something they had second thoughts about and they locked it away forever, but..." The gig's orbit, looping around the planet had brought them back up over the site, but January saw nothing out the viewport but a black, writhing mass covering a quarter of the planet. Maybe, it was fading, settling out now. He couldn't tell.

"But?" O'Toole prompted him.

"But even forever ends." And he relaxed in his harness, stroking the lovely sandstone, thankful that they had escaped the Irresistible Force.

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Short Story: **A PLETHORA OF TRUTH** by Bond Elam

The methods of science have a wide range of applications—some of them, anyway. And sometimes with surprising results.

Pastor Billy knew he was in trouble the moment he heard that his cross-town rival, Reverend James Wheelwright, had begun streaming his Good-News Roundup over the Internet. Not only would Reverend Jim continue to draw from their shared base of Sunday-morning TV viewers, he could now reach out to a whole new reservoir of recruits through their computers, handhelds, and in-car navigation systems.

Of course, Pastor Billy, who was no slouch himself when it came to soul-saving, struck back hard and fast. The following Sunday morning, during his regularly scheduled Prayer-O-Thon from the Tri-Cities Arena, he unveiled a technological breakthrough of his own—what he described as the most important advance in heavenly communication since Moses discovered the burning bush: the world's very first hotline to God.

The bright red phone, a traditional desktop model, rested on the coffee table between Pastor Billy and his co-host, Mary Lou Gilbert. As usual, they were seated in the two upholstered chairs that had been arranged living-room style in the elevated wrestling ring at the center of the arena. Around them, their five-thousand-member congregation peered down from their seats in hushed anticipation.

"Why, it's just like that phone President Reagan used when he told Mr. Mikhail Gorbachev to tear down his wall, isn't it?" Mary Lou marveled, pressing her hand to the bosom of her flowered yellow frock. As she leaned forward to examine the phone, the camera closed in on her face, catching the tip of her tongue, which tended to poke out the corner of her mouth whenever she concentrated. The image was relayed to the four large monitors suspended above the ring, giving not only the folks at home, but everyone in the arena a chance to see just how taken she was with Pastor Billy's exciting new innovation. "And all you have to do is just pick it up?" she asked, blinking up at him with her thick, dark lashes. "He's right there? Just waiting for you to call?"

"It's like I've been telling our viewers for years, Mary Lou," the pastor said. "The Almighty is always ready to hear our prayers. All we have to do is call." He spread his palms, lifting his gaze out over the heads of the congregation. With his long blond curls cascading down over the shoulders of his purple robe, he looked like a modern-day prophet who'd descended from the heavens to lead his flock to the Promised Land.

"And He answers Himself?" Mary Lou asked. "Him personally? He doesn't have an angel, or some saint or somebody, screening his calls?"

"Every time," the pastor said. "He likes to field His own calls. He says it helps Him feel closer to His constituents."

"But what if He isn't home? I mean, what if He's in the Holy Land or something? You know, smiting Philistines or turning sinners into pillars of salt?"

"Oh, He still answers," the pastor said.

Mary Lou's perfectly formed red lips twisted into a perplexed frown. "He can do that? He can be in two places at once?"

A smile flickered at the corners of the Pastor Billy's penetrating blue eyes. "Well, He is God, Mary Lou."

The congregation laughed. As the camera panned out over their freshly washed faces, the folks at home could see what a good time they were having, even if it was a religious service. Some of them clapped, while others nudged their neighbors, enjoying their chance to laugh along with Pastor Billy and the Almighty at Mary Lou's puzzlement.

"Uh ... do you think we could put Him on the speakerphone?" she asked, turning back to the pastor. "I'd just love to hear what He has to say."

The pastor grimaced. "You know, I asked Him about that. I thought it would be nice if the folks at home and here in the arena had a chance to hear the sound of His voice. But I'm afraid not. He says He doesn't like the way the speaker phone echoes when people talk to Him."

The audience sighed.

"But we can ask Him anything we want," the pastor added. "Like He says, the only stupid question is the one you were afraid to ask."

"Well, you heard it here first, folks," Mary Lou said, turning toward the camera. "This is your chance to find the answers you've been searching for. So get those cards and letters in the mail, and be sure to tune in next week when we'll be putting your questions to the Almighty Himself."

And so it was, as the address scrolled down the screen—with a tastefully worded request for a nominal donation to cover the cost of collating and handling—that Pastor Billy used this exciting new application of telecommunications technology to reach deeper into the pool of potential parishioners, thereby reestablishing himself as the number-one redeemer of souls in the Greater Tri-Cities Market.

* * * *

At least until the following Sunday—which was when Reverend James Wheelwright, who was not about to sit back idly twiddling his thumbs as market share slipped from his grasp, announced that his Creation Science Institute, which had long been committed to proving the historical and scientific truth of Holy Scripture, had finally isolated the gene for the human soul.

"So the Bible is right," his graying, African-American sidekick, Willis McGregor, said. "There really was an Intelligent Designer, and now our hard-working scientists here at the Institute have proved it."

Reverend Jim gave him an encouraging nod and slipped off his wire-rimmed glasses, leaning across the desk on one elbow to squint resolutely into the camera. "FCC rules still won't let me tell you the Intelligent Designer's real name, but there's no doubt about it, Willis. We've finally put the lid on Darwin's coffin!"

"All right!" Willis said, slapping his knee. He also turned toward the camera. "This is what we've been waiting for, isn't it, folks—a return to the old-fashioned, faith-based sciences that made America strong!"

So saying, he and Reverend Jim joined hands across the desk and lowered their heads in prayer. Unlike traditional Sunday-morning services with large congregations and lots of lights and music, the Good-News Roundup worked more like a two-person infomercial. Reverend Jim—whose lean features and short-cropped red hair gave him the look of a tough-minded military officer—wore a tailored white lab coat with the institute's leaping-fish logo on the lapel pocket. Willis dressed in a conservative gray business suit as befit a member of the institute's board. Occasionally, one of the camera crew might lose control of himself and shout out an "Amen" or a "Go get 'em, Reverend!" But, by and large, the service was conducted with the restrained decorum usually reserved for the promotion of vitamin supplements and health-food additives. The show's mission, as Reverend Jim liked to explain, was to show the folks at home that the faith-based sciences were more than equal to the threat posed by the atheist educators

who were so determined to destroy the moral fiber of America's youth with their attacks on the historic accuracy of Holy Scripture.

"So you're saying everybody has one of these soul genes," Willis said when they'd finished praying. "White people, black people, Christians, Jews, even Muslims."

"That's right," Reverend Jim said. "Our research shows that the Intelligent Designer spliced it into the human genome with His own hand, just fifty-seven hundred years ago, back in the Garden of Eden."

"Well, I'll be a monkey's uncle," Willis said.

"No, Willis, you won't," Reverend Jim said. "None of us will. Because unlike what all those atheist science teachers keep telling our kids, we are not descended from monkeys. We're all the children of Adam and Eve. Every single one of us."

"In other words, we're all equal in the eyes of the Lord."

"Umm ... not exactly," Reverend Jim said, sucking his lips back against his teeth. "You see, it's been a while since the Almighty did His splicing, and in the meantime, a lot of water has gone over the dam."

"What dam?" Willis asked, eying him suspiciously.

"Well, like I said, we've all got the gene, but in some of us it's not as fully developed as in others. Which, as you know, is how faith-based genetics works. You have what are called your recessive genes and your dominant genes, depending on what gets passed down to you from your parents."

Willis frowned thoughtfully at the camera for a moment, letting the folks at home see that it was okay to be confused at this point, what with all the misinformation the secular scientists had been putting out about genetics. "So you're saying if your father was secretly an atheist, you could find yourself with a recessive gene?"

"Exactly," Reverend Jim said.

"And if your mother was one of these activist judges, you might have two recessive genes. Maybe even end up being an atheist yourself."

The reverend nodded grimly. "You got it, Willis. You'd still have a soul, but it could be all shriveled up—dried out, so to speak, like an old prune."

"But isn't there anything we can do? Some way to help those poor, unfortunate people whose souls need watering?"

"I'm glad you asked me that, Willis," the reverend said as the camera moved in on his face. "Because it just so happens that along with our research into human genetics, our scientists here at the Creation Science Institute have also extracted a line of high-potency vitamin supplements from what we call the Fruits of Eden. These organically grown botanicals are genetic descendents of the very same peaches, pears, and plums that Adam and Eve cultivated in the Garden under the watchful eye of You-Know-Who. In addition to providing one hundred percent of your daily vitamin requirements, our test have revealed that our supplements will return you and your genes to full spiritual health when taken as part of a regularly scheduled program of personal devotion and daily prayer."

"So," Willis said, "even if your mom and dad were activist judges or atheist educators, you can still make it through the Pearly Gates."

"That's right, Willis. But these products aren't available in any store, so if the folks at home want to take advantage of this once-in-a-lifetime chance to save their souls, they need to call the number on their screens today."

"Well, there you have it," Willis said, turning toward the camera. "Our operators are standing by, ready to rush a thirty-day supply of our botanical supplements straight to your door. But remember, supplies are limited, so make that call. All it takes is faith, hope, and a major credit card."

And thus, with the final credits and disclaimers scrolling down the screen, Reverend Jim once again captured his rightful share of the Sunday-morning viewership, because as he well knew, Americans have long preferred pills and easy-to-swallow caplets to the more difficult lifestyle changes traditionally required for eternal salvation.

* * * *

With their viewers' salvation in the breach, Reverend Jim and Pastor Billy hunkered down—face-to-face, nose-to-nose, eye-to-eye across the airwaves: neither of them willing to give an inch. Until, that is, Pastor Billy blinked.

Straight into the camera of Willis McGregor's cell phone, as it turned out. At the very moment, the pastor just happened to be climbing out a back window of the No-Tell Motel in his white satin undershorts with the little purple crosses.

As the image streamed out across the Internet, Pastor Billy tried to explain that his only purpose in going to the motel had been to investigate reports that the motel's management had stocked its nightstands with counterfeit Gideon Bibles—a claim which was corroborated by Marigold Flowers, a local exotic dancer. Who, in her role as union representative, had gone to the motel with the pastor to investigate the claim. Because, as she put it, so many of her associates used the motel in their professional capacity.

Needless to say, when Pastor Billy walked out in front of the camera the following Sunday morning, the Tri-Cities Arena was packed to capacity with press and parishioners alike—all of them anxious to see if another man of the cloth had finally bitten the dust. The air hummed with anticipation as Pastor Billy and Mary Lou climbed the steps to the ring. The pastor held the ropes for Mary Lou, as he did each Sunday morning, but his usual beaming smile had given way to a heavily lined grimace—like a man about to face his maker. Which, of course, he was.

Mary Lou strode to the far side of the ring. Turning her back on the pastor, she crossed her arms and gazed off toward a distant corner of the arena, her jaw clenched in a disapproving frown. Behind her, Pastor Billy struggled through the ropes, momentarily tangling his purple robe, before he finally straightened to peer across the canvas at Mary Lou's rigid back. They both stood motionless, like a tableau carved in ice. A hush descended over the audience, the tension mounting higher and higher, until suddenly Mary Lou turned.

"Well! What do you have to say for yourself?"

She tried to control her anger, but as the camera moved in on her face, there was no hiding her trembling lips, the red blotches on her cheeks, the blue veins throbbing in her neck.

"I, uh ... I don't know what happened," Pastor Billy stammered. "It's all just a blur. A terrible white smudge in my memory."

"That's it?" she said, planting her fists on her hips. Her eyes narrowed to cold green slits. "You get caught red-handed climbing out the window of the No-Tell Motel, and that's all you got? A smudge?"

Pastor Billy's features crumbled. “Oh, Mary Lou, I'm so ashamed. I feel like I could just curl up and die right here in the center of the ring.” Clasping his hand in front of his chest, he raised his face toward the steel beams supporting the arched roof. “I just pray the Lord will forgive me for letting all these good people down. I know how they were depending on me ... our parishioners here in the arena ... all those poor shut-ins watching from home.” He bit his lip, his features twisting in an agonized grimace. “I think ... I think I'm going to cry.” As the camera moved in on his face, the members of the audience looked up at the overhead monitors to see a single glistening tear slide over his lower eyelid, quiver for a moment, then slip down his cheek to drop to the mat with an unceremonious splat.

Across the ring, Mary Lou's frozen features thawed. “There, there, Pastor Billy...” She hurried across the ring to rest a reassuring hand on his shoulder. “We're all mortals with sin on our souls and lust in our hearts.” She turned toward the audience. “I just want you to know, folks, you can take it from me, Pastor Billy has always been a perfect gentleman here on the set."

"You bring out the best in me, Mary Lou,” he sobbed, unable to lift his eyes from the mat.

"Well, I think I can find it in my heart to forgive you,” she said. She looked up the sea of glowing faces that peered down at her and the pastor. “What do you say, folks? Should we give Pastor Billy another chance?"

She clapped her hands, encouraging them to join in. But the audience remained silent. The only sound was the hum of the air conditioners, their wintry blast barely rustling the long blond curls that spilled down over Pastor Billy's shoulders.

Keeping his head lowered, Pastor Billy peered nervously up at Mary Lou from the corner of his eye. Her mouth tightened, the strain drawing her lips into a rigid plastic bow as she blinked up at the audience, struggling to maintain her smile.

Suddenly Pastor Billy dropped to his knees, threw back his head and thrust his clasped hands toward the roof. “Lord, I was afraid of this. I know You told us all to forgive and forget. But some of my flock are weak, Lord. Like You and I have talked about right here on the Prayer-O-Thon, half of them couldn't find their way to heaven if You pinned a map to their noses. But, even so, Lord, I wouldn't want You to send them to Hell just because they couldn't find it in their cold, cruel hearts to forgive a miserable, suffering sinner like myself. I mean, the thought of their flesh roasting on their bones ... of all those internal organs bubbling out through their noses—well, Lord, I guess it's just more than I could bear. So I'm asking You. I'm going on record, here and now. Please, please, please, don't send them all to roast in Hell just because they're too selfish and mean-spirited to forgive a poor, miserable, down-on-his-knees, begging-for-forgiveness sinner like me."

"Amen!” Mary Lou shouted. She threw up her hands and turned to the audience. “Well, what about it, folks? Can we forgive Pastor Billy, or do you all want to roast in Hell?"

From the high seats a voice called out, “We're with you, Pastor Billy.” Then a woman closer down shouted, “Let he who is without sin cast the first stone."

"There you go....” Mary Lou said, again clapping.

Slowly the members of the audience began to clap along with her. First a few, then more, until finally the entire congregation was on its feet applauding the pastor.

"Thank you, folks,” Pastor Billy said, climbing back to his own feet. “I just hope the Lord can forgive me, too."

"Well, what do you say we find out?" Mary Lou cried. "How about it, folks? Should Pastor Billy give the Almighty a call on the hotline right now? What do you think?"

Again, the congregation clapped.

Pastor Billy smiled weakly, allowing Mary Lou to lead him to his usual chair beside the coffee table. He sat down and she pushed the red phone toward him.

"Go ahead," she said. "Don't be afraid. The Lord has a place in his heart for all of us, Pastor Billy. Even low-down, good-for-nothing sinners like yourself."

"Okay," he said, drawing in a breath. "Here goes."

He picked up the receiver and held it to his ear.

There was a pause, during which he nodded his head as though listening to the first ring, then the second. Suddenly he straightened. "Hello...? Is that you, Lord? Yes, Sir, that's right. It's me, Pastor Billy."

There was another pause. As Pastor Billy listened, Mary Lou turned toward the audience. "Well, at least, the Almighty is still talking to him," she said in a loud whisper. "He could have had the call transferred to you-know-where."

The audience laughed.

"Yes, Sir, I understand," Pastor Billy said into the receiver. "And You really feel that way?" He paused a moment longer. "Well, no, I never thought of it like that, but now that You mention it, well, I guess it does make sense, doesn't it? Yes, Sir, a lot of sense." Another pause. "Well, You have a good day, too, Sir. And thank You. Thank You from the bottom of my heart."

So saying, he carefully hung up the phone.

"Well?" Mary Lou said. "What did He say?"

Pastor Billy drew in a deep breath, organizing his thoughts. "Well, first, He wanted me to let everyone know He's thinking about you."

"Yes," Mary Lou said. "But what about you, Pastor Billy? Did He forgive you?"

"Yes, He did, Mary Lou. In fact, He said..." He paused, biting his lower lip.

"Yes," Mary Lou prompted. "He said...?"

"Well, He said it was good to have someone like me representing Him down here in the Tri-Cities, because when I call asking Him to forgive some poor sinner..." He looked out at the audience. "Well, He says, I know what I'm talking about. I've got what He called a special expertise, so I'm not just going through the motions."

"Why, that's wonderful," Mary Lou said. "That's ... that's..."

"That's a lie!" a commanding voice boomed from the audience. "This man isn't talking to God. He isn't talking to anyone. In fact, that Heavenly Hotline of his isn't even plugged in!"

"What...?" Pastor Billy said. "Who's that?" He squinted into the lights, trying to make out the figure who had risen to his feet midway up the tier of seats directly in front of him.

Mary Lou glared up at the speaker. “Don't listen to that man, folks. All he wants to do is take your money. That fruit juice he's selling, it doesn't come from any Garden of Eden. He has Willis McGregor buy it down at the Safeway!"

"Jimbo ... is that you?” Pastor Billy said, leaning forward to squint harder.

"In the flesh, Billy boy,” Reverend Jim said as one of the spotlights that normally lit the ring swung around to engulf him in a circle of light. He waved to the audience as he descended the steps, shaking hands with those parishioners he recognized as he made his way down to the ring in his white lab coat. Willis McGregor, dressed in his usual gray business suit, followed just behind him, pausing now and again to exchange a few words with those old friends that the reverend had missed. The two of them climbed the stairs to the ring, stepped through the ropes and turned to face the audience. As they did so, the camera moved in on Reverend Jim's face, filling the overhead monitors with his lean, bespectacled features.

"Folks, you can't believe a word this man says. The truth is, he's a complete fraud.” Crossing the ring, he snatched up the red phone and held the disconnected plug up to the audience. “See, what did I tell you. It isn't even plugged in!"

"That doesn't prove a thing!” Mary Lou said. “The Good Lord doesn't need wires. Any fool could tell you that!"

"Yeah? Well, if Pastor Billy's talking to anyone, it's the devil,” Reverend Jim shot back. “And you folks out there in the audience, if you keep listening to him, every single one of you is going straight to Hell!"

"That's a lie!” Mary Lou shouted.

"Is it?” Reverend Jim asked. “Then how do you explain this?” He reached into the pocket of his white lab coat and pulled out a hairbrush, which he held high over his head for the audience to see.

"Hey! Where'd you get—” Pastor Billy blurted. Then he abruptly shut up, clamping his hand over his mouth.

"My trusty sidekick Wills McGregor recovered this hairbrush from the No-Tell Motel,” Reverend Jim said, pointing the offending brush at Pastor Billy. “Exactly where you left it!"

"I can testify to that,” Willis said. “That is the very same hairbrush Pastor Billy used to primp those golden locks of his while he was waiting for Marigold Flowers. I personally conveyed it to our scientists at the Creation Science Institute with my own hands."

"So we can say unequivocally that the chain of evidence has been preserved, is that right?” Reverend Jim said.

"Unequivocally,” Willis said.

"That's not evidence,” Pastor Billy scoffed. “It's a hairbrush."

"Ah ... but that's where you're wrong,” Reverend Jim said. As the camera moved in on his face, he slipped off his wire-rimmed glasses, peering resolutely out at the audience from the four overhead monitors. “Pastor Billy may not want to admit it, folks, but it just so happens that our scientists found one of his hairs lodged in the bristles of this very same brush—a hair from which they were able to isolate a sample of Pastor Billy's personal DNA."

"That doesn't prove anything,” Pastor Billy said. “I've already admitted I was at the motel. Like I told everyone, I was investigating the counterfeit Bibles."

"Maybe you were, and maybe you weren't, but that's not the point," the reverend said.

"Yeah, well, what is the point?"

"The point is, when we tested your DNA, we discovered that you are missing a critical human gene!"

"A what?"

Reverend Jim grimaced, again turning to the camera. "It pains me to say this, folks, but those of you here in the arena—as well as you poor shut-ins at home—all of you have a right to know. When our forensic scientists tested Pastor Billy's DNA, we found out that he isn't like you and me."

"He isn't?" Willis said, peering into the camera with a perplexed frown.

"No, he isn't, Willis. Like I say, it hurts like the dickens having to tell you all this, but the fact is..."

"Yes?"

"Well, the fact is, Pastor Billy is missing the gene for the human soul!"

A collective gasp arose from the audience. As the camera panned across the tiers of faces, many of the parishioners gaped at each other in dismay. Others clasped their hands and turned their gazes toward the ceiling. Still others closed their eyes and bowed their heads, slowly shaking them as though they wished the world would just go away.

"That's a lie," Pastor Billy cried. "That Creation Science Institute of yours is nothing but a snake-oil factory. And those so-called scientists—they couldn't find their way to the men's room!"

"You can call me what you like, but the evidence speaks for itself," Reverend Jim said. Reaching into his other pocket, he pulled out a computer printout, which he waved over his head. "The evidence is clear, my friends. Much as I dislike casting ethnic dispersions, the truth must be told. Pastor Billy's ancestors were never in the Garden. God had no hand in his creation. The sad fact is, Pastor Billy is a product of the very same theory of evolution that all those atheist school teachers have been using to despoil our nation's youth."

"Evolution!" Willis cried in dismay. "Are we talking Charles Darwin?"

"Yes we are, Willis. Much as I hate to say it, Pastor Billy is descended from monkeys!"

"Monkeys!" Pastor Billy exclaimed. He jumped to his feet. "Who are you calling a monkey, you good-for-nothing piece of goat cheese? You're nothing but a fruit vendor!"

"At least I'm not leading my flock to Hell!" Reverend Jim fired back. "We all know what you were doing with that Flowers woman." He turned to the audience. "He was riding Satan's rollercoaster, folks. Whooping and hollering like a teenager at his first rodeo."

"That's right!" Willis exclaimed. "They don't even have names for some of the sinful things he was doing."

"You're the one who's leading your flock to Hell!" Pastor Billy exclaimed. "Telling them they can atone for their sins with fruit juice. You don't know the first thing about sin! Or fruit juice, for that matter."

"Oh, yeah?" Reverend Jim said. "Well, I know a monkey when I see one! And you're a monkey!"

"And you're a no-good huckster!"

As the two men snapped and snarled, they dropped into a crouch, slowly circling each other with their arms outspread. Around them, members of the audience also turned on their neighbors.

"Pastor Billy's nothing but a monkey!" one woman cried.

"Yeah! He's leading us all to monkey hell!" another proclaimed.

"He is not," a man shouted back. "He was tainted by those counterfeit Bibles."

"All those typos and errors of faith," another called out.

The clash of voices rose louder and louder, until it echoed from the ceiling.

"Oh, this is just terrible," Mary Lou said, turning to face the camera. She clutched her shoulders as her rosebud lips twisted with anguish. "Who should we believe? How can poor, ignorant sinners know who to trust?"

"You're right, Mary Lou," Willis said, coming to stand beside her. "What's a true believer to do? If we follow the wrong man, we could all end up in Hell."

She and Willis turned and looked at Pastor Billy and Reverend Jim, who were now rolling around on the floor. Up in the seats, parishioners were bashing each other with purses and canes.

"Monkey lover!" one woman cried.

"Snake-oil hussy!" another shot back.

"It doesn't seem fair, does it?" Mary Lou said. "If God created us in His own image, you'd think we'd know who we're supposed to follow."

"But we don't," Willis lamented. "Even the experts can't agree who's right and who's wrong."

"If He could just send someone down to help us get it all straightened out..." Mary Lou said, turning her face up toward the ceiling.

"An angel," Willis suggested. "Someone we'd recognize just by looking at him."

"Someone in the heavenly family, so to speak," Mary Lou said. "Just for a little while, just long enough to help us clear up all this confusion. So we'd know who's telling the truth and who isn't."

As if on cue, the red hotline rang. For a moment, no one was quite sure whether they'd heard it. The members of the audience paused in their struggles. Pastor Billy, who was straddling Reverend Jim's chest, looked up. No one breathed.

The phone rang a second time, its jangling bell echoing from the metal roof.

In the past, Pastor Billy had always initiated the calls himself. It had never occurred to anyone that a call might come the other way. Pastor Billy and Mary Lou looked at each other, unsure what to do.

Slowly, almost warily, the pastor let go of Reverend Jim's lapels and climbed to his feet. Crossing the ring, he stared down at the phone. The camera moved in closer, filling the four overhead monitors with his face. The pastor's eyes were fixed on the phone, his lips quivering with apprehension.

The phone rang a third time.

Pastor Billy glanced quickly out at the audience, then he gulped a breath, squared his shoulders and picked up the receiver. “Uh, hello..."

A moment passed as he listened, then he nodded his head. “Yes, this is he.” He looked out at the audience, mouthing, “It's Him,” as he pointed at the receiver.

All up and down the tiers of seats, people let go of each other and turned to listen.

"Yes, Sir,” the pastor said. “I guess maybe things did get a little out of hand."

He was again silent for a moment, listening before he spoke.

"Well, yes Sir, You're right. With us being natural-born sinners and all, sometimes it is hard to see just what You have in mind for us."

He listened some more.

Mary Lou waved her hands back and forth, trying to catch the pastor's eye. “Ask Him if He could send someone down,” she said in a loud whisper. “Somebody who could get it all straightened out for us."

Pastor Billy nodded at her, then turned his attention back to the phone. “Uh ... some of the folks down here are saying they're confused....” He paused, listening. “Really? You're confused, too?

Another pause.

"Yes, Sir, that's true, but ... Well, we were tossing some ideas around, Sir, and we were wondering if maybe you could send someone down. You know, to help us get things straightened out. Like you did last time. Just for a few days. Kind of like a quick booster shot, so to speak."

Another pause.

"Uh-huh ... yes ... well, yes, if that's what You think.” He looked over at Mary Lou, grimacing uncomfortably. “But ... but..."

Another pause.

"Well, yes, Sir, certainly, if that's what You want, I, uh ... yes, I'll tell them what You said."

Another pause.

"Uh, yes, Sir, well You have a good day too."

He let the hand holding the receiver fall away from his ear. For a few moments he just stared at the receiver, then he carefully placed it back in its cradle as he slipped into the chair behind the coffee table to stare numbly down at the mat.

"Pastor Billy,” Mary Lou exclaimed. “What is it? What did He say? Is He going to send someone?"

Reverend Jim and Willis came to stand on either side of her, the three of them looking down at the pastor.

Pastor Billy shook his head, looking up at them. “He says too many people are claiming they know exactly what He wants. He says they're sending too many folks off to do terrible things in His name."

"Well, yes ... But if He could send someone...” Mary Lou said.

"Someone who can tell us what we're supposed to do..." Reverend Jim said.

"He says nobody's willing to think for themselves anymore," Pastor Billy said. "They don't want to use the brains He gave them. He says He didn't give us intelligence just so we could follow a bunch of self-serving Bible-thumpers."

"Bible-thumpers?" Reverend Jim said, blinking in dismay. "He called us Bible-thumpers?"

"The real question is whether He's going to send someone," Mary Lou said. "What did He say about that?"

Thunder rumbled somewhere outside the building, shaking the arched steel roof.

"He says He tried that and it didn't work," Pastor Billy said.

"Didn't work..." Willis repeated, knitting his brow.

Pastor Billy grimaced. "He says the New Testament had a lot of good ideas, but we weren't ready for them. He says it's time to go back to the Old Testament way of doing things—to the stuff that worked for Him the first time around."

"The first time...?" Reverend Jim said.

A second peal of thunder echoed through the building. This one louder. Rain began to patter against the roof

"I think we're going to need a boat," Pastor Billy said, looking up at the ceiling.

"A boat?" Mary Lou said.

The pastor nodded without taking his eyes from the roof. "A big one," he said. "He told me He's going to wash the slate clean, start over again from scratch."

"Oh, my..." Mary Lou said. As the camera came in on her face, she followed Pastor Billy's gaze toward the ceiling. While outside, the rain began to fall harder, pounding against the roof in sheets as though the sky itself had opened and the all the seas of the earth were pouring down over the land.

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Short Story: **LET THE WORD TAKE ME** by Juliette Wade

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Illustration by Vincent Di Fate

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Language is more than just words—sometimes much more.

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David Linden held his breath as two Gariniki paused in the rainforest's murky twilight, directly in front of his cramped observation blind—a gecko mother and child. With their backs to him, he couldn't understand all that the child was gesturing, but one of the signs was *"story."*

"Oh, give me a story," he whispered, knocking over an empty water cup in a vain attempt to lean closer through the station's video screen. "Just one. Just enough to let me figure out how to talk to you before they take us away."

The mother gecko's whistling laugh echoed through the speakers as she stroked the young one's head with claw-tipped fingers. "Even Afara-mudi fears the Word outside the House."

Which meant the path to the village was public, so no stories. David retrieved his cup with a groan of frustration. Why should his vigil yield more now, when four years of recordings from this location had given them nothing? The Gariniki didn't know that the eviction officer had arrived in orbit—and she would mean nothing to them, if they did.

Even a single story might make the difference. Father was up dealing with Officer Monroe right now; he could use a recording to argue that Garini Provisional Colony needed more time—a year or so, maybe, to assemble a collection of the canonical stories that made sense of the geckos' oblique language. Father had already won them a good six years' worth of extensions: No one could argue logic like the Great Arthur Linden, who'd made his name across the Allied Systems with his papers exploring the allusive structure of canon-based languages.

God knows they needed him to win another.

There was a worse problem here than just lack of stories, one that would certainly get Officer Monroe summoning her transport ships if she ever learned of it. Despite thousands of phrases collected and learned in context, a thorough extrapolated grammar and his passable grasp of Gariniya phonetics, Father had never managed to get a Gariniki to recognize that he was speaking their language.

Father was infuriated by the idea of a linguistic problem he couldn't solve, but David had to figure the problem wasn't linguistic at all, or the Great Arthur Linden would have solved it. No, it had to be a social problem—one linked to the mystery of *when* the geckos told their stories—as the Gariniki would say, why Afara-mudi never talked outside the house.

"The house," David whispered. "Damn!"

What if the gecko stories were told inside the habitations, like bedtime stories?

David quickly clipped a mobile data recorder to his belt. The gecko pair had already moved off. They would have at least a hundred yards on him by now, and Systems rules said humans weren't allowed to trespass into the village. He grabbed his water cup and tossed it in the waste carryout, along with three days of food wrappers and Systems rules too. He had to have a story tonight.

The night air under the canopy was rich and humid, and the vegetation encroached too closely on the path for human comfort. By the time he reached the edge of the village David's clothes were clinging to his skin, his glasses slipping down his nose.

The gecko pair had stopped at a cluster of ground-level huts instead of climbing to the upper habitations. Lucky thing. David tiptoed close enough to take cover under the thick drooping crown of a honihoni. The mother was conversing with a pair of neighbors; snippets of myth mixed with graceful dips of heads and tails, while the child added occasional silent gestures. It was beautiful, and utterly maddening.

When the pair entered the hut, David crept around back to listen through the loose reed thatch. The parent was still making talk: “Kridia's head-scales shone,” for example, a phrase evoking lateness of night, or “Rosbas drew strength from the sedi,” an exhortation to eat. No stories, though—just phrases and silences. David listened until his head hurt, until the silences merged and swallowed the last of the words. Then he pulled away in disgust and walked back along the path. One more idea come to nothing, at the worst possible time.

At the border of the village, a hand emerged from the speckled darkness and jerked him off the path into deep shadows.

"David, what the hell do you think you're doing?"

David caught his breath. “Father!"

"If Monroe finds out you've been trespassing...!"

"I know, Father, I'm sorry, I—” How stupid would he sound if he said he'd risked the colony listening for bedtime stories? It wouldn't win him the respect due to a fellow linguist, that's for sure, and Father would say he should have shipped him off world to college on Erimyno Treaty Colony instead of giving in to all his begging to stay. “I'm sorry."

"Well, never mind."

"So how did it go? Did you get the extension?"

"Damned Systems functionary,” Father grunted. “She doesn't care about the years of work we've put in; all she thinks about is Systems resources being wasted on maintaining us here at Garini Base."

David shook his head. “How can anyone say we're wasting resources? We hardly import anything.” He shuddered, realizing that ‘resources’ must mean something else entirely. “Does she mean our defense ships? But she can't take them away—it would be like handing the Garini rainforests over to be shredded by pirates!” And, since the Garini Provisional Colonists had been the first to inform the Systems about Garini's biochemical wealth, it would be their own fault.

Father was still back on Systems functionaries. “This Monroe's a meddler,” he said. “Wrecked my breakthrough just as I had it in my grasp, and now she's forcing me to extreme methods."

"Wait a minute—breakthrough? What kind?” Father had always been selfish about sharing exciting data that might revive his gradually waning academic reputation. “Did you hear a story?"

"It's a Gariniki I met recently outside the Lands,” said Father. “She's being hosted on the orbiter right now. I'd hoped for progress, but now Monroe's gone and spooked her with a machine translator, so she hides in the bed alcove every time I come in."

David stood aghast. “Father—you *kidnapped* a gecko?"

"Of course not! All I did was intercept her and arrange for us to talk privately. You know how badly we need a new approach. *Monroe* was the one who decided she should visit the orbiter as some kind of emissary, and now this is turning into a disaster." Father tugged at his short beard. "Somebody has to get through to her, and you're the only one left."

David flushed with excitement. "Me?"

"Your Gariniya is much more natural-sounding than mine, anyway."

What an opportunity! But this wasn't about pronunciation. Father had never let him in on direct contact—and *would* never, unless he was desperate. That probably meant they had weeks left, or even days. Add to that the fact that Officer Monroe's failure to communicate with the gecko was the only thing keeping Father from being charged with violations of the Accords on Indigenous Sentients. They had to get out of this somehow.

But what could *he* possibly hope to do with a poor Gariniki who had just found herself carried off to a diplomatic orbiter?

* * * *

I do not understand this prison. I have searched it, tested every surface with fingertip and claw, but learnt nothing.

Is it the cell of Duro-mudi?—but no, for there is no barrier of thorns here, no green of leaves, and no flowing water. There is only a soft bed of I-know-not-what, a mirror-basin lying empty and useless while a wall of silver reflects my face, and a chair of knife-metal where my tormentors like to sit.

My tormentors have the faces and ruffs of simians, but are too large and have no tails at all. The male blasphemes before me: I must avert my face as he allows the sacred Word to escape his mouth in this improper place, so far from the House of Leaves and the Mouth of Singing Crystal. Yet the female is worse. She sits and utters simian calls while a dark box in her lap—O, save me!—*speaks*. Imagine it: to hear the living Word issue from a dead box! My heart quails when I think of it, and I hide my face in atonement for whatever misdeed might have brought me to this test of faith.

It is not that I have never blasphemed myself. Every child has done so.

My first memories are of the gathering in the House of Leaves; of the sun glowing through the roof-leaves layered like scales; of us children sitting curl-tailed in awe while the Word flowed through the people with the inexorable power of water; of learning the Great Tales of our people, questioning and understanding them.

"But why the Great Tales?" I blurted out once by the granite basin in our kitchen.

"Allayo!" my mother cried. She turned her great-pupilled eyes away and gestured holy cleansing.

So I asked again in the proper place, amidst the gathering, in that sacred hall before the Mouth of Singing Crystal.

"The sacred Word is life, or death," she told me. "It binds, it brings bliss or misery. It is the blood of the People, that flows freely in its heart, in the House of Leaves, and the Great Tales like flesh grow from it; outside, the blood and flesh are clothed in small images that give understanding without unleashing the full might of the Word, like scales over the skin."

Living scales will not grow on the dead objects that surround me here. It is not at all what I imagined when I left my childhood behind in the Lands and began my Trial, seeking my own Great Tale. But

monstrous Cheora of the Two Faces greets travelers with pain first, wisdom afterward. For though a thousand things I neither recognize nor understand strike me dumb, yet in this desert of the Word I have grasped a greater truth, that it is the very alikeness of things that permits social speech.

How shall I bring this understanding back to the People? Can one forsaken by the Word yet return to claim it? I cling to my faith to sustain me, repeating to myself each hour: This is my Trial, and if I can endure it, it will become my Tale.

But in such a Wordless place, how can my prayers be answered?

* * * *

"It's not all bad," Father said, once the vibrations of shuttle takeoff had subsided.

David turned away from the window. With his stomach churning nervously at the thought of facing diplomats and geckos, he hadn't been enjoying the view anyway. "How so?"

"Think about it. In a way, I've been preparing you for this moment all your life—your chance to act as a full-fledged research scientist. I'm sure you'll do admirably."

"Oh, thanks." Yesterday's lectures would be preferable to a last-minute pep talk. Those, at least, had been accompanied by real audio and video of the captive Gariniki. She was young and bright-scaled, but certainly an adult, because the orbiter's hidden recorders had captured her commenting on objects in her room. Patting the bed she whispered, "Yahara-mudi's nest of palm"; drawing one finger along the bottom of the sink it was, "In the desert Herremi could not see her face"; and testing the locked door, "Duro-mudi languished thirty days." Gariniya, the translator's nightmare—it was awesome.

"You might want to think of a phrase or two to demonstrate in case Officer Monroe asks," Father said. "Just don't forget, her judgment of you and our colony's future will be passed on to all the Allied Systems."

David winced. Somehow he had to keep his cool, not let on that they'd been backed into a corner. There was one major problem. He'd spent hours in the night trying to convince himself that Father would never actually kidnap a gecko—how could he face Officer Monroe bearing that kind of guilt?—but he just wasn't sure. "Father," he said. "Please tell me you didn't actually steal her from the protected Lands."

Father's face reddened, but he gave a short laugh. "Just the kind of concern I should expect from a *colleague,* I suppose. Well, don't worry, look at this." From beneath his seat he pulled an artifact case and slid it across onto David's lap. "She was walking the north desert."

David hissed in a breath as the lid came open. On top was a ceremonial knife in a scabbard of intricately worked grazer leather, with a leaf-shaped blade and a hilt wound with stone beads. Underneath was a mass of white feathers. Lifting the top layer, he found himself unfolding a hooded coat of perforated leather densely clad with yorro plumage. "Whoa, Father, is this—"

"Sun armor. Before this I'd thought it was just another metaphor."

"It's gorgeous."

David suspected it was an heirloom; the unblemished feathers were layered without gaps, but the leather inside showed that patches had been resewn, and two of the worn tie-thongs had been replaced. He might have studied its details for hours, had the shuttle not docked at last with a clank and hiss.

They followed a crewman in Allied Systems blue onto the orbiter and along to a social lounge where their host was waiting.

Officer Monroe stood before an unlidded viewportal, half silhouetted by the dark-centered pink whorl of the McKinley nebula. She looked clean and powerful there, wearing sleek interdweller's clothing that would be totally impractical in the rainforest or on the gravel roads of Garini Base.

"Welcome back, Doctor Linden," she said. "Hello, David."

David stood up straight. "Nice to meet you," he said. "We don't want to abandon our home to pirates."

Father shot him a look.

Officer Monroe smiled. "It's a hard situation here, David. The language problem means you on Garini have had a more difficult task opening native relations than any colony in two hundred years. We don't *want* to see you evicted, but we've reached the limit on leniency permitted by Systems law. I'm authorized to open diplomatic communication if it can be achieved within three days, but if it can't, I'm charged with revoking the colony charter and initiating evacuation. The Garinians must be respected."

"I respect them."

"I'm sure you do. Your father has a lot of faith in you, David, and I hope you can reassure our guest. I didn't mean to unbalance a delicate situation."

David nearly informed her how stupid she was for approaching a gecko with a machine translator, but Father was giving him the look again. "That's okay," he grumbled.

"Officer Monroe, juveniles have special status among the Gariniki," Father said. "That will give David an excellent chance to put her at ease. I'll just take him down."

A hall led out of the lounge; its smooth pale walls were trying to be sophisticated but only managed to be boring. Father hustled him toward a door twenty feet down on the left side.

"I thought I told you to act professionally," he said. "You're not just David here. You're *my son,* and the representative of five thousand people on Garini Base."

"I'm sorry."

"And when you go in there, you're a representative of the Allied Systems, too."

"Father," said David. "Do you think being juvenile can really help me? You want me to use signs?"

Father shrugged. "We've got three days," he said, herding him through the door. "Do whatever works."

As David entered, the gecko-girl leapt to the bed alcove and backed tail first up the wall, toe-claws digging hard into its pliant surface.

David watched her breathlessly. She was a creature of jewels against the blandness of the molded softform. Her brilliant green tail curled and uncurled above her head; her huge amber eyes did not blink. After all these years, here he was, finally face to face with a real Gariniki.

He had nothing to say.

How could he use words, knowing she would close herself off? But how could he use gestures, knowing he'd demote himself to the social position of a child? Nervously, he pushed up his glasses and tugged at his homemade grazer-leather vest.

The gecko-girl's flicking tail slowed somewhat at that; she blinked, double lidded, and licked her lips with

a blue tongue.

It seemed enough like interest that David took off his glasses and held them out to her.

The gecko climbed down from the alcove and came toward him. The length of her limbs was more noticeable when she stood upright, giving her a more humanoid look, though she still stood only as tall as his chest. She did not take the glasses, but pushed his hand aside and lifted a corner of his vest between thumb and forefinger.

"The plains thunder in summertime," she whispered. "Criyayo was famed for dexterous fingers."

David's heart thundered like the hooves of the grazers. He took a breath to reply, then stopped himself, realizing that it was his silence that had won him her speech. That and this vest, made of the same leather as her sun-armor. It was a sign that they shared something: Garini, the planet she probably hadn't laid eyes on for days.

Maybe if he took her to see it, she might speak more.

Trying not to startle her, he pressed open the door. Father and Officer Monroe were nowhere in sight—if he was lucky, they'd be somewhere watching the surveillance monitors instead of talking in the lounge. He beckoned to the gecko-girl, who came cautiously up the hall behind him, seemingly aware that there was nowhere to run.

The lounge door whirred open on an empty room. Thank God. David pointed toward the view of Garini, but the gecko-girl didn't even look at it. With a cry, she ran forward to where the vivid pink funnel of the nebula shone through the viewportal, and fell prostrate on the floor.

Oh, no—he'd just ruined their last chance!

Then he heard her speaking. Speaking and speaking, face-down and low, but in complete sentences, in a way no human had ever witnessed.

"Let the Word take me, let it not forsake my tongue in the desert of the over-dark. On the mountainside the Mouth opens, singing, singing in the winds, and the People bow down at the birthplace of the Word, and not a one but is taken with speech. Once was silence, in time before time, and the People speechless, clinging to the trees. Then the Word issued forth from the sacred Mouth, bringing civilization to the Lands, but the people ask: Where did it arise? Oh, my eyes have been opened! The Mouth of Singing Crystal is but the lesser mouth, the child of the mother, the Mouth of the Heavens! And what great Word shall issue forth to me in the House of Metal at its lips? But let it take me, oh, let the Word take me!"

"The mouth in the sky?" David mouthed half consciously, grasping for purchase in the flood of cryptic meanings. "The word take me?"

Instantly her head snapped up and her giant amber eyes blinked at him, once, twice. "Can a scaleless one be taken by the Word in the presence of a Mouth?" she asked. "You are not of the People, nor of the Lands. Where does a man of skin come from that the Word can touch him?"

She had heard him! David felt sweat break on his forehead and did the only reasonable thing he could think of. He answered. "My name is *David,"* he said. "I'm a *human*. *Humans* come from—" To say Garini would mislead her, but to explain the Allied Systems would only confuse her. God help him—why did this have to be about diplomacy? "From a place called *Earth,* which lies on the other side of the *McKinley nebula."* He pointed to it.

She gaped at him, blue mouthed.

"We are your neighbors," he said. "We have only three days before we leave. We do not want to leave. We love Garini." This was ridiculous—he wasn't *speaking,* he was constructing sentences like a machine! "We wish to speak, to the Elders of the People, for peace. I wish to speak."

The gecko-girl cocked her head to one side. "The Word issues from the Mouth—*David*. There is only one place to speak to the Elders: in the place of the Word. It does not matter where you came from. You must come to the gathering in the House of Leaves."

* * * *

I have come to understand that the young *human,David,* is possessed.

Maybe he is Young Torias the Speaker—for Torias was born within the sacred Mouth amidst the songs of crystals, so filled with the power of the Word that he could not hold his tongue for anyone, not until the Word's coursing energy wore him away to an early death.

A man of skin and hair, like one of the People? I would have thought such a thing impossible, but that was when I believed the sacred Mouth unique, and the gift of the Word due only to the People. Yet now I have beheld the Mouth of the Heavens in its true form and vastness, no longer merely the Flower of the Over-dark it appears from the treetops of the Lands—and I find I have belittled its true power. If the *humans* have emerged from it, then perhaps they too cannot hold their tongues, for who can control the might of the Word once it has been released? So it surely is with *David,* and I pity him the wasting death that comes to an overused vessel of the Word, even as I envy him what he must feel, being so taken.

Yesterday, when I told him to come to the House of Leaves, I was so certain: There before me stood one taken by the Word, asking to speak, nearly shaking with its force passing through him. Let him come, I thought, and he shall have what he desires and bring word of the Mouth of the Heavens to the People. Yet now I wonder if it was only my own desire to end my Trial, to say what I needed so I might return home to the Lands with my Tale.

Today High Elder Sarinu-mudi heard me speak of my journey. We stood within the lips of the Mouth of Singing Crystal, where the slightest claw tap is transformed into echoing music. Before him I felt like a blaspheming child—worse, a heretic. Lucky indeed to receive his patience and tolerance, luckier, that he has seen fit to grant my request to appear in the House of Leaves and to have my Trial judged before the People in the presence of *David* and the other simians, *Arthur* and *Monroe*.

How did young Reomus feel on his return from Trial, bringing amphibious companions from south of the Lands? The gathering speaks of him as confident, triumphant in expanding the reach of the People. Yet his companions gestured like children and did not lay claim to the Word as mine do. *David* has tried to restrain his possessed tongue—another sign that he is worthy to be heard—yet I see *Arthur* press him with simian calls, and I am afraid.

Afraid, for I am no longer a child, but not yet among the mudi, and still I shall bring strangers to the House of Leaves.

May the Word save me.

* * * *

David sweated with more than rainforest heat, standing in a dense thicket of sonamo outside the House of Leaves. As much as they'd talked in the presence of the nebula, Allayo hadn't said a single word to him since, and he couldn't for the life of him figure out why. Father knew something was wrong, but there hadn't been enough time to discuss it because Monroe had jumped to conclusions and whisked them

down here with unholy speed to meet her artificial deadline.

They couldn't afford to reveal that she was shoving them blind into their only opportunity to speak.

Officer Monroe smiled, melting in her too-pretty clothes. “I'm still impressed to see how you've turned linguistic findings into actual results,” she said. “Mouth of Singing Crystal, a cave on a mountainside, and House of Leaves, an actual place? It must have taken years of work to separate the literal from the metaphorical."

Father stared at her while sweat ran down his temples into his beard, no doubt still struggling with their linguistic problem. “Oh, yes,” he replied at last. “Years of work."

David didn't mention that when years of work failed, blind luck might also do the trick. He tried to ignore them and the two somber gecko escorts, listening instead to the musical hum emitted when the wind blew across the Mouth of Singing Crystal.

"About the official treaty,” said Officer Monroe. “You let me know once you've opened communication for me, Dr. Linden, and I'll join the discussion then."

David couldn't leave that one alone. “Not with a machine translator, you won't."

"Shh!” Father turned back to Monroe with an embarrassed smile. “Well, Officer Monroe, we won't ask you to speak immediately—I'm thinking we should let David start, since he's the one with the existing relationship with our native ambassador. If it comes to that, I'll translate for you. You've got to keep your machine translator for incoming only."

She frowned. “If it comes to that? Why wouldn't it come to that?"

"Well, of course it will,” Father said.

David shoved his hands in his pockets. “I think I'll let Allayo do most of the talking."

Officer Monroe looked surprised. She glanced at their escorts and lowered her voice. “David, that's a lot of trust to place in such a new ambassador."

"I trust her.” *Honesty* wasn't their problem anyway. The real problem was this inescapable feeling that he was missing something important, hearing words but only getting part of what they really meant.

Allayo had said several times that she was on trial, looking for a Great Tale. A Great Tale had to be one of the stories of the canon, but how could she be *looking* for one? What would she be on trial for? She was always talking about the power of sacred words, but how could he tell which ones were sacred when she was so reverent in everything she said?

He could only hope they would let him speak—and that when he did, he wouldn't come out sounding like a complete idiot.

Soon Allayo's patterned arrowhead face poked in. She nodded to him, and—of all things!—*gestured* to their escorts, who straightened and stamped feet.

David swore under his breath. Was she a *juvenile?* But how could that be, when she'd been talking to herself on the ship?

Monroe said, “Is something wrong?"

"No, nothing."

Father spoke quickly. “It's okay. David's just nervous now that we're going in—*aren't* you, David?"

"Yeah,” David said, staring at Allayo. “Sure."

A path of flat stones wound by just outside, taking them to the entrance of the House of Leaves. From the shuttle the House had resembled the humped back of some rainforest reptile; up close it was a marvel of natural-materials construction, a huge overturned basket of thick withes roofed with yarin-leaves. The entry was a circular opening—gecko-sized, so David had to stoop low and step high to squeeze through. And the space within was large enough to hold—

It was hard to tell at first glance. There were so many: Gariniki in groups on the leaf-littered floor, on enormous raised stones, even climbing along the basket walls. Probably over five hundred, more than four villages’ worth. If they ever hoped to be heard, this was the place to be.

"The High Elder is first to receive the sacred Word,” Allayo said, laying long, delicate, claw-tipped fingers on his arm. “Stay here quiet until the Word comes to you.” She cocked her head and blinked her huge eyes in a gesture of amusement. “Try very hard, *David."* She disappeared into the murmuring crowd.

Soon a gong sounded. David sat down where the woven wicker pressed into his back. The House hushed and other sounds became audible: the gurgle of flowing water, a rustling in the sun-struck leaves overhead, and the strange high humming of the Mouth, rising and falling with the winds upon the mountain.

A dull-scaled male Gariniki stepped onto a high rock at the center of the House, bearing a staff of twisted wood, and made a keening sound that gradually rose in pitch to match the windy hum.

"O-ohhhhh! Let the sacred Word take me!"

"High Elder Sarinu-mudi is taken by the sacred Word!” The reply was enormous, a simultaneous chorus from every throat in the hall that thrummed in the wall at David's back. Father looked startled, and Officer Monroe, who had barely settled, almost jumped to her feet.

The Elder rapped the heel of his staff on the rock. “On the mountainside the Mouth opens,” he cried. “Singing, singing in the winds, and the People bow down at the birthplace of the Word, and not a one but is taken with speech."

David suddenly realized that *Allayo* had said that—exactly that—in the viewing lounge. Maybe it was an invocation? He glanced at Father and found Father looking back.

Allayo climbed up to a place beside the Elder, and an echo of the Mouth's song swelled amidst the gathering, then ebbed again into silence. The gecko-girl performed a dipping bow that ran from her nose to the tip of her tail, while heads bowed throughout the crowd. Not far from where they sat, a mother Gariniki took a tiny child by the nose and bobbed its head.

"Young Allayo today returns from Trial,” said the Elder. “She shall be taken by the Word before the gathering and be judged."

Allayo raised her whistle-toned voice, and again the eerie hum washed through the gathering. “Let the sacred Word take me! The People gather in the House of Leaves before the Mouth; the Word flows through the gathering, and I speak."

The thrumming chorus responded. “Allayo is taken by the sacred Word!"

"I speak my Trial: It is a tale of strangers."

"The feet of Chares-mudi in a foreign land!" replied the gathering at once.

"No," said Allayo, "not Chares-mudi these, but strangers from far beyond the Lands: men of skin who swim through the over-dark in pools of air that they carry in shells of fired metal."

There was a pause; the crowd moved uncertainly, an absence of speech like a lack of breath.

"Beautiful golden-scaled Geya-mudi plying the River Oss?" a voice asked.

"No," said another. "The shield of Saramin-mudi, forged over an entire year!"

"Both, I tell you," said Allayo. "When you hear what I have seen, you will understand these stranger-people. They know of things beyond the reach of the Great Tales, before which even the singing crystal of the Mouth falls silent in wonder."

"Blasphemy!"

Allayo cocked her head toward that voice. "I heard much blasphemy during my Trial. My journey took me to a place so strange, the words of the Great Tales fell away from my tongue and left me silent, without means to judge."

"That's it." Father gasped, a long, tearful sigh. "Oh, David, *that's it.* God, it's been eluding me for so long...."

David whispered, "You mean...?"

"She's telling a tale—a new one she's created about her time with us. The rest of them are judging what she says in terms of the preexisting canon, deciding what to think about what she's been through. It's no wonder we never heard any Tales—I had no idea there might be a single place where both adults and juveniles could talk normally. I bet every community has something like it, though the Mouth itself is probably unique."

"What?" Officer Monroe whispered. "You mean they can only speak in here? Why?"

Father hesitated. "Well—"

"Because the language is sacred," said David, swept up as the pattern came clear. "Not just *some* words; all of them. That's why the adults limit themselves to the canonical images outside the House. And the children—well, they would have to learn it in here, wouldn't they? There's no way to learn it solely from context." Then he saw Officer Monroe's face pale and realized what he'd just said.

"You never learned it." Her voice was indignant. "That's what you're telling me, isn't it?"

"No, no, we *have,"* said Father, but too late.

"You haven't!" said Monroe. "If you've never been here before, then you can't have heard these stories before, and that means you haven't learned the language at all. You're nowhere *near* opening relations!"

"That's not true," Father retorted. "You don't have to hear the stories to speak the language—David speaks well enough to please any of these people!"

"You're lying!"

Heads were turning toward them, double-lidded eyes blinking. “Quiet!” said David. “You'll get us in tr—"

He was drowned out by a sudden roar:

"The Venomous Snake within our walls, and vile Toryx-mudi at the door!"

Monroe leapt to her feet, fumbling in a pouch at her belt. What was she looking for? A communicator, to call the evacuation? A *weapon,* God forbid?

"Monroe!” David shouted. He leapt for her left hand; Father grabbed for her right.

Allayo's voice shrieked across the surging mob of reptiles. “No! Wait!"

Then came the rap of the staff and the Elder's voice. “No! There is no venomous snake. The Elders sent young Allayo into the wilderness for Trial, and when she returned with companions, brought her to the House of Leaves, to give herself to the Word before the people."

The wave of chaos froze at its breaking-point. They managed to catch Monroe's hands, to pull her back down as silence returned to the gathering.

A voice asked, “Young Reomus returns from Trial with companions, and expands the Lands?"

"Perhaps,” the Elder said. “You shall judge as Allayo speaks."

The gathering returned to unison. “Allayo is taken by the Word, and the people bear witness."

David shook with relief as the scale-armored bodies all around settled into rest. Monroe looked angry and terrified; Father was sickly pale in the green-filtered light. Fools, all of them, to let themselves get in this deep. Okay, so it looked better for their coming out alive, now that the gathering had apparently judged them allies—or subjects—or at least, individuals not to be harmed. But the secret was out. He'd really gained nothing in stopping Monroe but a slight delay.

None of their discoveries would be enough to save the colony. If Gariniya was so sacred that it was forbidden even to the children of the People, then how could a human ever be accepted as a legitimate speaker?

Really, Allayo was the only reason they'd been allowed in here at all.

What *was* it about Allayo? If she was adult, why had she used signs with the escorts? But if she was juvenile, why had she spoken in his presence before seeing the Mouth? The more he understood, the more confusing it all became. He sank back to the wicker wall as she began to speak.

"I left the Lands of Leaves and broached the great Desert, intending to seek the Path of Ice in the mountains beyond,” she said. “But beyond the salt-line break I discovered a strange glinting thing, open at one end like a spent sonamo pod, yet large enough to enter. My blood already sun-simmering, I took shelter there, but the pod fell shut and from behind a wall emerged a strange, simian man."

"The bearded wanderer from beyond the Lands importunes with his tongue,” said several voices.

Which had to mean Father. David flushed in embarrassment.

"Yes,” said Allayo. “I fell back, drawing my Trial-knife with little hope, but he did not attack. He waited, strange skin like soft leather slickened with mist. I invoked Krios-mudi and Poryfas-mudi, in vain. When I called upon him to show the courage of young Bedorel, he opened his mouth and trespassed on the

Word, so I turned my back. I thought he had gone, but he returned with worse.

"'I must ask you to come with me,' he said—as if he believed himself a child in the House of Leaves, or as if the Mouth had opened at his back."

The gathering shifted with breaths of shock.

"I bowed down on the knife-metal floor and made signs of holy cleansing. It was then that the pod shook and rose into the air, a wind vessel bearing me away."

The entire chorus had an answer for that, which resonated into David's back. "The wife of Samior-mudi the Elder, stolen by enemies!"

"No," said Allayo, "though so I believed then. Further in, the vessel was rich with pillowed seats and shining lights. It rose and rose until the over-dark seeped in amidst the emerald air, and there, in the well of deepest black, lay a House of Metal to which they brought me. There I endured a cell like beaten shields, leafless and without free-flowing water. In my dreams, I found the Mouth stopped. In my waking hours, my captors showed me vile instruments of blasphemy."

David shook his head at that. No wonder her reaction, then. Was that how she interpreted a machine that could speak?

"I mourned," she said, "until a day when a young one came, silent as an obedient child: no sociable words and yet no blasphemy, only a beckoning hand. We walked the House of Metal to its great windows, and before me the over-dark flowed, sparkling with its stars like the River Oss in sunlight. Then this one pointed, and I fell prostrate, for in the darkness I saw a Great Mouth, made of air and light."

The crowd gasped as one, a sound underlayered with the rustle of scales and wicker and the continuous hum of the mountain's Mouth beyond the walls.

"Nezumas-mudi felt fear before the multitude!" said a voice.

Allayo waved a hand. "No, this is no lie, for you yourselves may see the Mouth: It is the Flower of the Over-dark, which these men call the *Maken-li nebula*. And as from afar the Mouth of Singing Crystal appears a bright speck on the mountainside, so from afar the Mouth of the Heavens appears a bud of pink, like iriyas before it unfurls. This, our home, is our House of Leaves, standing before the Mouth of the Heavens."

Amidst the murmurs of the gathering, David heaved a sigh. Somehow the saddest thing about this was how much they *had* learned. Here in this place Gariniya was no longer a puzzle to be solved, something to be recorded, watched on a screen, then transcribed and analyzed in bits and pieces. In these voices it lived, every last name and obscure reference a part of the whole. While speaking, Allayo stood rapt, creating her tale like reverent poetry. Taken by the Word, there she stood, in the center of it, while humans could never hope to be anywhere but outside.

Allayo turned to look at him. "And then I understood these men, these *humans*. From the Mouth they emerged, and therefore they speak—like young Torias the Speaker, so possessed by the Word that only death could stop his tongue."

"Possessed!" David whispered, fascinated.

"Maybe that's what they mean by 'taken by the Word,'" said Father. "Maybe we could turn this to our advantage. I'll go up and speak with them, and—"

Despite his own temptation, David interrupted. “And *what,* Father? We don't know enough to be sure. They could well decide you're insane!"

"But surely...” Father's voice trailed off.

Atop the rock, Allayo bowed to her knees; the Elder put a hand on her head and rapped his staff. “I call the gathering to judge,” he said. “Young Allayo went forth silent from our Lands, a child untouched by the full force of the Word, fresh, untaken."

The gathering almost sighed. “Ah, the innocence of the child Allayo!"

"Her Trial took her to places unknown, forcing her to rest among blasphemous strangers and to bear witness to strange wonders. And see! The seed of the Word drinks in the new, as a plant drinks water and grows strong."

"Soon, the Word shall burst forth in its full flower,” said the voices.

"And now you have heard her Tale. Shall she henceforth bear the Word forward into the ranks of the mudi? If any among the mudi believe nay, speak now—or, bow to the flower of the Word that has opened before you."

The ensuing silence of the gathering felt like an explosion in David's head. That was the missing social component: what exactly it was that *made* an adult, bringing about the change from silence to speech. The Trial. A voyage of discovery for a child not yet restrained by sacred responsibility, giving her a single chance to do something totally unprecedented, to prove herself worthy to speak. That was the treasure he had found—and it was his chance.

Before he knew it he was on his feet, pulling free of Father's restraining hands. He half danced across a dirt floor packed with Gariniki who flicked feet and tails away from his footsteps, climbing the rock just as the Elder declared:

"I say young Allayo is no more; the Trial ended, she is Allayo-mudi before the gathering."

"Honor to Allayo-mudi!” The response washed over the central rock.

The Elder blinked at David. “Possessed One, say what it is that you bring before me."

"I am David, son of Arthur Linden, who importuned with his tongue.” A thrill of fear and anticipation nearly unbalanced the deep bow he offered to the tiny Elder. “I bring a Tale, if you will hear it.” He held his breath.

The Elder considered for a long moment, but at last he stamped his staff on the rock. “Young David today stands before us in the proper place,” he called out. “He shall be taken by the Word before the gathering and be judged."

David looked around at the House of Leaves teeming with the People. Here he stood, finally at the center of everything Garini. These people already understood that their lives balanced on the Word, on the Tale that stood at the intersection of youth and maturity; surely they could understand that the lives of dedicated colonists and the safety of this beautiful world could balance on a legal deadline that now stood at the conjunction of Word and word. They *would* understand, if he could tell his own Tale truly.

"Let the sacred Word take me,” he said.

He had forgotten the low, insinuating sound of the Mouth, but at once it arose in hundreds of keening

voices, singing in his body and penetrating his head. He waited for it to recede.

It continued.

This wasn't right—before, with the others, it had disappeared immediately. Did he have to say something? His ears were ringing; his heart began to hammer in panic. There *was* something—he'd remembered it a moment ago—God, what did he have to say to make it stop?

Allayo was looking at him, all golden eyes and emerald scales, beautiful and alien. She had said the words—but she would not prompt him now. She was whistling along with the others.

Through the waves of sound he fought to find his way back in, to put himself in her place, standing on the rock. But then a different vision slipped into his mind. He stood amidst a gathering of Gariniki with all the leaf-green planet beneath his feet, while before him the throat of the nebula opened on a river of light that filled him, poured forth from his mouth and illuminated all of them.

He opened his eyes and found the words:

"The People gather in the House of Leaves before the Mouth; the Word flows through the gathering, and *I can speak*."

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Special Feature: **HOOK, LURE, AND NARRATIVE: THE ART OF WRITING STORY LEADS** by Richard A. Lovett

The most difficult part of any writing project is the opening. That's hard enough for articles like this, but it's vastly worse in fiction.

Beginners are often taught that the opening's job is to hook readers and draw them into the story. The reality is it's more like advertising. Yes, you'd like to catch the undecided, but you also need to let them know what you're selling. To push the metaphor, if it's used cars you're selling, there's no sense trying to hook computer shoppers.

Reporters have a concept called the five Ws (who, what, where, when, and why) that they're trained to include in every article. A good news lead incorporates as many as possible. For example: “Yesterday, President Bush broke his collarbone mountain-biking on his ranch in Crawford, Texas."

The purpose is to let readers know what the story is about so they can decide whether to read further. (And in case you're wondering, Bush mountain-bikes but, as far as I know, has never broken a collarbone.) In fiction, the opening serves a similar purpose: if you're writing experimental mainstream, you really don't want an intro designed to hook fans of action/adventure. That gives us:

Rule 1 of fiction intros: make sure the intro matches the tone of the rest of the story. In other words, if you aspire to crisp conciseness, don't begin with a baroque flourish. Consider the start to Ed McBain's 1955 short, “First Offense":

He sat in the police van with the collar of his leather jacket turned up, the bright silver studs sharp against the otherwise unrelieved black. He was seventeen years old, and he wore his hair in a high black crown. He carried his head high and erect because he knew he had a good profile, and he carried his mouth like a switch knife, ready to spring open at the slightest provocation. His hands were thrust deep into his jacket pockets, and his gray eyes reflected the walls of the van. There was excitement in his eyes, too, an almost holiday excitement. He tried to tell himself he was in trouble, but he couldn't quite believe it.

McBain is advertising a character study of a punk with an attitude, done in stripped-down, detective-novel style. I wanted to know why this kid thinks being arrested is so exciting: enough that I immediately bought the collection, *Learning to Kill*, in which this was the lead-off tale.

Rule 2: Know when to show and when to tell. If there's one rule that budding science fiction writers have drilled into them, it's *show, don't tell*. But that's not as hard-and-fast as it sounds. Look again at McBain's intro. Everything comes directly from the author, but note how beautifully he sketches his character. The line about the mouth like a switch knife (a switchblade) is “telling,” but it gives more in one perfect simile than a thousand words of showing.

Classic literature often did the same. “It was the best of times, it was the worst of times,” begins *A Tale of Two Cities*, and what literature student can forget it?

Admittedly, it's easier to get away with this in real-world settings. If a story opens by informing you that every Friday evening, Joe Jetset hops in his Ferrari and lane-weaves down the freeway, sowing road rage behind him like psychic exhaust, it may be overwritten, but at least you know what it's about. In science fiction, the reader would have to be brought up to steam on the futuristic counterparts to Fridays, Ferraris, freeways, lane-weaving, road rage, and exhaust. That's a lot of telling, which is why “telling” intros are often unsuccessful.

But even in science fiction, showing isn't always better. Few readers think Heinlein blew it when he started *Stranger in a Strange Land* with the line, “Once upon a time there was a Martian named

Valentine Michael Smith."

Rule 3: When it comes to opening sentences, longer isn't better. One of the most famous opening lines of all time is *Moby Dick*'s: “Call me Ishmael.” Three words, that's it. But everything is right: the name recalls a Biblical character who in Christian and Jewish tradition played second fiddle to his half-brother Isaac,[1] and the “call me” bit lets you know that “Ishmael” is deliberately alluding to the Biblical story (although today's readers won't pick that up as readily as those of Melville's time).

[1: In Islamic tradition, Ishmael plays a more central role, but Melville's audience wasn't Islamic.]

Novice writers generally cram introductory sentences with too much information. This is based on the (probably correct) presumption that most readers won't quit in mid-sentence, and the (incorrect) presumption that if you throw out enough hooks, one will catch. Here's an egregious, made-up example:

"Yipes, spiders!” Joe yelled, as he yanked his hand back from the woodpile, remembering every horror story he'd ever heard about the creatures that lived there, trying to recall whether they were called hobo spiders or violin spiders or something else and whether their bite really could cause you to lose a hand to gangrene.

Here it is, written as six sentences, rather than one:

"Yipes, spiders!” Joe yanked his hand back from the woodpile, remembering every horror story he'd ever heard about the creatures that lurked there. What were they called? Hobo spiders? Violin spiders? Could you really lose a hand to gangrene if one bit you?

Still not deathless, but at least you can read it without drowning in subordinate clauses. If you're looking for a corollary to the general rule, it's that after the first few words, “as,” “-ing,” and prepositional phrases aren't your friends.

Rule 4: Hint at good things to come. McBain did this in his intro. Why does his punk protagonist think being arrested is such a holiday? What's his crime?

McBain takes more than a hundred words to start dropping hints that all is not normal, but in science fiction, it's often possible to do so from the opening line. Here are intros from three of my own stories:

On the second-luckiest day of his life, Bill Johnston was on his balcony, tending his vegetable garden.[2]
Albert Barnett was on his thirty-eighth blind date of the week and finally feeling comfortable with the process.[3]
It all began the morning the spammers hit my Hal 9000 alarm clock.[4]

In each, the hook is that something unusual has happened. Why is this Bill's second-luckiest day? What happened on the first? How can Albert schedule that many blind dates in a week? How can an alarm clock get spammed? (And why does anyone own something as cheesy-sounding as a Hal 9000 clock?)

Rule 5: The introduction must advance the story. Remember the five Ws? In fiction, you usually have only three elements to work with: character, setting, and conflict. The Hal 9000 intro hinted at a conflict with spammers. This intro does more than hint:

I'd always wondered what it would be like to be dead. Not that I've been in a big hurry to find out. And certainly not three times in one day.[5]

So does this, for a horror story I sold to a webzine:

Death was piloting a shiny, black Ford Expedition, although Duncan Jones thought he was the one in command.[6]

You can also start with character, setting, or a mix of the two. And since, in science fiction, you're working in the realm of all that is possible, the setting can include time, as well as place. This one, which I

wrote during the run-up to the 2008 Olympics, did that very explicitly:

Michael Hood's quest for the 2068 Olympics began when he was six weeks old. Of course, it wasn't 2068 at the time. It was 2041, and Michael's parents were getting a routine assessment of his GeneChievement profile.[7]

[2: “Tomorrow's Strawberries,” May 2005.]

[3: “Brownian Motion,” July/August 2003.]

[4: “Tiny Berries,” September 2003.]

[5: “The Sands of Titan,” June 2007.]

[6: “The Road to Heather Cove,” *Abyss & Apex*, 2nd quarter 2007.]

[7: “Olympic Talent,” *Nature*, 5 July 2007.]

Rule 6: Be leery of opening a story with a quote. The problem is that the reader knows nothing about the speaker or the setting, so the quote just hangs in a vacuum. For example:

"Have a nice day,” Bernie said, as he gave the customer her change.

This may not be a no-hoper, but you'd better salvage it quickly, somehow telling me why I should care about this routine-sounding exchange. This might work:

"Have a nice day,” Bernie said, as he gave the customer her change.
The Betelgeusian lobsterette clicked her claws in reply, then deftly snipped the head off a hamster and popped it in her mouth.
Bernie missed the good old days when a pet store sold animals that would be loved for something other than their flavor. “Damn it!” he exploded. “How many times have I got to tell you to do that outside? Can't you read the sign? No blood on the counter."

Now, the routine-sounding first line serves as counterpoint to what follows, giving it a reason to be there.

Usually, though, you're better off with a bit of rearrangement to get the quote out of the first line. Consider this one:

"I'm sorry, Mr. Dappelmeyer, but I can't sell you a ticket for that train,” the clerk said.

Now, let's give it a bit more context:

Herbert Dappelmeyer was the first victim.
"I'm sorry, Mr. Dappelmeyer, but I can't sell you a ticket for that train,” the clerk said. Her demeanor was normal but her knees were trembling so much it took two tries to find the toe switch for the silent alarm. Her name was Ginny and in six months on the job, she'd never before been afraid of a customer. But then Herbert was her first Red.[8]

[8: “Weapon of Mass Distraction,” Jan/Feb 2004.]

If I haven't gotten you with that, you're not in my target audience (see rule 1), and it doesn't matter.

Here's another example of what happens when you save the quote for a later sentence:

The dragon at the door had the voice of a sorority girl. Maybe, beneath the latex mask, that's exactly what she was. “ID please,” she chirped, revealing disturbingly realistic fangs. What little of her face wasn't concealed by the mask was dusted with glitter that winked in the moonlight.[9]

[9: “Zero Tolerance,” October 2005.]

I probably could have sold this story if I'd started it with the quote, but it's a lot better this way.

That said, you may be able to get away with a really short quote, especially if it triggers a universal emotion. That's why *"Yipes, spiders!"* could work. But, *"Hello," George said into the phone. "Hello? Hello?"* doesn't have much chance, even if it turns out that the bad connection is because the call's coming from Alpha Centauri.

Rule 7: Beware of single-word introductory sentences. These are seductive because you can make them sound very dramatic, read aloud. But on paper, they're usually the essence of dull. For example:

Geology. To most people it's just rocks, but Amy knew that actually it was everything that goes into rocks, from magma to erosion, from the Earth's core to its crust. Rain and sun and the slow dance of plate tectonics.

Now, let's drop the first "sentence":

To most people, geology is just rocks. But Amy knew it was far more than that: it was everything that went into them, from the Earth's core to sun, rain, and the slow dance of plate tectonics.

The original focused on rocks. This one focuses on Amy. Which would you rather read about?

That said, single-word introductions may not fail if they convey emotion, character, setting, or conflict. But it had better be a universally understandable emotion. To wit: *Ants. Stewart hated ants.* That (shall we say) has legs. A few too many for Stewart, but that's his problem.

Rule 8: The hook needn't be in the first sentence. There's a tendency to think there are ideal opening lines, just waiting to be discovered. This isn't my experience. You can and should sweat bullets over the flow and meter of your opening, trying to get it to lead into the story, rather than blocking people out of it. But sometimes, the opening line is simply a door.

Look again at McBain's intro. The killer line is the one about the "mouth like a switch knife." He could have led with it, but he saved it, until he'd established enough of the setting that you're ready for it.

Rule 9: Sometimes you write the story to fit the opening. This is an instance in which the really cool opening line is indeed the hook, but the first person hooked is yourself.

This line came to me after I'd heard a lecture on energy reserves:

The last gallon of gasoline was consumed on May 22 of a year best left to the imagination.

I had no idea where it was going, and it took months to figure it out. It became "Dinosaur Blood" (Jan/Feb 2006).

Similarly, my story "A Deadly Intent," began with a challenge from my coauthor Mark Niemann-Ross to write a story beginning with the line, "Courtney Brandt's skin was warm to the touch but the position of her body indicated a core temperature of 0 degrees C." Ultimately, we used a slightly different opening, but the story grew out of that line.

Rule 10: The best introductions gain meaning after the reader has finished the story. *Jane Eyre* begins simply: "There was no possibility of taking a walk that day." The reason, the story continues, is because it's raining. It seems incredibly ordinary, but to *Jane Eyre* fans, it's a perfect reflection of the Jane they will come to know: restless, hemmed in, frequently blocked by external circumstances from doing what she wants.

The same applies to "Call me Ishmael." Nobody would remember the opening if it weren't for the whale and Captain Ahab.

Rule 11: If the rest of the story is good enough, you can break any of the rules. Sometimes that means you couldn't find the perfect opening and have to settle for something merely serviceable. But on rare occasions, rule breaking is the best way of producing something special. There's no easy way to teach that. And it's only by knowing and understanding the rules that you know how to transcend them.

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Reader's Department: **THE ALTERNATE VIEW: ALL ABOUT TELEPORTATION** by John G. Cramer

At the invitation of publicists for 20th Century Fox, I recently spoke to a movie audience about teleportation as it appears in fiction and in real physics. The occasion was a preview of the new science fiction film *Jumper*, which was being shown several days before the official opening to a group of Microsoft employees in Seattle. *Jumper* is based on the young adult novels of Steven Gould. Although the film was largely ignored by movie critics, on the following Friday it opened to become the most attended film of the week, chalking up a $32 million gross.

The premise of the film is that some individuals are born with a rare innate talent, the mental ability to create a wormhole and use it to transport themselves (and other people and objects) to elsewhere on the planet—for example, to the flat spot atop the head of the Sphinx in Egypt for a picnic or to the interior of a bank vault to make a quick withdrawal. In the film, the creation of the wormhole is fast and almost seamless, but it leaves behind a "jump scar" that can be reopened by others, if they act quickly, making for tricky interactions between the teleporting "jumpers" and their ancient "paladin" adversaries.

I had the task of connecting this fanciful SF premise to the literature that preceded it and to the real physics that is relevant to teleportation. In this column, I want to explore these connections.

* * * *

The Literature of Teleportation

Teleportation is nothing new in the literature of religion. The New Testament tells us in *John 6:16-21* that shortly after Jesus walked on the waters of the Sea of Galilee to join his disciples in a boat on storm-tossed waters, he teleported the lot of them, boat and all, to the safe harbor of Capernaum, at the northern end of the Sea of Galilee. Later, in *Acts 8:38-40* we are told thatPhilip the Evangelist, just after converting an Ethiopian eunuch to Christianity, was teleported from his location on the Gaza-to-Jerusalem road to the town on Azotus, about 15 miles away. Not to be outdone, the *Quran* describesthe phenomenon of Tay al-Ard (folding the Earth), in which you raise your feet and wait while the Earth turns under you until you reach your desired destination.

My own first exposure to the teleportation concept was as a teenager reading the Golden Age science fiction of A. E. Van Vogt in the *Null-A* series, published in the *Astounding Science Fiction* magazine of John W. Campbell Jr. Van Vogt described how his protagonist Gilbert Gosseyn used his "double brain" for teleportation, employing a process called "similarization." Gosseyn's special nervous system was able to memorize the structure of a patch of ground or floor to "twenty-decimal similarity" (whatever that means). After that, as long as the memory of that location remained sharp in his auxiliary memory, Gosseyn could teleport himself to that memorized spot whenever he wanted. That made Van Vogt's convoluted plot lines move along very nicely.

In Arthur Bester's classic *The Stars My Destination*, adepts routinely teleport over distances up to 1,000 miles by a process called "jaunting." The culture would like to *jaunte* over interplanetary distances if they could just learn how. The post-humans in Dan Simmons recent novels *Illium* and *Olympos* routinely use personal quantum teleportation. In Iain M. Banks' Culture series, wormhole-based teleportation is widely used. Michael Crichton's 1999 novel and subsequent film *Timeline* describe an experiment in large-scale quantum teleportation that unexpectedly developed into a time machine connecting to the medieval France of 1357. On the recent fantasy side, Harry Potter and his magical friends have several ways of implementing teleportation: using apparition, floo powder, and port-keys to bypass the bother of normal travel.

* * * *

Teleportation and Extra-Dimensional Physics.

The notion of other dimensions has been a recurrent theme in science fiction, from Wells and Lovecraft to Robert Heinlein's *The Number of the Beast* (in which two extra time dimensions, tau and teh, give access to alternate universes), and James P. Hogan's *The Genesis Machine,* in which two extra spatial dimensions (hi-space) are exploited for instant communications, gravity control, etc.

In 1919 the German physicist and mathematician Theodor Kaluza noticed that when he solved Einstein's equations for general relativity using five dimensions instead of four, Maxwell's electromagnetic equations popped right out. The extra dimension added the electromagnetic force to the standard theory of gravity. The question was, how could there be such an extra dimension that had escaped our notice? In 1926, Oskar Klein pointed out that if this dimension was "rolled up," i.e. connected back on itself on a very small distance scale, it would be invisible, yet could provide electromagnetism. This Klein-Kaluza notion of hidden, rolled-up extra dimensions has more recently been used by string theorists to describe not only the electromagnetic force, but also the strong and weak forces, providing promise of a "theory of everything" that describes all particles, forces, and interactions in the same framework.

One "side effect" of such hidden dimensions is the possibility of shadow matter (sometimes called mirror matter), an additional type of matter that would interact normally with its own matter-type but would "ignore" ordinary matter, interacting with it only through the gravitational interaction. Thus, in a sense, such extra "hidden" dimensions may allow the existence of parallel universes to which one can "teleport." Changing normal matter to shadow matter looks like teleportation between parallel universes. My own hard SF novel *Twistor* used this concept as a premise. Apparatus in a University of Washington experimental physics laboratory unexpectedly rotated normal matter into shadow matter and vice versa, causing objects and people to disappear and to be transported to an Earthlike shadow world. Therefore, extra dimensions are one physics-based way of accomplishing teleportation.

* * * *

Quantum Teleportation

Quantum teleportation, which has received a lot of discussion by science writers lately, is *not* about making a quantum jump to another location. Instead, it is a quantum mechanically valid solution to the problem of how to make a precise duplicate copy of a quantum state at another location. According to the rules of quantum mechanics, you cannot just measure a quantum system and use the measurement results to reconstruct the system somewhere else, because (a) the act of measurement changes the system measured, and (b) the uncertainty principle prevents simultaneous measurement of "conjugate quantities" like position and momentum that would be needed for such reconstruction. Another quantum rule prevents you from "cloning" multiple copies of a quantum system, so any duplication requires destruction of the original.

The procedure for quantum teleportation requires the following steps: (a) Create a pair of "blank" quantum systems that are "entangled," i.e., separated but linked through some conservation law; (b) mix the "teleportee" with one of these entangled states and make a number of measurements on the mixed system; (c) transmit the measurement results by a normal communication channel to the location of the entangled twin system; and (d) perform a set of transformations on the entangled twin system based on the received measurement results. If this procedure is carried out correctly, you should have produced an exact duplicate of the original quantum state in the new location. Note that the mixing and measuring have destroyed the original system.

Essentially, one is using Nature's private entanglement channel to send most of the information needed to reproduce the original system. The number of measurements needed for such teleportation is the logarithm of the degree of system complexity, which keeps the needed number of measurements fairly

small. For example, to teleport a quantum system consisting of 10,000 moles of atoms (about the equivalent of one person) to an identical state somewhere else, you would need to do only about 195 measurements on the mixed system.

I should emphasize that unlike extra-dimensional and wormhole physics, quantum teleportation is not conjecture but real physics. It has been demonstrated in many laboratories, with apparatus that actually teleports single particles and photons. Moreover, in 2006 Eugene Polzik and his team at Denmark's Niels Bohr Institute reported teleporting a very complex atomic system containing about 1012 atoms to a location half a meter away.

So how would you actually quantum-teleport people (*a la* Star Trek transporter)? I'm not sure. The problem, on the human level, is what to use for the pair of entangled blank quantum systems, on which the characteristics of the teleported person must be imposed. You'd need an entangled pair of "blank human beings" (perhaps clones of Mitt Romney?). Then maybe you'd get a huge blender, put in the subject and one blank, mix the states, make 195 or so measurements on the mixture, transmit the results, and the transform the other blank 195 times, until the teleported person pops out. But I don't think I'd volunteer to be the first test subject. There are some engineering details here than need to be worked out.

* * * *

Wormhole Teleportation

This brings us to wormhole teleportation, which is the premise of *Jumper*. In 1935 Albert Einstein and his colleague Nathan Rosen discovered that the formalism of general relativity (our current standard model for gravity) has solutions involving "teacup handle" curved space objects that could connect one region of space-time to a completely separate region. They suggested that fundamental particles (electrons, protons, etc.) might actually be such objects, with lines of electric flux threaded through them to give them electric charges. At the time, these objects were called "Einstein-Rosen Bridges," but they are now called "wormholes." (My hard SF novel, *Einstein's Bridge*, derives its title from this antique name for wormholes.)

In 1962, Wheeler and Fuller showed that such wormholes were much too massive to be fundamental particles, and that they were so unstable that if one happened to pop out of the vacuum, it would close up before even a single photon could be shot through it. However, in 1988, Kip Thorne and his student Mike Morris showed that wormholes could be stabilized and that, using relativistic time dilation, they could be converted into time machines, "time holes" that connect one time to another in the same place. (See several of my AV columns on wormholes for the details of this process.)

The two mouths of Thorne-Morris wormholes are subject to a phenomenon called "back reaction," a manifestation of conservation laws. If an object of mass *m* passes through, the entrance mouth must *gain* its mass-energy (*E=mc2*) and the exit mouth must *lose* the same energy. The same is true of other conserved quantities: momentum, angular momentum, and electric charge. Perhaps the best solution to this problem would be so send some "ballast object" with the same mass, etc., simultaneously through the wormhole in the opposite direction.

The *Jumper* film suggests that the human teleporters are creating a wormhole and passing through it to another location without anything going in the opposite direction. Back reaction would seem to create great problems for this scenario, because, unless the mass-energy at the wormhole entrance was somehow contained, the wormhole mouth would explode like an H-bomb. There were also some violations of momentum back reaction involving the teleportation of a fast moving car and a double-decker bus.

However, despite these physics problems I found that *Jumper* was an enjoyable film, and I did not find

that my suspension of disbelief was stretched to the breaking point. It was fun.

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AV Columns Online: Electronic reprints of about 140 "The Alternate View" columns by John G. Cramer, previously published in *Analog*, are available online at: www.npl.washington.edu/av.

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Probability Zero: **OUTSIDE THE BOX** by Jerry Oltion

When two armed policemen came out through the airlock to haul him back inside the habitat, Todd wasn't overly surprised. He had stolen the pressure suit, after all. He hadn't expected to be caught quite so quickly, but he had known it would eventually happen.

With eyes still blinking from the intense sunlight, he took one last look at the lunar landscape. Near the underground habitat's entrance the dull gray dirt had been churned by the wheels of countless construction vehicles, and farther out the solar collectors made stark black silhouettes, but beyond those he could see the softly rounded pockmarks of old craters in soil that had lain undisturbed for millennia. He could have seen the same thing—had seen the same thing many times—through remote cameras, but standing outside with only a bubble helmet between him and the actual surface made it much more immediate. Much more real.

He switched on his radio. His helmet immediately filled with a babble of voices that stilled when he said, “All right, all right, I'm coming.” He turned away and trudged back to the airlock, his footsteps far heavier than the stolen suit's weight could account for. His grand exploration of the great outdoors had lasted less than fifteen minutes. He would probably get probation and have his RFID branded juvie until he turned 18, all for that.

"It was worth it,” he told the cops.

"I doubt that,” one of them replied. “You're in serious trouble."

"For borrowing a spacesuit?” Todd asked. “Get real. Nobody even uses them anymore. They're—"

"You're being charged with reckless endangerment,” said the cop. They reached the airlock, and both cops stepped inside first.

Todd briefly thought about running, but then he really would be in trouble. “Endangering who? Myself?” he asked as he stepped in after them. The door closed, and air began to rush into the elevator-sized chamber. It took a moment for his eyes to adjust to the dimmer light.

The cop said, “Endangering yourself, the two of us, and the emergency rescue team that's waiting inside in case one of us got in trouble out there.” The tone of his voice lowered as the air pressure rose. That didn't make any sense to Todd; the suits maintained a full atmosphere no matter what the outside pressure, but then the other cop let out a deep breath and Todd realized they were both nervous about being outside. They didn't see it as an adventure; they just saw the danger.

"You're afraid of vacuum,” he said.

"We're not afraid of nothin',” the other cop said. He grabbed Todd's arm and yanked him backward, as if that somehow demonstrated his bravery.

The airlock's interior door swung away and the cops pulled him into the prep room, where half a dozen more people stood around in pressure suits, their helmets removed. They all looked at Todd as if he were an alien. The cops took off their helmets and stared, too.

"You should see your faces,” Todd said. “All I did was go outside."

There was one person not in a P-suit, a woman about his mom's age, with an expression a lot like his mom's when he had been bad. “I'd advise you to keep quiet,” she said. “You're already in enough trouble as it is."

"Who are you?"

"Alicia Stayton, attorney at law. I specialize in juvenile mischief cases."

Todd laughed. “That's what you think this is? Juvenile mischief? Look, lady, all I wanted to do was go outside the habitat for once in my life. I didn't mean to get everybody all excited, and I definitely didn't intend to cause ‘mischief.’”

"What did you expect to accomplish by going outside?” asked one of the cops.

"Don't answer that,” said the lawyer.

"I didn't expect to accomplish anything,” Todd said. “Except see the landscape with my own eyes. I wanted to feel the freedom of the great outdoors."

"Freedom?” asked the cop.

"Yeah, freedom,” Todd said. “You know what freedom is? We used to have that before everybody got scared of their own shadows. I read about it in a book."

"Be quiet!” the lawyer said. “You have no idea how much danger you're in."

"For talking about freedom? For taking a little bit of it for myself?” He looked at the cops, at the cop-rescue team behind them, and said, “Ah. I get it now. That's what this is really about, isn't it? I messed with your authority. Well, go ahead and re-establish it. Arrest me. Let's get this into the news. Let's get people talking about freedom again. Pretty soon there won't be enough cops to keep us all inside."

The two cops looked at one another. The rescue squad took a couple of steps backward, all at once, as if they had drilled the move. The lawyer shouted, “No, he doesn't mean that!"

"Mean what?” Todd asked.

The cop that had yanked his arm said, “Do you intend for your illegal act to influence government policy?"

"Don't answer!” said the lawyer. “You have the right to remain silent."

Todd looked at the cop. He didn't like the expression on the guy's face. But Todd had just been outside, something practically nobody even considered doing anymore, and he couldn't resist saying, “Government policy could use a little influencing."

"I tried to help you,” said the lawyer. She backed up against the rescue squad, then turned and fled down the corridor.

The cop pulled his gun out of its holster. “That's terror talk, son. Trying to influence government policy through illegal acts, especially acts that endanger people's lives. That's been the definition since 2007."

He raised the gun. Todd tried to say, “Wait!” but it just came out a squeak. The barrel of the gun looked big enough to put his head in.

I just wanted to go outside, he thought.

For an instant, the tip of the gun grew brighter than the Sun.

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Short Story: **JUNKIE** by Maya Kaathryn Bohnhoff

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Illustration by Lauren Harden

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Before you can seize an opportunity, you have to recognize it....

* * * *

Matty Gurkow looked out into the eternal stars (well, cyclic anyway) and sighed with longing for them. When he'd first accepted his post aboard the *Terrapin* he had imagined that just being able to see the stars from Earth orbit would satisfy that longing, but the views changed little and with utter predictability. Every time an interplanetary craft would jet by on its way to the colonies, he would wish with all his heart that he had kept better grades in school and been a bit more careful about physical fitness.

He'd failed to make the cut as either scientist or astronaut, and so he must be content to trundle about in high Earth orbit as a hard-systems tech on a mundane, over-sized barge.

"Acquisition tech"—that was his official title. All he had acquired out here was an unhealthy taste for fast food (the only kind there was in an orbital), and an unequally unhealthy fantasy life that centered around First Contact and endless five-year missions.

Matty was a child of *Star Trek*—the seventh generation—and his quarters showed that. Models of every movie and TV starship since the original *Enterprise* flew at the ends of near-invisible nanowires from the ceiling of his quarters. His wall bore projections of space- and planetscapes. His shelves were cluttered with what he called “space swag"—artifacts collected from some of their recoveries that held absolutely no appeal for anyone but Matty Gurkow. His five crewmates thought him a complete dweeb. They were absolutely right. But he wasn't merely a dweeb—he was an *archetypal* dweeb.

The six-person team worked in three shifts of pairs, trading off pairing so as to avoid “personnel problems.” They rotated planetside every two months for two weeks.

Matty was using his shore leave to further his education and his health. He would get off this barge one of these days and emigrate to one of the colonies where exciting things had at least a possibility of happening. Things more likely to result in seeking out new worlds, as generations of Trekkers had dreamed of doing. He was looking forward to his next shore leave, during which he would complete the residency requirement for his bachelor's degree in astroengineering. Something that would bring him one step closer to being qualified to maintain and repair propulsion systems for exploratory craft.

"Doin’ your homework, Matty?"

Matty glanced up from his notebook to see his shift-mate, Janine Dukakis, peering over his shoulder.

"Yeah.” He held up the pad. “Orbital mechanics."

"Aren't you already an orbital mechanic?"

"Very funny."

Janine plopped down next to him at the scanner console and looked out on the vast sweep of stars visible beyond the wrap-around “window” of the bridge. It wasn't a window, really, but rather a viewscreen of sorts. You could get the realtime external view, but you could also get magnifications up to one hundred times in any direction, or a tactical display, which came in real handy for tracking EVAs.

Just another of the things *Star Trek* got right.

"You ever dream of going out there, Janine?" he asked her. Janine was new to the crew of the *Terrapin,* and he knew very little about her except that she was pretty in an unconventional, no-nonsense sort of way and had a laugh that could peel the paint off a bulkhead at thirty paces.

She flipped her long, dark brown braid over one shoulder. "Used to. Not so much anymore. Glamour wore off, I guess. You?"

"I'm working at upgrading my profile so I can maintain extrasolar systems."

"The stars still call your name, huh?"

"It's different out there," Matty said.

"Oh, right. You get to stare at a black void with *different* pinpricks of light. Very heady stuff."

"Yeah, but to set foot on other worlds..."

"For a couple of hours or a day, at most. Then you have to trek back again."

Matty was a little annoyed with Janine's banal attitude. To him, space was still sacred—still "the heavens."

"So what would you rather do?" he asked peevishly.

Her face lit up. "Deep-sea diving. I've been getting my scuba certification on shore leave. I figure to join a professional salvage team, or maybe study marine archaeology."

Matty tried not to curl his lip. Backward-looking field, archaeology. "I guess I'm more future-oriented," he said. "Making First Contact..."

"Oh, yeah. Like that's gonna happen here."

"No, not here. But maybe out there, on the Fringe." He raised his eyes to the view from the bridge.

The Fringe—you couldn't speak the words without thinking them in title case—was a shipboard term for the outer reaches of humanity's space exploration. The Fringe currently didn't extend much beyond the solar system, but new propulsion technologies offered the near prospect of reaching the nearest Sol-class star with its single, Earth-like planet.

Janine laughed, restricting her decibel level to merely warping local space. "You're cute, Fringe Boy. Very ... ingenuous."

Naive, she meant. Nebbish, his mom would have said.

"Gee, thanks."

"Want to know what I think?"

No, but he made an interested face anyway.

"I think no matter where you are, the chances of First Contact are slim and none. And who's to say First Contact is a good thing, anyway? It may mean the end of the world as we know it."

"Are you always this optimistic?" Matty asked before he could stop himself.

Janine grinned. “Yeah, that's me—Little Miss Sunshine. Oh, hey! We got one!” she added—a second *before* the scanner pinged.

"How'd you do that?” Matty asked, keying the “catch” up to the main screen.

Janine shrugged. “Caught the blip out of the corner of my eye. I've got excellent peripheral vision. I'll buzz the team."

She got up and moved to the communications console while Matty got the readings on the new acquisition. It was large and roughly cylindrical. A cast-off hab segment from the last Venus mission, he guessed, shaking his head. These big chunks of debris could be nasty, especially if they got to tumbling as this one was.

"Old sucker, aren't you?” he murmured under his breath.

"Huh?” Janine asked.

"Old,” he repeated, nodding at the screen. “And big enough to use the primary recovery arm."

"Siraj and Tessa are on their way to the bays,” Janine told him.

"Yeah...” Matty frowned as the HAZSCAN yipped at him. “This is weird. HAZ is picking up some sort of radiation reading."

"From an old, dead, hab module?"

"Yeah."

"Residual?"

"Active."

They stared at each other for a moment, running unlikely scenarios.

"Instrument glitch?” asked Janine, seizing on the most likely.

"I'll shield for radiation. Better have the team suit up for HAZMAT recovery anyway,” Matty said.

He turned his gaze back to the scanner. Janine had to be right. When he'd first seen it, he'd have sworn the radiation signature was coming from a point beyond their acquisition. Now it seemed to be coming from practically on top of it. Weird.

He focused the sensor array on the tumbling structure, taking measurements, calculating volume and mass, then checking their empty bays.

"It's too big for a standard bay,” Matty said. “I'll pull the bulkhead between Bays Seven and Eight. Have ‘em use that."

"Sure thing.” Janine relayed instructions to the recovery team, then headed for the lockers to help prep the EVA suits.

Matty moved the *Terrapin* into position to match the habitat's slow tumble through space. When the ship was in position he began arranging the external optics so he could monitor the operation. That's when it struck him how much this was like the maneuvers he'd watched early every Wednesday morning from the second-floor bedroom window of his parents’ house.

He keyed the optics sequences with a groan. *Matty Gurkow*, he told himself glumly, *you are a glorified galactic garbage man*.

As the optical arrays moved on autopilot to focus on the recovery bays and the target object, something on the view screen caught his eye. He glanced up and choked as a shriek lodged in his throat.

Instead of the hab unit, the outward-facing optical array—OP3—displayed a swiftly panning shot of another spacecraft. It loomed, huge and gleaming and indescribable, dominating his entire field of vision. And it was completely unfamiliar—at least, that's what his senses told him in the blurred moment that the array caught it.

"Janine!" Matty aborted the automatic pan of OP3, his fingers scrabbling over the control panel in a desperate attempt to reacquire the target manually. "Janine!" he shouted again, barely hearing his own voice above the clamor of his runaway pulse.

That was when he noticed the magnification setting on the optical array: In his panic, he'd apparently bumped it to its highest level. Whatever he had seen must have been several astronomical units away. Of course, he couldn't tell how many now with the controls all discombobulated. He'd have to view the playback and take the range and trajectory readings from that.

He reset OP3 for the recovery operation with a sigh; he was not, after all, about to have a close encounter, but still...

"You rang?" Janine poked her head back onto the bridge and glided over to him; the reduced gravity shuffle looked awfully good on her.

"The number three optic caught another spacecraft for a moment. Way out there ... somewhere..."

"So? There *are* other spacecraft out here, you know," she teased gently.

"Yeah, but this one looked ... well, it didn't look like one of ours."

She gave him a bright, inquisitive stare. "You sure?"

"Well, not really. The optics were on auto and moving pretty quickly, but I should be able to go back and look at the vid record and..."

He started to initiate a playback, but Janine put her hand over his and stopped him.

"Not before we get that old hab unit aboard, Matty. They're waiting for you to prep the bays."

"But..."

"Matty, what were we just talking about? You're all hyped up on 'what if.' Odds are you got a glimpse of one of our colonials. Right?"

"Right." He shook himself free of his First Contact fever and let OP3 resume its program. Then he slumped in his chair and turned his attention to withdrawing the bulkhead between the bays, feeling more dweebish than ever.

"It is most certainly some sort of gigantic vessel. Quite peculiar in its form." Tefkleh om Bar studied the image in his viewing tank with unconcealed excitement.

His nearest companion on the bridge of the Discovery Ship *Pride of Barfaris*, Ops Specialist Fez om AmBar, had not taken her eyes from the immense and obviously manmade object since their holo-array

had acquired it three days earlier.

"It is vaster than I could have imagined," breathed Fez. She pointed a digit at the three-dimensional display. "Surely the rotation is for the purpose of creating artificial gravity. Perhaps it is a generation ship."

"Yes, that would be my guess, given its size," agreed Tefkleh.

"Are there life-signs?" Fez was so overcome that her voice oozed out like a breeze sighing through a wind flute.

The science officer, Raus om Bar, checked his instruments for the third time. He smiled, his thin lips pulling back into a rippling curve. "Oh, yes. They seem to be concentrated in the aft section of the ark, but they are there: heat signatures, mechanical activity, the indication of communications..."

"Can we contact them?" Fez asked Tefkleh.

"Pray that it be so."

Fez accepted this as an order, and assumed a prayerful position and attitude in her jump seat, sending ardent pleas to the Supreme Being that, this time, they would encounter another race of men. They had been scanning the heavens and searching unrewarded for more than ten reigns. Two Manifestations of the Supreme Being had come and gone and still they searched, following false leads to dead ends. But this time...

Fez peeked at the image in the tank. This was most definitely a manmade craft. She was awed. How far they must have come to require such a huge vessel. She closed her eyes again, apologized to the Deity for being so distracted, and resumed her prayers.

Sometime later, Tefkleh interrupted them with a mew of frustration. "They do not respond. No matter what I send or in what frequency, they do not respond."

Fez opened her eyes. The titanic unknown continued to rotate on its long axis, its smooth, curving hull awash in the light of the distant star. "Look, Tef! Is that a docking bay?"

Tefkleh brought their craft about, matching the rotation of the larger vessel. On one massive flank, there was indeed a portal of a size more than adequate to admit the *Pride of Barfaris*. Tefkleh brought them in close to the portal, still matching rotation, then shook his head.

"I must assume the outer hull ceases rotation for docking. Attempting entry with it in motion would be foolish ... for any number of reasons."

"Perhaps if you try to hail them again," Fez suggested. "If they see our orientation, perhaps they will understand that we wish to..." She could hardly bear to say the glorious words. "...to meet with them."

Tefkleh considered this for a moment. "Well, certainly, if they were inclined to violence they would have sent out war craft or threatened us by now."

Accordingly, he pinged the other ship and sent a simple mathematical message on all frequencies. A moment later, he gasped as the message was answered with a short burst of peculiar static from the alien. Then the huge hull began to slow its rotation. In a matter of moments it had stopped and light could be seen within the docking aperture.

Tefkleh turned to look at Fez. "I believe we are being invited aboard."

Fez took a deep, calming breath. “Then let us accept the invitation."

They glided up to the ark's massive flank and navigated through the docking port into a space that was so immense and cavernous as to be mind-boggling. They barely had time to register this, however, before all light was extinguished. The holotank went dark. Completely dark.

Fez's eyes sought the aft view. It was chilling. “The stars are gone,” she whispered.

"The holotank is down,” said Raus softly.

"Can we retreat?"

"Alas, no,” said Tefkleh. “Our instruments are dead. I have no sensors by which to steer. We shall have to wait to see what our ... our new friends wish to do with us."

* * * *

"There it is! Right there!” Matty pointed at the image that flitted across the screen.

Siraj stopped the playback, then ticked it back several seconds.

"Well, it's clearly not natural,” he allowed. “But look at the bearing. Aimed in that direction—out past Mars—it's almost certainly manmade. Besides, look at the mag-level. It's got to be out on the Fringe. And pretty big."

"Not according to this range reading,” said Janine.

They looked to where she tapped a well-shaped fingernail. The range reading put the ship virtually on top of them.

"That's nuts,” said Siraj. “There's no way that's right."

"Yeah,” agreed Janine, “thing'd have to be the size of a lunchbox.” She raised a brow at Matty. “You reset the controls while the array was in motion, didn't you?"

Hangdog, he nodded his head. “I sort of panicked when I saw it. Hit all the buttons at once."

Janine shrugged. “Then it's probably just one of the deep space stations."

"But it doesn't look like one of ours,” Matty protested. “Look at this section here.” He pointed at a peculiar marking at the extreme top of the image. “That looks like some sort of symbol or letter. It's all ... sweepy and elegant. We don't put lettering like that on our spacecraft."

"Sweepy?” repeated Siraj, raising one glossy black eyebrow. “Maybe it's from the Persian States. We sometimes put Arabic or Farsi designations on our ships along with the Roman-Cyrillic ones."

Matty subsided. Siraj was right. That lovely, graceful figure could just be a blurred portion of a Persian character. He sighed and shook his head. “I'm sorry, you guys. I know I'm being a real wingnut."

Siraj put a hand on his shoulder. “You're just a very imaginative guy. But now we've got work to do. Time to start dismantling the hab unit."

Matty found it hard to raise any enthusiasm for the chore.

Seeing the downward tilt of his mouth, Janine leaved over and gave him a gamine grin. “C'mon, big guy. Just think of all that cool space junk in there. I'm sure they'll find something you can add to your little

collection."

True enough. First Contact was probably just a pipe dream, but contact with some spacer's old junk was always fun.

He looked up at Siraj. “Well, what're you waiting for? Bring me my booty, ye scurvy dogs—arrrr."

Siraj saluted him. “Aye-aye, sir.” He marched smartly through the hatch—well, insofar as one could march in low gravity.

Chuckling, Janine followed him. “Matty Gurkow, Space Pirate, sails again."

The recovery crew moved in to scour the habitat for anything that was not bolted down. It became immediately apparent that this recovery was particularly rich with rummage—some of the rooms had been abandoned almost intact, apparently due to a fast leak in an outer bulkhead. According to the computer records Matty called up on the hulk as his crew worked, the spacers had been just able to evacuate everyone successfully before a catastrophic failure occurred. He was glad of that—he'd hate to think any of his swag had belonged to someone who'd been killed in such an accident.

He watched the recovery process for a while—feeling little surges of excitement over this or that object—but after awhile his mind went back to their not-so-close encounter with the not-so-alien spacecraft. It had seemed to him that the vessel was too large to be one of their colonial craft, and too shipshape to be a deep space station. He let his mind take that extra step into the Gosh-Wow area of “what if"—what if the ship *was* alien and was even now entering their space to make contact ... or to conquer?

He toyed with the idea of looking at the replay of the sighting one more time, and had even fired up the recovery log when Siraj beeped him.

"We're done in here, Matty. Pretty good haul, if I do say so myself. We're saving the best of it for you."

"Oh, right. And what would that be—a pair of mismatched shoes?” They'd actually found a such a pair shoes the last time they'd recovered a habitat and they'd all gotten a laugh at the thought of the shoes’ owner unpacking his hastily gathered belongings only to discover he'd left those two odd shoes behind.

"Toys, my man,” said Siraj cheerfully. “Some kid left half his childhood in here."

* * * *

"We are under attack!” Tefkleh cried as the ship was buffeted by yet another barrage of unseen energy. He strapped himself into his seat and grasped the edge of the control console until his knuckles turned gray.

Fez and her fellow crewmen followed suit. From her position at the ops console, she prayed she might yet be able to return to their disabled ship some sort of power and sensory input. If this horrific attack continued, however, it would be too late.

She fought to stabilize herself, and slipped the tips of her digits into the computer's input sockets, concentrating with all her might on the virtual array of circuitry she could now “see” suspended before her eyes. She traced the sensor circuit back through its web of slender fibers to its core. What she saw confused her.

"There's some sort of damping field in place."

Tefkleh's face went to palest mauve. “The power necessary to do that—to take out all our

instrumentation—would have to be immense. We have fallen into a trap. We have been captured!"

"Then why are they bombarding us?" asked Raus. "We are at their mercy."

Even as he spoke, the damping field began to ease. Then, with a suddenness that was startling, it was gone altogether.

"They've stopped jamming us." Fez turned her full attention to the ship's controls, reaching again into the virtual web of systems. They were a riotous jumble—quite nearly as confounded as she felt. "I'll have to reset the entire system."

It took long, tense moments, but after a time, she was able to get the heart of the *Pride* to respond. One by one, the precious systems revived: life-support, artificial gravity, engines, weapons, communications, and—at long last—sensors and optics.

The holotank flared to brilliant life, nearly blinding the bridge crew. The scene it displayed when it was stable was enough to inspire horror. They were in a cavernous chamber and they were not alone. Arrayed against them, bristling with armaments, was a motley fleet of alien ships.

"Dearest Deity!" breathed Tefkleh. "Are these also prisoners of the alien ark?"

"So they must be."

Raus checked the sensors. "No life signs," he said dreadfully. "They are all dead."

"But there is light coming from that one," said Fez, pointing to a sleek, winged vessel with an ovoid bridge. "From its weapons port."

"Yes! I have it. There is some sort of power concentration there at the bow. It must be on automatic pilot."

"Captain?" asked their own weapons officer.

"Fire!" cried Tefkleh.

* * * *

Sitting at the desk in his quarters, Matty considered the collection of "pirate booty" he'd amassed. Some action figures from the latest *Star Trek* franchise (action figures that had actually been in space), a selection of holo-pics from several wishful science fiction movies, and a cute little communicator badge from the second-generation *Trek* series. Very cool.

His com unit beeped. It was Janine.

"Hey, Matty? Come to the bridge for a moment, would you? We're getting some weird readings from the sensors."

His heart picked up its pace. "That ship I saw earlier?"

"Not exactly. That odd little radiation profile we were picking up."

He was disappointed. "Oh, okay. Be there in a moment."

He started to rise when he heard a strange whistling sound. A blob of something hot splattered on his desk to lie there bubbling. It was plastic. Molten hot, green plastic.

He looked up. His scale model of a Klingon Bird of Prey was rocking from side to side on its invisible tether. Its starboard nacelle had been reduced to a melting lump. As he watched, a narrow beam of blue-white light struck the little model, spinning it around.

"Shizmet!" Matty leapt from his chair and out of the rain of boiling hot plastic.

His com unit bleeped again. "Matty," said Janine, her voice urgent, "there's a wild energy emission from your location—crew's quarters."

"Yeah. Yeah, I know."

"Any idea where it's coming from?"

Matty stepped back from his desk, his eyes going wildly to the array of model spacecraft that adorned his ceiling. The blue-white beam flashed forth again and he could now see its source. The little model spaceship Siraj had brought him from the recovered habitat was firing—*firing*—on his Klingon Bird of Prey.

"Matty?"

"Yeah. Yeah. I see it. Oh, jeez, Janine, you're not going to believe this but it's-"

She cut him off. "Matty, whatever the hell it is, it's generating some sort of intense energy buildup. I think it might be going to explode."

"Shizmet," Matty said again. He swiped the thermo-fleece blanket off his bed and threw it over the little ship. The nano-line parted and he balled the model up and sprinted for the recovery bays.

At Bay Seven/Eight he cycled the airlock and dashed in. The abandoned hab unit sat in the double bay looking forlorn. He had no time to indulge in his usual sense of romance over such things. He moved to the hab's nearest hatch, opened it, and shoved the ship in, blanket and all. Then he shot out of the airlock into the corridor and hailed the bridge.

"Jettison the hab unit!"

"What?" Siraj's voice was eloquent of his disbelief.

"I put the thing in the hab unit, in case it blows sooner than later. Eject!"

"I see what he's done," said Janine. "Do it!"

The bay doors whined like a pair of old dogs asked to get down off the sofa. Matty watched on the bay monitor as a slit of space appeared above the habitat. With maddening slowness, the doors swung fully open, the magnetic clamps released and repelled, and the old piece of junk returned to the vacuum of space, floating away with its dangerous cargo.

"We're clear," Matty told the bridge. "A little speed, if you please."

He felt the ship surge as the thrusters fired, hopefully taking it away from danger.

"Breathe easy," Janine told him. "The buildup stopped almost as soon as the unit left the bay. I'm still getting that weird little radiation reading, though. And you know what's even weirder? It's moving."

* * * *

The bridge crew of the DS *Pride of Barfaris* was silent as the enormity of what had nearly happened to

them dawned. To come seeking inhabited worlds, other races of men, and to find this ... it was almost more than Fez could bear.

"Self-destruct aborted," she told Tefkleh, her voice muted. "Securing from battle stations."

"It was not to be," said Tefkleh philosophically. "We have long felt that our inability to find other sentient life was owing to our lack of readiness. Perhaps it also is owing to the same lack in others."

"But to fail to even communicate with them. To be forced to-to destroy another ship..."

"A drone, only. There were no life-signs, although—" Raus slanted a glance at his console. "—the readings from that chamber we were in..."

Fez looked back to the data that streamed before her eyes. "Yes, they are most anomalous."

Tefkleh rose from his jump seat and moved to put a hand on Fez's shoulder. "Be patient, Fez. It is only a matter of time. This system is immense and seems to be teeming with artificial energy readings. We will make First Contact soon. I am certain of it."

* * * *

"So what do you think it was?" Janine asked him when it was all over. "Your little malignant space toy, I mean?"

Matty shrugged. "Terrorists? Maybe that's why the hab unit was abandoned. Maybe someone planted a bomb on it and forced them to jettison it. Then the bomb deactivated when it hit space for some reason. When we brought it aboard, we somehow reactivated it."

"Huh." Janine looked impressed. "Not a half-bad theory. What might have reactivated it, d'you think?"

He shrugged. "Gravity. Light. Heat. Who knows?"

"Well, all I know is, that was real quick thinking on your part." She leaned over and kissed him on the forehead, then glided away to her station.

Matty returned his half-hearted attention to the recovery crew, which had just reacquired the spacehab module. The anomalous energy reading was gone, having moved out of their sensor's range, and it seemed safe to retrieve their prize.

They'd checked all of their other "booty" carefully for even the tiniest energy signatures, then returned them to the recovery bay just in case.

Janine wasn't the only one who'd congratulated Matty for his instinct to use the old habitat and the heavily clad bulkheads of the recovery bay as a detonation shield.

Siraj had even contacted NASA to sing his praises. "Any of the rest of us," he'd said, "would've just chucked it out an emergency hatch, exposing our hull."

So Matty's mood was generally good, but all the excitement merely underscored the day-to-day boredom of life on a garbage scow. He certainly hoped the crew's commendation would look good enough on his record to give him a leg up when it came to seeking a more interesting job.

One that would put him in a better place to make First Contact.

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Short Story: **IMPRINT** by Kyle Kirkland

Some jobs require very specific qualifications—and offer very special opportunities.

Giles Bailey knew the headline was phony the moment he read it. The question was, who wrote it?

Sandra. Giles activated his legs and whirred across the small office. At his comm terminal he locked the limbs and sat down in front of the vid. “Dr. Sandra Plindolie,” he said. In a moment the green eyes and brown hair of the twenty-seven-year-old postdoc appeared on his monitor.

"Giles,” said Sandra. “Just the person I want to see. My magnetic scanners need adjusting."

"First, let me ask you about an interesting story on my news feed."

He observed a brief smile on Sandra's face. But she didn't confess at once. “I hardly look at the news—all those rumors,” she said. “What story are you talking about?"

"The one you wrote and inserted into the university's news circuit. The one that begins, ‘Prosthetic Legs Stolen—Police Baffled, Victim Stumped.’”

Sandra laughed. “Did it make you chuckle?"

"No."

Sandra stared at him. “Did it make you mad?"

"No."

"Then why'd you call me?"

"To confirm my theory. I'll drop by this morning about the scanners."

Before Giles closed the comm, Sandra said, “Wait a minute.” She bit her lip. “Why don't you lighten up sometime?"

"That's easy.” Giles touched a button on his belt, disengaging his legs. He spun around in his chair, leaving the perfectly balanced carbon-composite limbs motionless on the floor. “I can lighten up by eight pounds whenever I want."

"That's not quite what I meant,” said Sandra.

Giles couldn't tell if she was amused or angry. “I'll whir over to your lab in about an hour,” he told her. He cut the comm and the screen blanked. After smiling grimly, Giles reconnected his legs.

* * * *

Because the director of the Center for Neurobiology was having trouble with his computer, Giles couldn't get to Sandra's lab as soon as he'd promised. Professor Handen was not only a director but also one of the best-funded scientists at the University for Scientific Studies, and he had top priority as far as the Technical Help and Resources Department was concerned. Giles went straight to Handen's office.

"It was working fine last night,” said Handen, flashing his Wall Street investment banker smile. His white lab coat failed to conceal most of the Armani suit underneath. Giles was convinced that the reason Handen always wore a lab coat was to avoid being mistaken for a trust fund portfolio analyst or a young scion of a university benefactor.

"Just about everything around here is out of kilter," said Giles. "Only take a moment." He looked around, embarrassed that his self-propelled tool cart had bogged down in the plush carpet. He whirred to the cart and extracted an electro-probe.

Handen stared as Giles opened the computer panel. "This should be an easy job. Even one of the less gifted techs could do it. Why are you here?"

Giles looked up sharply. "Everyone is busy this morning, sir."

"Busy? Or afraid?" Handen leaned back in his enormous chair. Circling his head was a halo of wall-mounted awards, signed certificates, Lasker Prize mementoes, and other documentation of a meteoric and immensely successful career in science.

Giles took a reading with the probe. "I wouldn't know, sir."

A lie—Handen cowed the other techs so badly that they forgot which probe to use. Giles also felt self-conscious when Handen stared at him, but for a different reason.

Handen kept staring, as if the director was sizing Giles up. With a rail-thin torso, two slender but muscular arms, two wiry artificial legs, and a pear-shaped head, Giles often noticed people looking at him while pretending not to.

At least Professor Handen didn't try to conceal his stare. But Giles knew Handen wasn't the pitying type. The university had hired Giles on Handen's insistence, but not out of pity. And Giles knew what Handen was getting ready to say.

"I'm going to make a scientist out of you, Mr. Bailey. Science is where you belong, not swinging around a monkey wrench."

"My work is interesting," said Giles. He reached for the input circuit that he'd put in his pocket, having guessed before he'd arrived what the problem would be. After he replaced the old circuit, Professor Handen's computer booted quickly.

"No problems?" asked Giles.

Handen didn't even glance at the screen. "You know why the U.S.S. has overtaken the Ivy League and the Caltechs in science funding? It's because guys like me know how to spot talent. I find the people who make me look awfully good as I sit here in this office." The professor chuckled. "Awfully good."

Giles thought about Sandra. Maybe the professor meant it as a joke, but Giles thought the statement held more truth than Handen would have liked to admit. Rumors said that Sandra was up for an assistant professorship if she secured another grant.

"I've reserved a place for you again this semester," said Handen. "Full scholarship. What do you say?"

A tremor shook Giles's emaciated ribcage. "The same thing I said last year, professor. Thanks but no thanks."

Handen scowled. But the scowl vanished quickly, replaced by a smile. "Couldn't hide in the tech room if you were a student, could you? Well, I'll wear you down yet, young man." He rose and dislodged the cart, pushing it to the door. "Wait and see."

* * * *

"Finally," said Sandra, as Giles entered her lab. "The god of electricity has arrived."

"I got here as soon as I could. The whole—" Giles paused as he saw Sandra unstrapping a female student from the magnetic stimulator. "Sorry, I didn't know you were working."

"We're done," said Sandra. She pressed a button, and the hemispheric apparatus rose toward the ceiling and latched into place, six feet above their heads. The small room rumbled as the motor abruptly shut off.

"Well?" said the young woman. "Is my brain the same as everyone else's?"

Sandra shook her head. "Of course not. That's what makes my research so interesting. Each person's brain is unique. The same general principles apply, but there's huge variability."

The student sat up from the chair and suddenly spotted Giles. She stared at the slender body, at the beanpole legs that were covered by a thin protective fabric, and at the misshapen head that no amount of cosmetic surgery could ever fix. She looked away, embarrassed, but then seemed to will herself to look back. "Hello," she said to Giles in a child-like voice. "What's your name?"

Giles told her.

Sandra looked at the student. "Thank you for coming," she said, vaguely gesturing to the door.

The young woman didn't move. "How old are you, Giles?" she asked, in the same squeaky voice.

"Six. I look older 'cause they do experiments on me. But I'm slow so people still treat me like a child. You noticed the shape of my head, didn't you? It used to be normal but one day they put me in a vise and then they—"

"He works here," said Sandra to the bewildered student. "Now run along and I'll see you later."

After the student left, Sandra turned to Giles. "Sorry about that. They don't mean any harm, you know."

"If I keep frightening away your volunteers," said Giles, "you won't have enough experimental data to put in your grant proposal." He nodded toward a reinforced circular door, behind which was a magnetically shielded chamber. "Can I get started on the scanners?"

"Giles, I—"

"I'll get going then," said Giles. The tool kit motored forward, following a signal emitted by Giles's prosthetics. "Glad you don't have carpets in here."

"Wait. Sit down." Sandra gestured to the chair. "Since you keep frightening away my subjects, the least you could do is give me some data."

"But your scanner—"

"Forget the scanner. The transcranial magnetic stimulator is working fine, and I need to do some more TMS experiments anyway. Sit down. How about if I inhibit your frontal lobes? You're not afraid of what you might say, are you?"

Since joining the Neurobiology Center three years ago, Giles had become familiar with neuroscience, and electricity and magnetism were the same in the brain as for any electrical circuit. Electrically active brain cells generated a magnetic field and were affected by one, which allowed sensitive magnetic scanners to record activity, and TMS to stimulate it.

"Maybe later," said Giles. He whirred into the scanner room.

Sandra followed him. “Your mother called me again."

"You two are getting to be quite friendly.” Giles gazed about the room. He briefly flipped through some data charts that showed wavy oscillations, which Giles recognized were brain rhythms recorded from the student volunteers. Moving on, he stopped to examine a pen-graph attached to a magnetic field meter. The machine slowly spit out heavy-stock paper, with an inked, wiggly line indicating the magnitude of stray fields in the room. “Did you mean to leave this on?"

Sandra glanced at the meter. “No. Damn it. I must have forgotten to turn it off last night. This grant has got me frazzled."

"It's a lucky accident.” Giles switched off the machine and began scrolling through the record. “Something happened last night and this might tell us what it was."

"Giles, the source of whatever it was didn't come from this room, and since we're inside a magnetically shielded—never mind, you're the god of electricity and I'm just a neuroscientist. What I was about to say is that your parents keep asking how you're doing. And your mother is one of the nicest people I've ever met. Why don't you call her sometime? She tells me it's been three years—” Suddenly Giles thrust forward a scrawny arm. “Take a gander,” he said, pointing to the chart.

Sandra frowned. “Don't change the subject. Why haven't you ever forgiven your parents? Being different isn't so bad—look at your parents, for instance. They were certainly different, at least emotionally, intellectually. They had you and loved you despite what the gene tests predicted. Who else would have done that?"

"No one,” said Giles. “That's why I'm a unique freak. I could work the circus sideshows if those places hadn't shut down years ago from a lack of material. Look at the chart."

Finally Sandra dropped her gaze. She saw a huge spike in the chart. The time stamp read 0242 hours. “Wow!"

Giles nodded. “It's a Godzilla of an electromagnetic pulse, all right."

"How could that be recorded ... in *here*?"

"Magnetic shields aren't perfect. If an external field is strong enough it'll saturate the shield.” Giles stroked his chin with a slender finger. “This is serious."

"Probably somebody in the physics department. They've got some powerful MRI equipment there. Plenty of grant money in that sort of thing."

"No, I already checked. It's not them. And this isn't the first time something like this has happened."

Sandra looked at him. “How do you know?"

"Two times this month my SQUIBs freaked out all of a sudden in the middle of the night. Undoubtedly the same thing would have happened again last night if I had been working with them."

"What are you doing with SQUIBs in the middle of the night?"

Giles paused. “If you must know, last month I started taking precise measurements of Earth's magnetic field. Did you know the magnetic poles move around? It's kind of cool to track them."

Sandra rolled her eyes. “Only you would—but Giles, don't worry about these blips. I'm sure it's the

physics department."

"They're not willing to admit it."

"According to rumor, they're working on something big." Sandra shrugged. "Just as long as they don't ruin my equipment, I don't care."

"Rumors aren't facts. And you should care. We all should care. It might affect your experiments. My legs, too."

"Your legs?"

"The connections between my hip nerves and the controller circuits are electromagnetic. If I get caught in a field as strong as the one last night, I could end up running into a wall at full speed."

"But ... but I'm sure they only do their work in the wee hours of the morning. It'll be okay. I heard they'll be wrapping up this project pretty soon anyway. Let's just let it go."

"I don't..." Giles paused. "Anyway, I'll finish calibrating the scanners shortly."

"Thanks." As Sandra left she spoke over her shoulder. "Call your mother, Giles."

Strangely unscientific, thought Giles. He understood that Sandra was preoccupied with an upcoming grant proposal, but she usually had more than her share of curiosity.

Giles now had two things to ponder: the magnetic anomaly, and Sandra.

* * * *

A week later, Giles reluctantly admitted that Sandra may have been right.

Exhausted, he disconnected his legs and fell into bed. The occupants of the efficiency apartment on the floor above were playing loud music, even though the clock showed 0215 hours.

He'd be dead again for work tomorrow.

For seven straight nights he'd searched a circular area two miles in diameter, centered on the university's campus. Other than Earth's magnetic field and a few stray sources—such as those gigantic speakers in the room above—he'd found the magnetic equivalent of golden silence.

Suddenly his SQUIB alarm went off.

Giles leaped off the bed. In addition to the surprising strength of his wiry arms, Giles Bailey had a flexible spine, a concomitant of the congenital condition that had caused his legless birth, tiny ribcage, and the failure of his skull bones to knit properly. With his arms he dragged himself across the floor and clambered up the workbench with the skill of an acrobat.

"Ah-ha!" he shouted, glancing at the indicator.

He turned on an old CRT television set. The screen flickered. "Pretty strong interference," he muttered. This probably wasn't a false alarm, even though his apartment was near a utility substation and was one of the worst places to make such measurements.

Still, he had to locate the source. But that shouldn't be such a problem—it was strong enough to deviate a compass needle, and with the periodic use of a strong electromagnet he could find the source easily enough. It didn't matter if it was mobile, as long as it was within a certain range; his electromagnet, when

turned on, would be attracted to and follow the other magnet like a baby goose follows its mother. Giles attached his legs and gathered his equipment.

The night was dark and quiet when he went outside. A quick check revealed the general direction he needed to go—toward campus—so he hopped onto his scooter and rested his prosthetic limbs on hooks attached to the frame. He'd customized the scooter so that all the controls were on the handlebars, and a retractable stand could slide out quickly to keep him from tipping over when he had to stop for a red light. The motor purred quietly—he'd tinkered with the engine as well as adjusting the controls—and Giles flipped a switch, which retracted the stand, and then he sped off without waking the neighborhood. The heart of the campus lay a quarter mile away.

The search proved easy. It ended at the physics building. Lights shone through a couple of third-floor windows.

Giles pulled out his wireless and consulted the university's web directory. On the third floor of the physics building he found a center devoted to high-intensity magnetic field research.

* * * *

Sandra laughed. “I told you so!"

Giles sank back into his chair. He wanted to close his eyes but he was afraid he'd fall asleep.

On his comm screen, Sandra's smiling face kept talking. “Admit it—you were hoping for some sort of fascinating natural phenomenon. Like Karl Jansky found when he aimed his antenna toward the sky and discovered astronomical radio waves."

Giles sat up. “How do you know about Jansky?"

Sandra paused. “You think I'm naive about electromagnetic phenomena?"

"No. It's just that it's pretty off-topic for you."

"I know quite a bit more than you think. Such as the probable source of gargantuan magnetic fields."

"I said you were right. There's no need to rub it in."

"Just making sure you understand. No more all-nighters, okay? I should warn you that Handen noticed. You don't want to start nodding off on the job."

"That's funny,” said Giles. His on-the-job performance hadn't slipped in the least—which was why he was so tired.

"There's nothing funny about it. I'll tell Handen about the physics experiment and he'll raise hell to get it stopped. They're not supposed to work with fields like that without adequate shielding."

"You'd think they'd know that."

"Of course they know that. Why else would they work so late at night? Hoping to get away with it. But you caught them."

"I caught them,” repeated Giles.

Something bothered him about that.

Sandra's smile returned. “Before you get back to work, how about coming over to my lab? My TMS

offer still stands. What about it, Giles? Want to be free of your inhibitions, if only for a few minutes?"

"No, thanks."

The young postdoc's smile vanished. “I wish I could get you to see how special you are."

"Goodbye, Sandra. Comm—"

Before Giles could finish shutting down his comm, Sandra rushed on. “You have a special ability, and you're a special person. Take Handen's scholarship offer. Stop rebelling against—"

"Off.” The screen blanked.

Giles stared at the dark monitor.

Too easy, too pat. That's the best description of his search last night.

Suddenly a text message scrolled across his screen. “That was rude. Don't be so paranoid. -Sandra P."

I'd like to get you in that TMS machine, thought Giles, and turn off your frontal lobes, Sandra. Wonder what you'd have to say.

* * * *

He didn't forget about the magnetic disturbances, but he couldn't afford to conduct any more vigilant night-long surveillance either. So Giles rigged a detector at a good location, remote from most known magnetic sources, about a mile from his apartment. He set up a transmitter on the site to communicate with a receiver he kept with him at all times. After getting a false signal on several occasions because of an overlap with an FAA channel, he tweaked the system's frequency toward the quietest band.

Then the rumors started.

U.S.S. was always full of rumors and Giles Bailey had never paid them much attention. Rumors of research breakthroughs and big-money grants proliferated, and students talked incessantly about which professor gave the easiest tests. But now people started looking at Giles with expressions he found unfamiliar. Not pity, but contempt.

One day a message showed up at his comm. The university's psychological services had made an appointment for Giles Bailey to receive a “standard evaluation."

Giles shook his head in disbelief. He knew people thought of him as a friendless introvert and a technogeek. When did that start translating into a potentially dangerous terrorist?

Late that afternoon Sandra came into the technician room. Giles was the only tech present.

"Told you so again,” she said.

He looked up. “Told me what?"

Sandra frowned. “Overwork. The strain has begun to tell. People are starting to talk."

"They want me to see a psychiatrist."

"I know. Giles, it was Professor Handen who asked the psych center to make the appointment.” She put her arm around his thin shoulders. “But don't get scared. It's just a formality."

"Why should I be scared? I'm not crazy."

Sandra gave him a long look. “Other people in your situation would be worried."

Giles shrugged. “I'm not other people, as you've often commented."

"There are rumors about you swirling around campus."

"I've noticed. It's quite possible to insert stories in the university's news feeds if you have the skill. As you well know."

"Have you heard the rumor about the physics department?"

Giles shook his head.

"They've found a high-temperature superconductor,” said Sandra.

"When will they publish their results?"

"The paper may be published soon. Don't you realize what that means?"

"No. I know what you're saying, all right, but I don't believe it."

Sandra sighed. “You're exasperating. How can I get through to you?"

"I can ask the same question about you,” said Giles, staring at her. “You're a scientist, and a good one, too. Better than Handen, in my opinion. Aren't you curious about this magnetic phenomenon? Isn't that what drives a scientist? Curiosity?"

"Sure, I'm curious. But only about things—"

Giles finished her sentence. “Only about things you can write a grant for?"

"No. That's not what I was going to say."

"I want to learn about this magnetic disturbance, now more than ever. Because I—"

"Because what?"

"Never mind."

"I think I *will* mind,” said Sandra. “Do you hate us that much?"

"What? Who said anything about hate? I'm curious, that's all. I think someone around here is hiding something important. And they've got no right to do it. That includes you, Sandra."

In a soft tone Sandra said, “You still haven't forgiven your parents for keeping a secret."

"That has nothing to do with it."

"Giles, it has everything to do with it. Maybe you don't want to think about these things, but you should. Keeping that secret allowed them to have you—"

"Secrets are almost always bad. And, for your information, my parents didn't just keep a secret. They not only ignored the gene screen, they forged my mother's ultrasound scans. That's against the law."

"Sometimes breaking the law isn't a bad thing," said Sandra. "If a law is morally indefensible, it should be broken. Your parents thought you were worth the price they had to pay. I hate that inane healthcare cap too, and I think it should be repealed. It's deprived the world of too many gifted people."

Giles turned his frail back on Sandra and concentrated on a set of schematic diagrams.

* * * *

He paid little heed to the rumor mill, even though he was evidently very much a hot topic of gossip. Giles overheard snippets here and there, some of which claimed he had become violently jealous of certain electromagnetic breakthroughs soon to be announced by the physics department. Supposedly Giles was bitter about the physicists turning down his employment application. Nobody bothered to mention that the physics department had no openings when Giles had applied to the university.

The appointment with the psychologist proceeded as scheduled. Giles was much more tense than he'd expected to be. But the psychologist, a middle-aged man with a soft voice and a loud suit, seemed friendly. He gave Giles no feedback during the interview, and asked mostly innocuous questions.

A week passed, and though the rumors hadn't dissipated, Giles heard nothing from the university counseling service. No news was good news.

One night at 0300 hours, the remote alarm buzzed him. It took Giles several seconds to awaken. He almost shut off the power, but finally decided to drag himself out of bed and check it out. Wearily he attached his legs and rode the scooter into the night, hunting the source.

This time the trail led away from the university. A half mile from the edge of campus the signal maxed.

Giles parked the scooter on the shoulder of the road and shined his flashlight. The source was intermittent but strong, and located somewhere in a wooded field roughly ten acres in area. He didn't know who owned the property. There didn't seem to be any houses or structures among the trees, although a three-foot-high fence surrounded the lot.

Was this too easy again? Another phony? "You're not going to fool me, guys," said Giles, breaking the silence of the night. But maybe they were hoping to tire him out.

He decided to investigate anyway. Giles got off the scooter and whirred to the fence. He didn't want to risk damaging his prosthetic limbs while attempting to jump or climb over, so he disconnected his legs and crawled underneath, taking care not to get dust or dew into the sockets. He'd spent a lot of time building his prosthetics and always observed the appropriate precautions.

Several different paths snaked through the woods. Giles followed one for a while, his whirring the only sound to be heard except for the occasional rustling of a mouse and the *whoooo* of an owl. The trail dead-ended, so he turned around and took another path. At the end of this path his flashlight illuminated a wooden shack, about six feet tall, which had the appearance of a child's tree house except it was over the roots of a giant elm instead of in its branches.

A deep voice broke the silence. "Giles Bailey."

Giles flicked the beam of the flashlight around, but didn't see anyone.

The voice sounded again. "Walk over to the building."

"I don't walk," said Giles petulantly. "I whir. Who are you? Where are you?"

"Do what I say, smartass."

"Since you ask so nicely...” Giles slowly whirred to the shack. Suddenly a door opened.

"Crawl in,” commanded the voice.

Giles hesitated.

"You've been looking for something, haven't you? It's in there, so what're you waiting for?"

Another voice came from somewhere. This voice was feminine—and one that Giles recognized. “It's all right, Giles. Go in."

He crawled through the opening. The door slammed shut and the floor smoothly dropped beneath him.

An elevator, he realized.

Some distance beneath the surface the elevator stopped and another door opened. Giles got out and turned his flashlight off, since there was plenty of light, although it seemed to come from the walls themselves.

The square room, about twenty feet on each side, held a single object. Mounted on top of wiry scaffolding was a sphere of about five feet in diameter.

Giles wondered if it was another fake. Was someone at the university investigating something they didn't want publicized? And was this another, more elaborate false trail?

Running his hand along the surface of the object, Giles felt a coolness and smooth perfection he had never sensed before. He looked underneath. Part of the sphere was hollow, and the inside glowed with the same eerie light as the room walls. He slipped between scaffold poles and gazed upward. The interior appeared forbiddingly small. Briefly he poked his head inside.

The sphere hummed and both of Giles's legs kicked wildly. He fell to the ground, thrashing and flailing, until a few seconds later all was quiet.

May have damaged the prosthetic circuits, thought Giles, grimacing.

If the damage was severe, the precision limbs would take him weeks to repair. The connections between his nerve endings and the servos required electronics you couldn't find just anywhere—not enough demand for them.

Curiosity overrode the angst about his prosthetics. Maybe this wasn't a fake. Giles disconnected the legs and set them aside; he'd have to test them, but he could do that later. Looking up into the sphere, he saw a beveled edge around the rim. It'd make a good handhold.

"Can I go inside?” he asked aloud. He might just be able to fit, even though it'd be an incredibly tight squeeze.

No answer. “Well, if you want to fry me, go ahead. I'm just a cripple, I don't care.” Athletically he pulled his torso into the sphere. There were no handles, but a few vertical rows of rivet-like bumps provided enough of a grip for his agile fingers. To fit inside he had to curl up in a ball, but his spine and minuscule ribcage allowed it.

Something clanged shut.

"Huh?” Giles had not seen a door or latch below, but now he was trapped inside a suddenly enclosed container.

The humming reappeared, growing loud. Giles got warm, as if his insides had begun to cook.

He panicked. They were really going to kill him!

He had no room to swing his arms, but with fists he beat against the walls, feeling an unaccustomed surge of emotion—an overwhelming mixture of anger and despair.

But the warmth didn't grow any stronger, although he began to sweat profusely.

Soon he calmed down, becoming distracted by the glow coming from the sides of the container. The glow began to display some sort of projection map, and Giles, puzzled, studied it. He barely had room to even crane his neck, and he had to blink the sweat out of his eyes, but he could get at least a blurry view of most of the interior. Concentrating, it took him about ten minutes to guess what he was looking at, although he couldn't be sure—no opportunity to test his hypothesis.

Then he fell out of the bottom of the sphere. Getting out of the sphere was much easier than getting in, thanks to gravity and the lubrication of sweat that covered his body.

Sandra's voice cried out, “Are you all right?"

She stood over him in the underground room, along with several people whom Giles had never seen before. As they gathered around, Professor Handen entered the room through a sliver of a hatch in one corner. But everyone ignored him and stared at Giles.

"What happened?” asked Giles, groggy.

"Don't you know?” Sandra said, gasping. “My god, I don't believe it. I mean, I saw it, but I don't believe it!"

"Believe what?” Giles tried to stand, then remembered his legs were lying on the floor. He picked each one up and inspected it.

"I think one of the circuits in the left leg opened,” said a voice.

Giles nodded. He had no means of conducting a rigorous performance check, but he could tell there was going to be some malfunction. He connected both legs and stood up, though wobbly. “They'll do for now,” he said. He looked at Sandra. “Got a rise out of me this time, didn't you?"

Everyone chuckled. Giles stared, mystified. “I said something funny?"

* * * *

The hatchway led to a small lab. A dozen equipment racks lined the walls, though the racks were all empty. After drying himself with a towel, Giles followed Sandra as she entered the lab and sat down at one of the barren consoles. The rest of the people disappeared, leaving Giles and Sandra alone.

"I recognize some of these racks,” said Giles, glancing around. “Bet a few have ‘University Property’ stickers on them."

"Want some coffee?” asked Sandra.

"No. I want some answers."

"I hope you'll like what you hear,” said Sandra, giving him a sympathetic look. “Otherwise there'll be trouble."

"They'll fry me good next time?"

"No. But your career will be ruined. The process has already started, or haven't you noticed? Giles, try to understand for once—"

"I understand some of it. Or at least I think I do. Grant money is tight, correct?"

Sandra sighed. “It's not just about university endowments."

"Oh, it never is. But it just so happens that the university is sitting on a gold mine."

"We don't know what we're sitting on. That's just it. The association wants to find out ... before unveiling it to the public."

"The association?"

"It's not just the university, Giles. Listen. We don't know what this thing is, but it's almost certainly an alien artifact. Some explorer found it in Central America. He mentioned it to a wealthy friend, who happened to be an alumnus of the university. That was about six years ago, and a few articles got published on it at the time. Sensationalist articles."

"Tabloid stuff. Nobody believed it?"

"Totally ignored by everyone except those who were certain the artifact contained an alien impregnated by Elvis. After an exchange of money it landed in the hands of the alumnus, who donated it to a group of scientists and professors at the school. They formed an association to study it."

"To which you belong."

"I joined later. They recruited me.” Sandra shrugged. “They thought I was a good match for the job. I once wrote a paper about weird science. My professors castigated me, told me I had too much imagination. But the paper got me noticed, at least by people who also have some imagination."

"And you're smart. But why a neuroscientist?"

"Because we think the artifact might be a helmet. I mean, we did until you managed to crawl inside."

"A helmet?” Giles paused, lost in thought. “A helmet..."

"And the magnetic fields it generates on the inside are its way of communicating with the wearer. If their brain cells use electrical signals like creatures on Earth, then a magnetic interface makes a lot of sense. That's what I'm studying."

"Privately funded by the association."

Sandra smiled. “We try to be private. It's hard to hide a magnetic field. The underground room is shielded and the internal fields the artifact generates aren't too strong, but sometimes it also emits external magnetic pulses of gigantic magnitude. We don't know what the external magnetic pulses are supposed to do. To us they're a nuisance that gives us away."

"Didn't matter about the shields once I was on to you, and your technicians knew it. You can't hide a magnetic source from another magnet, even if you redirect the fields with a shield. There's no such thing as a magnetic insulator. My electromagnet was attracted to your shield, just the same as it would have picked up on the magnet inside if there'd been no shield."

"So now you know about us. And thanks to you, now we know it might not be a helmet. It might be a craft."

The door opened and Handen walked in. He took a sip from a cup of coffee. Apparently he'd been listening in. “Some of us had already hypothesized that very thing."

Giles said, “I could have guessed just from the maps inside."

"We never saw them before,” said Sandra. “We examined the interior with fiber optics many times, but we didn't see anything. The artifact is so small, and we never even knew it closed up like that, because..."

"Because no one could come even close to fitting inside. Until me, that is. It appears to become activated only when there is a warm body fully inside. I didn't see any hatch either, until it morphed into place after I got all the way in."

Handen grinned. “If you hadn't gone inside, I would have suggested it."

Sandra gave him a hard look. “We didn't know it was safe—"

"I figured it was safe enough,” said Handen. “And I knew you wouldn't be able to resist, Mr. Bailey."

"It moves,” said Giles decisively. “But I've got no idea what propels it. How high did you say it levitated when I was inside?"

"A few feet. It went up almost instantaneously."

"The operators may have electrical brain impulses resembling our own, but they must be able to withstand acceleration better than we can. That thing has a lot of power."

* * * *

Outside, the night had grown chillier. Giles noticed someone had taken his scooter.

"They'll drop it off at your apartment,” said Sandra. She ushered him a short distance down the road to an unlit house, where a few cars were parked.

"Giles,” she whispered, looking around. “Before Professor Handen joins us—” She stopped when she heard footsteps.

"We'll take my car,” said Handen. He indicated a Mercedes.

Giles wobbled on his damaged prosthetics, but managed to stay upright. Sandra opened the door to the back and told Giles to get in.

"No,” said Handen. “He rides up front. You ride in the rear."

After they piled in, Handen turned on an interior light and the heater, but didn't start the engine. Gravely he looked at Giles. “I'm going to repeat my scholarship offer. One last time."

"I've been thinking,” said Giles. “Maybe I ought to earn a degree, if it'll let me study things like that artifact. It's the coolest thing I've ever seen."

Handen smiled, turned off the interior light, and started the engine. “I'm delighted to hear it."

"But I'm going to tell everyone about it,” said Giles.

From the back seat Sandra groaned.

"Stubborn," said Handen, as he put the car in gear and drove onto the road. "Very stubborn, Mr. Bailey. I'd hate to lose you."

"Lose me?"

"Giles," said Sandra, "please—just join us, and everything will be all right."

Giles looked at Handen's silhouette. "Otherwise, I get arrested for being some kind of kooky terrorist. Is that right, professor? And nobody will believe me about the artifact. After all, I have no proof. And that lab ... it's going to disappear soon, isn't it? You're in the process of moving. That's why the equipment racks are empty."

Handen nodded. "We've built a better lab. Safer and more secure."

"More secure from prying eyes," said Giles. "Such as your competitors."

"Listen, Giles," said Sandra. "Think about it. Why should we alarm people with a mysterious artifact? We're studying this thing, and when the time is right and we know more about what it is, we'll go public."

Giles frowned. "That's the party line, I take it. Sure, you'll go public. When the time is right, and when the university's scientists understand it enough to file a patent on it. But you seem to be willing to play their game, Sandra. I guess maybe it's not such a high price to pay. You get to do scientific research on one of the most exciting objects anyone's ever found, and to you, and other scientists, I suppose, that's worth the sacrifices you have to make to the bean counters. Except that you've got no right to keep this to yourselves. It's not your property."

"Oh, but it is," said Handen. "Legally so, bought and paid for."

"Intellectually, it's not yours to keep to yourselves."

Handen smiled. "The law isn't very intellectual, Mr. Bailey."

From the back seat came Sandra's pained voice. "Okay, Giles, so maybe I've made too many compromises. But don't you see?

Eventually this knowledge will be shared."

"Will it? Or will they just keep on filing patents? How about it, Professor Handen?"

"Depends on what we find."

They approached the apartment complex where Giles lived. Giles hadn't realized how much time had passed while he'd been underground—the eastern sky was already yellowing. He said, "I seem to recall someone telling me that unjust laws shouldn't be followed. What about it, Sandra? Besides, if the association believed they were legally in the clear, why do they hide it? They probably realize they'd be forced to let other scientists study it and somebody else might figure out how it works first. There go the patents. And all the money."

"Don't be like this, Giles. Don't make them ruin you. They've got a lot of power. You can't fight them and win."

"On the contrary," said Giles. "I've already won."

Handen snorted. “You've got to love this guy! So much confidence.” He pulled the Mercedes into the parking lot and stopped. “Last chance, Mr. Bailey. Tomorrow—today, rather—it's lights out for you, unless I get your signature on a few private documents I've had our legal team prepare."

"I'm going to college, Dr. Handen, but not on your terms."

"Then you're not going anywhere, Mr. Bailey. Except possibly to jail, after I talk to the police—I'll find something interesting to tell them, and make the charges stick if I want. Regardless, your employment options will be quite limited. And that's a shame. I really mean that."

Sandra began to sob. “I won't be a part of this. I can't, professor. Let's just let him talk. No one will believe him—"

"No."

"We'll start even more rumors—"

"We've started too many rumors as it is,” said Handen. “People are getting suspicious. Other universities are asking questions. No, Sandra. Mr. Bailey has made his bed and now he has to lie in it."

"I won't let you.” Sandra's voice wavered. “I won't ... I'll back him up."

Handen turned around. “So we'll have to ruin your reputation too. That's just another loss we'll have to accept. And frankly, Dr. Plindolie, it's a smaller loss than Mr. Bailey here."

"Nobody is ruining anybody,” said Giles. He opened the door. “Although *you* won't come out of this smelling so sweet, professor."

"You can't prove anything, Mr. Bailey, as you've already admitted. And your reputation is in tatters. You can't win."

"I told you before, I've already won.” Giles got out of the car.

Handen's grim facade showed a tiny but noticeable crack. “What did you do?” Then, more to himself than anyone else, he said, “You couldn't have done anything. You were constantly watched. You couldn't have..."

Giles went around to the back door. Sandra rolled down the window.

"I guess you were right,” said Giles. “Sometimes secrets aren't so bad. It all depends. This secret wasn't right because the motivation was greed."

"What did you do?” asked Sandra. “Back at the lab, what did you do?"

"I didn't do anything, except be myself. As it turns out, that was enough. Don't blame yourself, you couldn't have known. No one could have guessed it."

"Guessed what?"

"That the craft could learn the brain patterns of an operator so quickly."

"But that's why we need you, Giles. In one night you helped us make a breakthrough!"

"Breakthrough,” said Giles. He smiled. “Good choice of words."

"You activated the helmet. Or craft, or whatever. That proves you're special."

"No, I think it proves just the opposite. Proves I'm normal, since it treated me like it would have treated anyone else. Here I was, thinking I was different because I look different. Everybody treats me differently, you know. But I wasn't seeing the big picture. And he—or she—fixated on me."

Sandra gaped. “What are you talking about? You think it's alive?"

"It might be a finely tuned artificial intelligence. Or it might be alive, in some sense I don't understand yet. If so, maybe the operator is a symbiont. Either way, I finally made a friend."

Handen shot out of the car. “You have no friends, Mr. Bailey. You're all alone!"

"Except for me,” said Sandra.

"I'm not as alone as you think,” said Giles. “And I bet I know what the artifact's external magnetic field is for."

"What are you talking about?” sputtered Handen.

"Brain rhythms—the oscillations in brain activity by which we process information. I've picked up quite a bit of neuroscience in my time at the research center."

"What are you...?” A look of comprehension settled on Handen's face. His cheeks began to sag.

Sandra got out of the car. “What are all those people doing?"

A crowd had started to mill around the parking lot. Some of them were waving, pointing at the sky, and talking on their cell phones.

Giles said, “My hypothesis is that it locks onto brain rhythms, once it's imprinted on the operator's activity pattern. It probably produces its own pattern, matching it to the operator and creating a sort of resonant circuit. It must be exquisitely tuned. With the resonance amplification and its powerful external fields, it can track the operator's pattern wherever he goes. Like my tool cart, only with a much more complex circuit that can identify an individual in a noisy environment."

The artifact hovered about forty feet above Giles's head. Bits of soil stuck to it and a few scratches ran along the sides, evidence of having recently burrowed through a bunker and the ground above it. Sirens could be heard from the distance.

Giles walked into the gathering crowd.

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Novelette: **SHOTGUN SEAT** by Paul Carlson

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Illustration by Mark Evans

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The most irresistible revolutions can be those that sneak up on you a little at a time....

* * * *

The phone rang at three-fifteen am. I looked at the clock, then the phone. Remembered why I felt so worn out. That cheered me up enough to grab the handset.

"Hello?" My bleary eyes couldn't make out the caller ID.

"Hey, Claude, it's Doug."

"Doug?"

My brain finally kicked into gear. Dispatcher Doug Gonzalez worked the graveyard shift at Argus Trucking. He always went home two hours before I got in, so I rarely saw him.

"Claude, my man, I called all the guys on the list. You know how it is."

I knew. Company procedure, with a specified order of phone contacts. A lot of truckers are party-hearty types when they're off duty, and it'd take an earthquake to wake them up. Doug knows it and I know it. Even so, it had been six months since he called me at night.

"So, Doug, wuzzup? Burnin' hot load?"

"Talk about hot. Some outfit called Sylvantronics took out insurance for seven million bucks! Got to deliver their goods by three this afternoon. Tell me you can handle it, buddy."

"I'd never let you down, amigo." Already I was reaching for my company shirt. "No traffic at this hour, so I'll see you in a few."

I could grab something to eat later, before or after making the pickup, depending. The suits at HQ would be ecstatic. The company gets to keep a share of those insurance premiums, but it'd be up to me to make sure nothing bad happened along the way.

I was almost out the door when Laurie woke up. "Doug called?" To my nod she added, "Don't work too hard."

After forty-three years of marriage, she knows me better than I do. I kissed her on the forehead. "Might get some overtime out of it."

Zoomed my old Camaro into the company lot with five minutes to spare. I love the cool night air, which is all too rare in the middle of a Southwestern desert summer. Inside the dispatch office, Doug had the paperwork ready. There was an unfamiliar bicycle in the corner.

I scanned it with a practiced eye. Twenty-nine miles to make the pickup, in a high-tech area, then two hundred thirty to the drop-off, way out in the desert. I'd heard of Sylvantronics and their robots, but didn't know they had a facility in the middle of nowhere. A promising development, robots, but far too expensive for my household.

"The trucking business never looked better," said Doug, with a sly grin I couldn't quite figure out. "Have yourself a fine drive."

Energy conservation always wars with safety considerations, and that year the company yard was rather dark at night. I could find my rig blindfolded, so I figured, what's to worry about?

Someone was standing by the truck. I'd been mugged a few years earlier, so I hesitated. Then, recalling Doug's grin, I kept walking.

A moment later I remembered: I was scheduled to have a brand-new trainee that day. But Lou wasn't coming in until seven am, almost four hours later.

"Mr. Dremmel?" came a soft voice. "Mr. Gonzales said I could meet you out here, by your truck."

"That's me." Was this Lou, after all?

"Hang on a sec." I unlocked the driver's side door, so the cab light cast its dim rays on the scene. There stood a young Asian woman, dressed in coveralls and a baseball cap. She wore a small backpack.

Time for some fast mental footwork. "You're, umm, Ms. Lu?"

She offered a hand. "Lu Ai-Ling. Your boss said to come in today for evaluation and training, so here I am."

We shook on it. Her hand was small and without calluses, but her grip was firm.

"Now?" I mumbled. "At...?" I had to force myself not to stare.

She laughed, sounding almost as nervous as I felt. "I know this must be unusual, but your office lady, Beryl, gave me a link to the company system. When Mr. Gonzales logged in your response at three-fifteen, my home computer woke me up." She hooked a thumb over a slender shoulder. "I live about a mile from here."

"This outfit could use more dedication like that." Sounded dumb, but I really did mean it. "No wonder Doug was grinning." I climbed into the cab and opened the passenger side door. "Possibly this is his idea of a joke."

The light illuminated Ai-Ling as she climbed into the shotgun seat. I almost did a double take, but only my eyes moved. She was gorgeous. I'm not too good at judging ages, but she couldn't have been out of high school more than five years.

Hey, I can be as politically correct as the best of 'em. Yes, there are women truckers; employees and owner-operators both. Most travel with partners, and a few work on their own. Trucking is murder on your hands, and requires long and unpredictable workdays. Not conductive to a healthy lifestyle, so maybe that's why it's mostly guys. I'd have bet a week's pay there wouldn't be many truckers like Lu Ai-Ling on the road that day.

Curious, she reached up and unhooked my CB mike. "Use this a lot, good buddy?"

"Not much, any more." I tapped Doll Box's console. "This here guide unit has data channels, proactive tracking, voice interface, all the fancy gear. Not to mention universal cell phone access." As she replaced the mike I heaved a sigh. "Trucking's not what it used to be."

She looked disappointed.

"Let's do our pretrip walkaround. Maybe Doug told you? We have a rush job today, a point-to-point run."

"Walkaround? I studied that in the manual." She showed me her Class B commercial driver's license, which was only a couple of weeks old. "My cousin Lim showed me how to drive his bobtail truck, and I borrowed it to pass the DMV exam."

Usually Argus hires Class A drivers, who can handle full-size big rigs. If this lady proved serious, she could attend our company school in Tulsa. All you have to do is sign up for one solid year, in order to pay it off.

"Since it's dark out we'll stick to the basics." I grabbed a flashlight from beside my seat and climbed out. When she followed, swinging down from her side, I could see she had her hair pinned and tucked beneath her cap.

"Smart idea with your hair." I popped the hood. "Got to stick your head in places. Now what are we looking for?"

"Fluid levels, clogged filters, loose wires and leaks, frayed belts. More, but I can't remember it all."

Good enough. "Ms. Lu, after the first couple of pretrips, you won't even need a checklist." We took turns thumping the tires. "There are gauges and sensors, but you know what? The sensors themselves can be defective." I pointed the light at a tire. "See here? The tread is working loose. Not a problem yet, but you don't want this crud flying off when you're highballing down some interstate."

"Got it."

"Then we're set to roll."

* * * *

Back in the cab, she buckled in and straightened her cap. "Call me Alice. I want that to be my CB handle."

"Like in Alice's Restaurant, or maybe Alice Kramden? It'll work." I prefer the classics. I wondered if she'd have a good opportunity to sling her handle around today.

"Hello, Alice," said the guide box. "Claude always calls me Doll Box."

Ai-Ling a.k.a. Alice was unfazed. "Is this a Keltora 3200 unit?" she asked. Most of the circuitry is out of sight, as she probably knew. "Good voice recognition protocols, and I'll bet it's got neurophasic interfacing."

Maybe it does, but before I could display my ignorance about the subject, the guide box affirmed that Alice was correct. Except, it announced, it's a 3200C unit, with better data stream integration. Told myself I owed the thing another module or two.

We had a full tank, so fuel wasn't an issue. Went through the driver's startup routines, including the breathalyzer and wakefulness tests, then confirmed our routing.

We pulled out of the yard at four-thirteen am, which wasn't bad.

Silence seemed too awkward, but I didn't want to sound like a goof, either. I'm faithful to Laurie, and don't mind who knows it. On the other hand, truckers are *required* to have excellent eyesight. There would be a lot of envious guys on the blacktop today.

The freeway was shrouded in predawn gloom. “Alice,” I asked, “do you know the roads around here? Can you read paper maps? I've had days when the GPS went kaput, so that's important."

She opened her pack and dug out an area map. “Looks like we're heading east to make the pickup.” She tapped the map with a penlight. “Exit here, turn left, easy. No commute jams in that direction, correct?"

"You are. If there aren't any accidents or construction zones. Doll Box will alert us of any major jams.” We could listen to the morning traffic reports on the radio, but I prefer music to begin the day. NewsTalk later, depending on what kind of mood I'm in. “We should be there in less than an hour. Hope the load is ready."

No sooner had I said this than the autobrakes came on. Traffic was at a dead stop ahead. I kicked in the jake brake, which clamped the exhaust stream with its distinctive rattling roar. In the lane to our right, a car almost slammed into somebody. Likely some damn fool who'd disabled his situational autopilot.

Doll Box had no comment.

Alice turned on the am radio and punched up a news station. A couple of minutes later, their regular traffic report didn't even mention the freeway we were on. The local driver's infonet had a few questions posted, but no answers as yet.

"Let's figure out what's happening.” I had Doll Box tap into the traffic cameras, but as I'd suspected, the ones up ahead were off line. Probably full of bullets. Even the tiny inconspicuous ones get zapped by handheld lasers or something. I rarely say it out loud, but with the Feds cracking down so harshly everywhere, I didn't blame folks for hitting back.

Doll Box learned that a police cruiser had all the lanes stopped, but nothing more.

"Alice, it's time to use my secret weapon."

"Your what?"

"See that compartment? The square door? Open it and hand me the bird."

Alice probably thought it was a test, or maybe some weird in-house initiation, as she didn't appear worried about my sanity. Yet. In any case, she opened the compartment.

"It *is* a bird.” She lifted a gray dove out of the recess like it was made of fine china. When it blinked she flinched, but didn't drop it. “Here you go."

I booted up a program on my personal cell phone, and used wireless to instruct the bird. Didn't want to attract attention, so I handed it back to Alice. “Open your window and let it fly from your hands."

She let the bird go, and it fluttered up and away. I held my phone where both of us could see the screen, and its real-time transmission from my trusty scout.

"Fascinating, Mr. Dremmel. Are those things legal?"

I gave her a weak grin. “Gray bird, gray area. It's a civilian prototype. If they catch on big, somebody's going to regulate the hell out of them."

My robotic dove spotted the police cruiser, then flew onward. A quarter mile farther, the problem became obvious. A tall light pole had fallen, blocking all the lanes. Luckily, nobody had gotten smashed

by the thing.

"What happened?" Alice wondered.

"A lot of valuable aluminum in that pole. Maybe it fell because some thieves messed up." I shrugged. "Might be activists or *el cheapo* terrorists. If nobody posts a rant, I'd go with thieves."

"I've heard of that before, but not around here. Times are bad, huh?"

"Us truckers see it all. Someday you can tell your grandkids."

She laughed again. That felt good.

We watched a tow truck drive up from the opposite direction, and drag the pole onto the shoulder. The cruiser pulled up beside it, maybe to look for evidence, as cars surged forward.

Alice caught the returning bird like an old pro.

Everyone rubbernecked as we passed by. The pole was shredded at the base, wicked shards forming an ugly wound. I was never in the military, but I've happened upon enough domestic terrorism to know what explosives can do.

We geared up smoothly. "My next tractor is going to have a continuous automatic transmission, or so the boss tells me. Big rigs are always last for that kind of technology."

"Cool!" Her grimace hinted she'd also recognized terrorism.

The pickup was routine. I let Alice open our trailer, unlatching the bars, then swinging them up and around. An object lesson in how physical strength is sometimes required in this line of work. She handled it well.

Our load was sealed inside three-dozen wooden crates, each set on plastic anti-vibration pads. The shipping crew wasn't totally silent, but they didn't volunteer any information either. The invoice only stated they were thirty-six production model something-or-others.

"Looks like cybernetic gear." Alice was examining the invoice by dawn's light as we pulled back onto the freeway. "Possibly new components for their robots. I've never seen these designations before." She looked up. "I know a guy who works at Sylvantronics. Maybe we'll see him."

So she knew about technology. I kept wondering what she saw in truck driving. Could be anything from a summertime lark to familial rebellion to a childhood dream. She might even have a criminal record, and be unwelcome at most jobs. I wasn't about to embarrass her by asking.

"How are you set for chow?" I asked instead. "We've got plenty of time, and a straight shot ahead."

"Sometimes I pack a lunch, but there wasn't time."

"Same for me. How 'bout we swing by that big truck stop at the crossroads? It's twenty more miles, and if you're choosey, the food won't clog your arteries within three bites."

"Sounds good. Always wanted to sit in the Drivers Only area."

Score one for Childhood Dream.

Five miles on, we got flagged to pull through a truck scale. Usually I'm waved past by the remote system.

My rig had passed inspection six weeks ago, so that wasn't an issue. I explained all this to my trainee as we cruised down the designated lane.

Our weight or load did not trigger any sensors, so we rolled on through. “We get an hour for breakfast, since it was such an early start. Company policy."

I showed Alice how Doll Box updates the log. Back when I first started driving you had to write everything by hand, on a special chart.

The diner was crowded at seven am, mostly with drivers who'd spent their off-duty time parked overnight. That place was an institutional dinosaur, straight out of the 1950s. Did my darndest to look casual, even bored, as we headed to our table. Alice was, to coin a phrase, young enough to be my granddaughter.

We both had good appetites. I considered splurging on Corn Chip Pie, and a lot of coffee to counteract its brain-clogging grease. Then I remembered our seven-million-dollar load, and decided to remain as sharp as possible. Had oatmeal and some halfway decent Earl Grey tea. Alice devoured a Truckers Special, with eggs, pancakes, vat-grown bacon, and more.

On our way outside, I decided to introduce my trainee to Laurie. They could share lifestyle tips. Heavy-duty chow wasn't leaving a mark on Ms. Lu.

"Mr. Dremmel, that was a *ton* of food. Is it okay if I jog it off? We've got ten minutes left on our break."

She must've read my mind. “Ms. Lu, I've been a trucker almost forty years, and nobody's asked me that before.” To her chary look I added, “Sure, go right ahead. But...” She froze. My gesture encompassed the vast parking lot. “Where did we park?"

She lifted her wristwatch.

"Uh-uh,” I cut in. “You might not always have a tracking gadget handy.” I'd popped that quiz before, and wasn't about to give Alice any macho freebies.

She looked around at the hundreds of trucks, and her arm traced the course of her thoughts. “That way, two rows in, left and not quite halfway up.” Next she described my rig, better than I probably could. “I'll find it."

"You passed. Off you go.” And off she ran.

Eight minutes later, hardly breaking a sweat, Alice met me at the truck. Together we checked the locks and seals. No one had bothered the load.

"This place is cool,” she enthused. “I saw one of those new boron-hydrogen cycle rigs, and a lot of biodiesel electrics, and that pallet yard next door has capacitor-powered forklifts."

I grinned. “Saw a piece on Truckers Road about some physicist, claims he found a way to pack hydrogen into metal form."

"Metal hydrogen? Like a super-compressed fuel?"

"Guess so. Said they'd prepack it, and rigs would swap out the whole fuel container. Be years until it's available. Maybe Argus will buy some."

If Alice signed on with Argus Trucking, my recruitment bonus would buy something really nice for Laurie.

Better than the plain little anniversary gift I'd gotten her the day before.

I cranked up the engine, and we rolled in low third gear.

Alice pointed to the CB mike. “Can I give it a try?"

CB had fallen out of favor, but in that busy gathering place, who knew? “Sure. It adjusts itself, signal-wise, and you can scan for any chatter."

The radio speaker came to life. “Hey Jimmy,” said an unknown trucker, “check out the seat cover in the Argus rig. Heading out the north exit."

Several voices crowded the channel. Hoots of acclamation followed, and not a few verbal leers. I didn't quite blush, and neither did she, though I wasn't sure the message had sunk in. Gawd, it was like a flashback to high school. Laurie always knocked ‘em dead. Made me feel old and young at the same time.

"Seat cover?” Alice asked me. “Lot lizard?"

"You want it straight?” She did, so I gave it to her. “You're a sight for sore eyes. A lot of those guys are wildly jealous, and half are misinterpreting our situation."

"Guess so!” She got a beat-up old booklet from her pack, looked up something, and thumbed the mike. “Alice from Argus here. That's a big ten-four, guys. Thanks for being real sunbeams this morning.” Flashed me a grin and kept flipping pages. “No fox jaws in this fleet. Maybe see you around, but we've got a load to haul. Threes and eights.” With that she signed off.

* * * *

By then we were on the freeway, headed into barren country on the next leg of our route. We'd be on the interstate two hundred miles yet, with plenty of company on the blacktop.

Alice read an e-book for a while, then tried the CB again. This time I recognized the first voice on the channel.

"Got a copy, Trucker Claude?” came a familiar query. “And who's *not* a fox jaws on board?"

She handed me the mike.

"Got you five-by-five, Pedro. My trainee is doing a fine job, I'll have you know. She's got brains, and beauty to match the foxy voice."

I told Alice, “That's Pedro Owen. Thinks he's a one man CB revival. Go ahead and chat it up."

This they did. Pedro was ten miles behind us, with another rush load for Sylvantronics. He'd picked up farther away, but skipped breakfast. We slacked off a little, allowing him to close the gap without getting busted for speeding.

Soon a third voice came on the CB. “You savages got a cartel going? How ‘bout letting an old-timer get a word in edgewise?"

It was a retired trucker and his wife, driving a solar-boosted RV. He'd been in our rearview mirror for a while. Pedro came up behind us both, placing the old guy in the “hammock” position.

"Got us a convoy?” Alice asked me, with the CB mike lowered.

She was paying attention. Good. “Heh.” I wagged my head. “It *is* possible to overdo the jargon."

Nonetheless, they chattered happily. Turned out Pedro and Alice liked the same novel, something about hackers in a cyber world, and artificial intelligence and androids and more. I'd heard of this, but really, a lot of it went right over my head. Made the time go faster for her, while I was happy with my favorite talk show. Their audience knew Trucker Claude from several calls I'd made over the years.

Around noon, I spotted a speed demon in the mirrors. Car was dodging around like everybody was standing still. He came past my rig in a flash, then swerved into our lane. Alice gave a little shout as I eased off on the pedal.

The speeder passed a rig on the right side, lost speed, then cut him off. The poor trucker braked hard and shimmied; darn near jackknifed.

"That's it!” I had Doll Box call up a twenty-second video clip from the forward wide camera. There went the speeder, license plate clearly visible. “Gotcha.” I told Alice, “We'll shoot this clip over to the state police."

"He'll claim, ‘It wasn't me driving.’ Lots of cheaters do that."

"Not to Claude Dremmel they don't.” I checked the rear camera footage, and sure enough, there was a clear view of the driver's face. Desert sun makes fine lighting.

Doll Box titled both clips and emailed ‘em. That guy probably had other complaints on file by then. If so, Smokey would seize the car, and the jerk deserved it. Almost as bad as a red light runner.

"Are we going to have lunch?” Alice asked.

Ah, to have such a youthful metabolism. “Look around. Nothing but empty desert. We'll catch something at the junction."

At two o'clock Beryl emailed me from the office, to ask what the holdup was. “Holdup?” I responded, with Doll Box transcribing my voice.

I told Beryl we had an hour until the deadline, and thirty-five miles of road left to cover, so what was the problem?

"Deliver the load, and don't say anything about being late,” was her directive. Familiar advice from a thousand previous screw-ups. Did not like the sound of it, but so far as I could see, everything was going right.

"Copy that,” I emailed back. “We'll skip lunch, just for you."

"Something's up,” I informed my trainee. “The customer is asking where we are."

"But we've got an hour."

"So says the paperwork. You know the old line about ‘the customer is always right?’ In this hurry-up business, that applies triple.” I threw up both hands, leaving the wheel untended for a moment. “Time to hustle."

"Might've asked *me*.” Alice looked rueful. “Don't you carry food and supplies? Some of these rigs are equipped like that RV behind us."

"Sorry. If I was doing regional or cross-country runs, I'd stock up for sure. But with city routes, I learned

the hard way. With my luck, if I spent the money, I'd end up switching trucks for a day or two. Some ravenous temp driver would devour everything."

"I see." She got a snack bar from her pack, and devoured that.

Truth was, the oatmeal breakfast had left me hungrier than ever, but some male ego thing wouldn't let me admit it.

Pedro and Alice compared notes. He was catching grief from his own dispatcher, so somebody was really bent out of shape.

We reached the junction and exited, bidding farewell to the old timer. Made a quick pit stop but, with regrets, passed up on the lonely diner. Alice seemed to like Pedro in person, during the few stationary moments we allowed ourselves. He's a likeable fellow, and in much better shape than me, considering he's thirty years younger.

I squinted at the horizon. A two-lane highway went away north, diminishing to a thread, then vanishing amid hues of brown. The kind of desert, desolate at first glance, that John McPhee and George R. Stewart brought to life in their books.

"Glad you're hitting it off with Pedro," I told Alice. After all, the man was single.

"He's an independent contractor, right? Carries loads for different companies?"

"Yeah. Hauls a lot of high-value items. Electronics, military assets, things like that. Loads that could draw unwelcome attention, but they make up for it with extra security."

"Oh?"

"He has a concealed carry permit. Gets armed guards and escorts sometimes, and one time he had air cover."

"Wow! But not today?"

"Not sure, and he wouldn't say. He *is* in the same big hurry." I grinned. "Since you're so interested, Pedro's quite a character. His real name is Stansfield, as in S. Peter Owen. His grandmother was a Bradford, in the DAR and everything. Been leading citizens in New England for darn near four hundred years."

Alice looked it up. "Daughters of the American Revolution. I'm impressed. So why isn't Pedro in some cushy Harvard faculty club, or on the board of DuPont or something?"

"Long story. His father is Heathcliff Owen. Heard of him?"

"No."

"I'm not surprised. The man owns a lot of companies, but keeps out of the limelight. Got past the dot-com crash, and the troubles in 2012, without losing his shirt. Came out ahead, is what I heard."

"So where does that leave Mr. Stansfield Peter Owen?"

"His father is a big admirer of the work ethic. Didn't hand down a dime to his sons." I reached over and patted her shoulder. "Besides, maybe you're not the only one who always wanted to sit in the Drivers Only section."

She looked thoughtful. “I suppose you're right."

* * * *

We almost missed our turnoff. Doll Box didn't have it listed. The road was marked by a little sign, and barely wide enough for our trucks. A half mile along, a guard booth came into sight. Some distance away, a second building overlooked the area. I could see more guards up there, watching us. A dry streambed crossed beneath the road, deep enough to stop most vehicles.

"I've seen military bases with inconspicuous security like this,” I commented.

Pedro pulled in behind us.

Alice commented, “This facility is new. I've been checking on line, and there's not much detail.” Her eyes shone with curiosity, and perhaps something more. “They have several square miles of land."

The guards checked our IDs and invoices. Pedro jumped out and handed them his paperwork. One guard broke the shipper's seals on our trailers, and waited for us to open them for inspection. Alice stepped in to open my trailer. Took her a couple of extra tugs, but she got it.

After a short time that felt like forever, they waved us through. It takes Argus a week or so to review a job application, but those guards ran instant checks on the three of us. They must've deemed us acceptable, since we received Visitor badges, complete with photos. They also had us sign nondisclosure forms.

I wondered what would happen if, for whatever reason, the guards *didn't* approve us. Would they shoo us all the way back to the city? Expect us to park outside the gate until our employers could send someone else? That would take hours, if not overnight, and they'd already paid double for a rush job. Plus, the insurance coverage had a time limit. Rules are rules.

We drove through a cut in some low hills, and the Sylvantronics complex lay spread out below us. A series of road loops fanned out from a gigantic warehouse building. Everything looked new, not yet blasted by the desert sun and gritty winds. Gravel, rather than grass, dominated their landscaping. I could see a lone vehicle whipping around a tortuous roadway.

Another guard directed us to drive inside one end of the building. The rollup door must've been eighteen feet tall, and the dock space within was large enough for a dozen big rigs. A massive consumption of interior space, and a good way to hide from satellites, drones, and other observers. The other dock spaces were empty.

I did a perfect T-turn, backing up to my indicated dock spot-on. A real showoff move, sure to please at the truckers’ national championships.

But Pedro did me one better, by turning the rear wheels of his newfangled trailer. He spun in place, within a turning radius smaller than the overall length of his rig, and backed in neater than a train engine at a roundhouse. I was impressed—and truly outclassed. Argus, and its long-time owner Old Doug, weren't about to cough up for steerable trailers.

The warehouse crew made it clear they wanted to handle the crates, but stopped cold when a white-coated man landed on the scene. “Landed” in a metaphorical wartime sense. The guy was loaded for bear.

He spotted me as a driver, and lit into me like the mad professor he resembled. “Why are you late?” he began. “I told you to be here at one o'clock!” Fresh salvos kept coming, as he swung on Pedro. “I paid

you people thousands extra to bring these necessary items according to a strict schedule! How can we operate in the face of such incompetence?"

By unspoken agreement, Pedro and I decided to let the fellow blow himself out. Alice looked aghast, so when the man rounded on Pedro again I told her, “This happens once in a while. The gentleman must be having a bad day."

At the first opportunity, Pedro presented his shipping documents. I was glad to let him go first, since he's got more experience with high-strung specialist types. “If you'll look here, sir,” Pedro said, “the manifest clearly states, ‘deliver by three o'clock this afternoon.’ It is now three-nineteen, and we reached your front gate with eleven minutes to spare. We are sorry if there was some misunderstanding."

"Misunderstanding!” the man exploded. “We have the most efficient corporate system in North America, and redundant multichannel communications. There was no misunderstanding! Your employers will hear about this incompetence, and ... and ... feeble attempt at making an excuse."

"Then again,” I whispered to Alice, “some guys are, shall we say, emotionally challenged. Dude is taking it out on a handy disposable target."

I showed the man my paperwork. “Sir, I was also instructed to pick up early this morning, and get the load here safely by three. I believe we have fulfilled our contract. There is, if you wish, a standard procedure for filing complaints with our employers."

"If I wish!” he screamed. “What I wish is not important. The project is what is important.” Then he lashed into his own warehouse crew, who'd been doing an amazing non-technical feat of stealth. “What are you people standing around for? We need these items immediately!"

They jumped into action as fast as any crew I'd ever seen, granted that warehouse guys are rarely in any kind of hurry. Meanwhile, Alice was doing something with Pedro's and my signature pads. I hadn't even noticed her taking them.

She put on a brilliant smile and showed the pads to Mr. White Coat. “Sir, your gate guards told me you'd sign for my load personally. I'm sure Mr. Owen received similar instructions. If you would, please?"

I guess music and bright smiles can sooth the savage beast, or however the heck that saying goes, because the man calmed down. Alice showed him several lines of data.

"Sir,” she told him, “here are the actual instructions, as relayed by voice and plain text, from this facility to both of our dispatchers at three o'clock this morning. Separate calls were made to both of the shippers, which accurately reflected our pickup times."

The man read the text lines, frowning hard enough to curdle an entire dairy.

"You see,” Alice went on, “this facility uses military time exclusively. Notification of our dispatchers was made at three o'clock in the morning, or 0300. The delivery was expected by 1300 this afternoon, but that's one o'clock, not three.” She reversed into a moue. “Nobody compared the company dispatch logs to your backup data transmission until one-seventeen this afternoon. A simple misunderstanding, which happened in the middle of the night."

"Humph.” Mr. White Coat did not look mollified. Some night shift Sylvantronics flunky would need to polish his resume.

Inspiration struck me. “Remember when NASA crashed a Mars probe, because their mission teams mixed up miles and kilometers? They had months to catch the error, and never did. I was delivering new

computers to JPL around that time." I shrugged. "Anyhow, your items are here okay. A week from now, none of this is going to matter."

The man counted each crate then told us he'd be back to sign for them later. "If you need compensation for the extra delay," he stated, "take it up with your employers." As he stomped off he aimed a glare at all three of us. "We'll not have to put up with this human foolishness for much longer."

"You put up with this abuse?" Alice asked Pedro.

"I've yelled back," Pedro admitted, "on occasion. This really is unusual." Then he grinned. "We get paid the same either way."

"I suppose it does strengthen one's character," Alice mused aloud. "Wonder if my friend is here?" She approached one of the warehouse guys, who gladly interrupted his work to show her a company directory.

* * * *

Sure enough, Alice's friend had been assigned to the new facility. A short time later, a tall skinny fellow entered the dock area. "Ai-Ling," he called out, "it's good to see you." They hugged.

"This is Dr. Sanjay Bishnoi," Alice told Pedro and me. "He was a teaching assistant for several of my computer classes." She punched her friend's arm. "I imagine the pay is better here."

Bishnoi took in the situation, and did not ask Alice why she was hanging around with two grizzled truckers. "It will take our crew some time to complete the unloading and check for damage. You were signed in, yes? Perhaps I can show you what you delivered today."

Damage! I decided to overlook the implied insult, since my companions looked even more curious than I was. Thus we were treated to a grand tour, edited to the interesting parts only.

"As you know, we supply industrial and military robotic systems," Bishnoi told us. "We also have a position in the home care market, but fully capable humaniform units remain elusive." He brought us to another section of the warehouse, opening security doors with his badge. "We're on the verge of a breakthrough."

All three of us were amazed at what we saw next. A humanoid robot was driving a car around an indoor track, dodging mobile obstacles and obeying a set of traffic signals.

"That's only the beginning," Bishnoi said, with evident pride.

In the next section, a flatbed truck waited in a mockup dock area. A bipedal robot surveyed the situation, which looked to me like a typical loading job.

Mostly I surveyed the robot. The frame was shiny metal, and instead of hydraulic pistons it had synthetic muscles. Its limbs and torso were enclosed in tough, clear plastic. My companions agreed it was "humaniform" but not "fleshly." Which, I concluded, fit Sylvantronics' bloodless corporate image to a tee.

"This robot," our guide said, "is the prototype unit of the thirty-six production models you delivered here today." He looked at me. "You brought the bodies." To Pedro he said, "You brought the brains. Each unit can learn, and rapidly adapt to new situations."

Obeying some silent cue, the robot got on a forklift and hoisted a large metal crate onto a flatbed trailer. Then it threw two heavy-duty nylon straps over the load, threaded the holddowns, and tightened the straps with a practiced eye. Next it opened the truck and started it, using chuck keys built into its metal

fingers.

Bishnoi watched intently, though no one seemed to be guiding the action. The robot drove around the indoor track, sharing a single lane with the car, which had come in though a side door. A minute later the robot stopped, then unloaded the crate.

"That's what Mr. White Coat meant about not putting up with ‘foolish humans’ for much longer.” I hadn't meant to say it aloud, but sheer astonishment loosened my tongue. “I wonder if they could handle all the other hassles that come up?"

"You said it, bro,” Pedro echoed. “Never thought I'd see the day."

Alice didn't look surprised, but if anything, deeply offended. She sidled up to Pedro and me. “Claude, you said Alice Kramden? More like Alice in Wonderland.” Her head wagged mournfully. “No CB chatter from these paragons of efficiency."

Demonstration over, Bishnoi collected us. I was pretty sure he'd missed Alice's harsh expression. We headed straight back to our rigs.

Mr. White Coat showed up long enough to sign our paperwork, then directed his crew to bring the new robots to another testing area. “We will have our initial verification run at twenty-two hundred hours. Be ready!” He strode off with nary a backward look.

Ten o'clock. After dark. Worried about the competition? Not that darkness offers much concealment.

Alice murmured something about, “A Turing Test times ten.” I didn't understand the reference, and forgot to look it up, until much later.

As we passed the guard booth Alice asked me, “Mr. Dremmel, can we send your bird out again? Take another look at what they're doing back there?"

I fought the impulse to make a retort. “Ms. Lu, right off the top of my head, I can think of a half dozen reasons why that would be a stupid move. You're a smart kid, and I bet you could come up with as many more."

She had the good grace to look abashed. “Sorry I mentioned it."

But she didn't look sorry for the idea itself.

I called Laurie to say I'd be late. If my trainee sent any similar message, I didn't notice. We stopped at the junction for an early dinner, and Pedro joined us. The talk was lively, and for the most part I just listened. I've got plenty of stories, but don't insist on telling them all at once.

Alice fell asleep on the drive back. We got into the Argus yard by nine that evening. Under the old rules I'd have run out of duty time already, thus been required to stop somewhere for the night. As it stood, I punched out with double time on the clock, and wrote out a good report on my trainee.

It got through my thick head that Alice was riding a bicycle. Since it was dark out, I talked her into letting me strap it onto the roof of my Camaro, so I could drop her off at home.

She lived in an upstairs apartment, in what's best called a humble area. I watched until she'd made it into her front door okay.

* * * *

Beryl's got a miracle touch. Few places on Earth are more dingy than our local Argus Trucking yard, but she fixed up the break room with a semblance of festiveness. No helium, but finding the party balloons and all took some ambitious shopping. One more trade war, and the USA's store shelves were going to get Soviet looking.

Alice had passed her four-week training course with flying colors. She was a real Class A trucker, and certified to rumble around our highways and byways. Just in time for the hottest part of summer, but I swear she didn't seem fazed.

"For she's a jolly good fellow" carried across the oil-stained asphalt as the yard crew, plus whoever was in town that day, welcomed our newest employee driver.

Alice beamed. "Thanks, guys. Especially to Claude, for giving me a great start around here."

Some of the guys looked a mite *too* appreciative. I spoke in a stage whisper: "She's a great driver, and if some creep tries to 'jack her rig, she's got a Black Belt she can use to discourage him."

I had no idea whether Alice could, or would, kick some lowlife into next week, but I figured it wouldn't hurt for such a rumor to get around. In real life, sexual harassment policies can only do so much...

Pedro was there for the party, which took up the whole lunch break and a few minutes beyond. He must've understood the intent of my words, because he gave me a discreet thumbs-up.

By coincidence, Sylvantronics made their big announcement on that same day. The news and bloggers got all worked up over their new truck-driving robots. I guess it was predictable. People were used to indoor robots already, but sharing the road brought everyone's "but *I'm* the world's best driver" instincts to the fore.

Sylvantronics planned to lease a few units here and there, at low cost, in return for each customer putting 'em through the wringer. Beta testing, they call it.

Quick as that, the welcome party ended, and Beryl handed Alice her first sheaf of manifests. I saw that it was a simple run: dropping a full trailer across town. That would be it for the day, no muss and no fuss. And, I realized, not much physical exertion.

Alice did not complain.

* * * *

Argus started its test robot at the home yard in Tulsa, but a month later our turn came up. Because I had the most seniority, management picked me to ride with it. More like, I figured, if an old fogey like me could handle the thing...

Couldn't have set it up better if I'd been Steven Spielberg. The sun was coming up, shining all over the robot's polished metal, as we began our first day as team drivers.

"Good morning, Mr. Dremmel," said the robot. "I'm glad to be working with you. Shall we get started?"

I'd seen a video of this same robot at work in Tulsa, and its voice sounded different in person. Not weirdo-metallic, or silky-fembot, or butler-smooth either. Just a regular dude's voice. Which, I decided, was perfect.

Alice was assigned to residential deliveries that week, and wasn't due in for an hour yet, but she showed up to see us off. Her look was so keen that I wondered if she'd known about Sylvantronic's test schedule. They kept such things under tight wraps. On the other hand, my youngest grandkid could've

hacked Argus Trucking's computer system.

Doll Box and Mechagodzilla hit it off swimmingly. That's really what our crew started calling the robot. In truth it was graceful, like a steel and porcelain ballet dancer, so who says truckers don't have a fine sense of irony?

Our local run was routine, so I decided to spice it up. When I got to the Jimenez Brothers warehouse, I hunkered down in the cab and told the robot to take the paperwork inside. The trailer's rear camera gave me a fine view. Matt, the owner's grandson, looked like he was about to faint.

Matt must've heard me laughing, because he came stomping outside, eyes fiery. I'd been delivering there for years, and we've had a lot of good times together.

I told him, “What, you mean it's *not* April Fool's Day?"

We both cracked up. Damned if the robot didn't look amused, too.

When I got back to the yard, Alice was putting her load-lifting waist belt in her locker. Gangbangers like to steal those special belts, to use for gym workouts, so she kept hers at work.

She was limping, and trying to hide it.

"You okay?” I asked.

The “war of the sexes” was long over, won by I'm not sure who, but Alice wasn't going to claim her female exemptions just yet.

"I had a bunch of residential drops today,” she explained. “Mostly catalog orders. You know that GreenMart still makes its furniture kits out of particleboard? Dang, but that material is heavy!"

I winced in sympathy. “Spent a week on disability leave, flat on my back, thanks to that crud. A full-size computer desk kit weighs at least 270 pounds, and they don't allow drivers to open the carton."

"My worst load had about 120 pounds’ worth. Nice old lady who lives in a third-floor walkup. She was so flustered, told me how her son-in-law promised to come help, but he was stuck at airport security, and I wasn't about to wait around, so—"

In theory Alice could've called dispatch to request another Argus driver, and gotten help carrying that heavy box up those stairs. I knew why she hadn't called.

My hands went up in mock surrender. “I've got an idea. Alice, old fogey Claude got along fine with Mechagodzilla today. *You* have computer training, and you know about these robots. Our residential routes are way more complicated, so there's plenty of test opportunities. How about we convince the boss it's your turn now?"

The robot could help her out, and with no ego involved. That way, the macho drivers wouldn't be able to rag on Alice for needing help. Was I being sexist? I hope not. Fatherly, I'd admit to. Not many people can handle such loads alone.

The yard manager agreed, and when Alice left work on her bicycle, I'm not sure she was limping any more.

Within days, my hunch proved correct. That robot proved a boon in any number of situations.

Hearing of this, the boss asked Alice to demonstrate at the next driver meeting. “You show us,” he put it,

not “have the robot show us,” which I thought was a good sign. What he didn't know was sometimes Alice had the robot drive while she took a nap. Its arms and legs were long enough that it didn't have to occupy the driver's seat, thus fooling casual observers. Wraparound, mirrored sunglasses can bollix the wakefulness system, as every trucker knows.

Alice had taught the robot to carry our heaviest, most awkward loads up a flight of stairs. Our company mechanic uses a big ladder to reach the roofs of the trailers, and Alice borrowed that for the demonstration. The robot carried a large carton while she walked above it, providing extra balance. They got it on top of a trailer, thirteen feet up, stepped across to a rig parked next to it, then made their way back down again. That wasn't in the Sylvantronics manual, for sure.

Our toughest guys claimed *they'd* never accept such help, but most of the crew really liked the idea. Heck, Doug Gonzales was our night dispatcher *because* his back had gotten so messed up. After the demonstration, he told me he was thinking about reapplying as a driver.

Upon this newfound acceptance, Argus leased one driver robot for each company yard. At other trucking companies, Sylvantronics units met with mixed success, and sometimes with violent opposition. Other robot manufacturers adopted a wait-and-see attitude.

Still, the new robots found dozens of other uses, all over the country. A whole lot of activists objected, on so many legal and religious and ideological and ecological and social and moral and economic grounds that I lost count, but they all got steamrollered. Millions of dollars could still grease the wheels, it seemed.

* * * *

In September, Pedro helped Alice pay off her debt to Argus, and she went back to school. I got a beautiful handmade card in the mail, and showed it to Laurie.

"Looks like something my nursery school kids made,” Laurie commented. “I guess the artistry is better."

It was a pencil drawing of me standing beside my rig. ‘For that dark mysterious encounter, and all our adventures since,’ read the caption.

Laurie was not upset. I did not frame it, and she did not throw it away. What more can I say? I'm proud of my understanding wife.

There was a small note tucked in with the card, which said, ‘The chatter must go on!’ I wondered what Ms. Lu was planning.

* * * *

Heathcliff Owen looked uncomfortable. Guess I should've been pleased by the sight; a blue collar *Schadenfreude* of sorts, but it was too happy an occasion for such things.

The wedding was beautiful. I hadn't been Best Man in a formal ceremony for years. Laurie looked wonderful in her bridesmaid's dress. We hadn't been to *any* weddings since our youngest son got hitched. Kids these days...

The ceremony took place in a church near Pedro's home; some busy little denomination I wasn't familiar with. Nobody threw any snakes, but Heathcliff probably considered the place beneath his dignity. Still, he was there, along with a trophy wife not much older than the bride. Brought a whole jet-load of relatives, too. No rental tuxedos on that side of the aisle!

Alice's cousin Lim was there, looking freshly scrubbed, and a couple of relatives came over from Asia. Her friends, from work and school, almost filled the bride's side of the aisle.

Courtesy of Dr. Bishnoi, a robot served as ring bearer. The newest household-type unit, as he told anyone who asked, or didn't ask. Humaniform but not fleshly it may have been, yet it looked fine in a suit. Dignified.

A few “leaked” photos of the ceremony provided great publicity for Sylvantronics.

* * * *

That girl had plans, all right. Alice graduated in Computer Science and Robotics after another year of college, by taking more credits than you could shake a laser pointer at.

She wasn't done yet.

* * * *

Pedro's condo looked ten times better with a female touch.

"Got to show you something.” Alice led me to a shelf in their home office. “Pedro got these from a contact he hauls for, one of those agencies we aren't supposed to talk about. These were rejects, defective, but I fixed them."

"I am impressed.” They were works of art.

On a high shelf roosted two spy birds, a pigeon for use in the city and a hawk for the countryside. Each had a range about ten times better than my trusty old dove.

Then Pedro announced dinner. Cod fillets and cheddar cheese sauce, with hasty pudding, and apple cider to drink. He could reach back to his childhood and make New England dishes like you wouldn't believe.

Pedro and Alice took turns cooking. At our place, I never tried to cook. Wouldn't dare! When Laurie is out of town, I'm lucky to get something heated. Straight from the can means no dishes to wash.

We took turns dining at each other's homes, for two get-togethers a month. Usually on Saturday, but juggled to fit our irregular work schedules. Sometimes we'd watch a video, or play a board game after dinner.

They held off on having kids while Alice helped Pedro drive his rig. She was determined to gain the respect of truckers, and also of Pedro's high-tech customers. Inflation kept roaring, but they managed to save up some money.

Then Alice launched a consulting business, helping companies integrate humaniform robots into the work force. Pedro told me that several robot manufacturers offered to hire her, but she refused them all.

* * * *

Somebody threw a bagel at the break room TV set. On the screen was a news alert from Los Angeles. A driver robot was preparing to go solo.

Work had come to a screeching halt at Argus, as we all got a good long peek at the future. ‘This human foolishness,’ came to my mind, like it was yesterday.

"It's the end of an era,” Beryl moaned.

"Damn straight,” said our company mechanic. “Next up, they'll have fixit robots to go with the driver ones. No way a man can make a decent living, any more."

"Old Doug won't never allow it," a driver said, meaning Argus Trucking's stubbornly traditional owner.

Time to speak up. "Hate to say this, folks, but Old Doug is going to retire soon, maybe at the end of this month. Don't ask me how I know, but the new management is all fired up to *modernize* this place." Even I winced at the sarcasm in my voice.

Inevitably, the Feds and big trucking company owners had pushed to broaden the rules. A pilot program was starting in Los Angeles; Shakey City, as CBers call the place.

Soon as I got home, I had the TV run a search for videos of the event. "Hey, Laurie," I called, "check out the news. They had that solo driver robot demonstration this morning."

She came bustling in, with a handful of colored paper for some art project she was planning for her students.

We watched with fascination as the newest model Sylvantronics robot took the wheel of a big rig. Mr. White Coat (as I will always think of the man) was on hand, with Sanjay Bishnoi talking to the press and VIPs.

"There's Alice." Laurie pointed to the back of the crowd of dignitaries. "She's getting paid to consult, right?"

"Yeah. Not sure for who, in this case. Hope they're paying for a big fancy hotel room." I requested a close-up, and the TV found a second video source. The image zoomed in on our young friend. "Look!"

Alice was fidgeting with her shoulder bag. Barely visible, peering out from the bag, was a tiny, moving bump. The TV found us a couple more angles, but none any closer to Alice.

I was certain it was the spy pigeon.

Laurie agreed. "Most gals in LA have to settle for a Bichon Frise dog in their purse."

We laughed, long and hard.

I requested a fast news summary. The robot had completed its delivery run without a hitch, with more aerial cameras following than OJ's white Bronco chase ever got.

According to the analysts on TV, Wall Street was ecstatic. Got me to thinking. Could it be that I resembled a buggy whip manufacturer, like those talking heads claimed? Time to make way for the future? I figured this was a more profound sort of change.

I could retire any time, but what about younger folks? Men who'd no longer have a serious job to keep them focused? But, as usual, the big boys had their way. In several other cities, more robots went solo.

I still wanted to let some air out of Mr. White Coat's tires. Every time I saw him on TV, Alice's harsh look, from that day in the desert, would rise in my mind's eye. Compared to some, her sentiments were mild. *Something* was bound to happen.

* * * *

Three weeks later, when the public's attention had wandered, a robot was solo-driving a shipping container from the Port of Los Angeles to a big electronics store in Pasadena. The suits wanted to match up all the latest elements, so the load was inside a new autoloading type container unit.

This time, when the news broke I did not wait to get home, and nobody blamed me. I know all the good

break spots, and modern cities don't have a lot of safe, legal places where you can park a big rig. I parked at a funky old shopping center that doesn't mind trucks, so long as you're spending a little money. Then I asked Doll Box to do something against Argus work rules, which was, to grab the video signal of a certain news outlet.

The driver robot had pulled over in Watts, opened the container, and unloaded several hundred boxes. Each box held a flatscreen television set, the fancy kind that looks 3-D without your wearing special glasses. The police didn't see it, since about 90 percent of the surveillance cameras in that area are gone. Neither did that truck's guide box send an alert.

By the time I tuned in, many home video clips and eyewitness accounts had been gathered for news reports. The robot cranked up its voice, denounced capitalism and profiteering, and offered the TV sets as a gift to the oppressed peoples of the area. Whether this was a lunatic rant or a liberating sermon, Che Guevara or Hugo Chavez or Hakim X Sunshine couldn't have proclaimed it better. To an old-timer like me it sounded campy.

Heedless of any cameras, the locals threw off their oppression with enthusiasm. Every box was gone in minutes. That robot was fast! It drove away before the police responded, got back on the freeway, and delivered the empty shipping container to the store. The police only recovered about a dozen TV sets.

Then another report broke. Apparently, in several other cities, driver robots were also taking action.

Doll Box only has a little monitor screen, so I threw work rules to the wind and ran inside a nearby diner. Tommy, the owner, was an old buddy of mine. Cooked a mean soyburger, and he had connections to get real beef sometimes.

"Hey Tommy, put your both your TVs in split-screen mode. Something really big is happening."

One look, and he agreed.

In Denver, a robot dropped its load of frozen foods at a busy Salvation Army soup kitchen. In Orlando, a load of over-the-counter medicines went to a low-income senior citizens' center.

"Check it out," I told Tommy. "Somehow they acted at the same time. Finished before humans could respond."

The next three events were outright weird. In San Francisco, a trailer full of chainsaws ended up in an alley near a Natural Resources Defense Council office. The manifest was marked "Discard, Dangerous Items." Then several pallets of Creationist literature landed in the parking lot of a scientific (AAAS) office in Washington. Not to be outdone, a load of Plan B pills went straight to a National Right to Life place in Oklahoma City.

By then the cops were cracking down, and pulling over every robot-driven truck they could find. Even so, there was one last incident, south of the border. A shipment of toys, headed for a retail shop in a highbrow neighborhood, went instead to the Shriners' children's hospital in Mexico City. The electronic invoice appeared legitimate, so with happy surprise, the staff accepted the donation. Later, when the *Federales* showed up, nobody had the heart to take anything back from the kids.

I don't know about anybody else, but when that report from Mexico came on, the folks in Tommy's Diner cheered like it was a high school soccer game.

* * * *

All that week I followed the story with interest. Sylvantronics clammed up, but rumors abounded. Was it

a hacker prank? Economic terrorism? Union activists? Jealous corporate rivals? A shared malfunction? Nobody knew.

Reclaiming the loads would've been a PR disaster. Even the coldest-hearted bean counters knew that, so the items were written off as donations. But the insurers panicked, in their own debonair fashion. Even though its own shipments were unaffected, the military almost went on red alert.

Wall Street turned its fickle thumbs down. Sensing the country's mood, politicians piled on thick. President Donna Weinberg held a press conference.

I caught the key part of her talk:

"A great many people, like seniors and the handicapped, depend upon household robots. I can assure you these are safe, and will not be recalled. However, my experts agree that industrial robots must have constant human supervision."

Unsaid was, people could vote and robots did not. Human truckers came back into favor real quick.

By the end of the week, solo robot drivers were out like the dodo bird.

* * * *

A few days later, it was Pedro and Alice's turn to have us over for dinner. Recent events were, of course, our big topic.

Pedro said, “The FBI says there's no evidence of terrorism, or a hacker prank. They're stumped. None of my government or industry contacts have any good leads."

"Dr. Bishnoi asked me to keep my eyes peeled,” Alice said. “The robot's basic programming seems intact. He wonders if they didn't make their units care *too* much about humans. We have so many troubles, and now they're seeing everything."

Did I imagine a smug look on Alice's face?

On our way home, Laurie commented on the uproar. “I feel like we're watching history unfold. Yesterday, one of the kids at my nursery school asked if a nice robot was going to bring her some toys. She's only four years old! Honey, do *you* think it was hacking, or an incipient robot takeover?"

I'm no expert, but it's surprising how much an old trucker can learn, when right in the middle of something. “I'd say clever hacking. The robot takeover comes later."

Laurie agreed, then we talked about the beauty of the desert sunset. Next to us on the freeway, a robot was driving a big rig. Its human team driver was in the shotgun seat, chatting on his CB.

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Novella: **TENBROOK OF MARS** by Dean McLaughlin

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Illustration by Vincent Di Fate

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What distinguishes a hero is the ability to do what needs to be done....

* * * *

I

If the eighty-some passengers aboard the shuttle car from Footprint Brazil to the airport, he was the only man from Mars. Out the window he could see long rows of ... well, no crop he recognized. Far off, remnants of old forest marked the horizon. Everything so green, the sky impossibly blue, and the Sun's blaze amazingly strong. Too quick to be understood, something flashed past the window. For a moment he couldn't think what. Then he remembered birds.

Gone too long, he thought.

All the others in the car were from the Moon, or Brazil Synch workers down for their biweekly ground legs recovery. Oh, a few could be coming off work from Footprint, like the pair who'd helped him from the lift capsule into the personal mobility device or the others who helped him settle into the shuttle car's recliner. Earth G dragged him down. He thought of Atlas, holding the world's weight on his shoulders. Well, he'd learned something of that, up there.

Like, for example, knowing the plain hard sense of not putting off the hard things when, in the end, you'd have to look them in the eye. Get it done with. Box yourself until the only way out was to soldier through the bad patch.

So he'd decided he should come down as soon as he could, not stay up at Synch where a man could float weightless for a day. Or four. Just made it worse when the time came. During the long trip from Mars the *Edgar Burroughs* had gradually increased its spin to give its passengers—the lucky eighteen, plus himself—the effect of gravity slowly building from Mars' one third to ninety-eight percent of terrestrial, but then, necessarily, it had stopped rotation for the docking process. That had been a long, careful series of maneuvers that took most of a day. It had meant, of course, lapsing into zero G and losing some of the accommodation he'd gained by all those hours in the exercise compartment and the high-protein food. The human cardiovascular system could endure only so much. Also, hard to be sure about the bones.

Then, just his luck, Synch had been crammed. Two boosters from the Moon had docked just ahead of the *Burroughs,* delivering almost a thousand from the lunar stations en route to down home. By the time all the handshaking with the official welcoming committee was done—

* * * *

"Ordeal over at last," said Rikkard Wysotski, Brazil Synch's operations director, still not letting go of his hand. "Not over," Don had said. "Still something over five hundred up there. Waiting."

It wasn't in Director Wysotski's script. "I understand everything that can be done, is," he fluttered. "I really don't have anything to say about that."

"Somebody needs to," Don said, and finally got his hand back.

* * * *

—the medic station had a long, slow line waiting for descent-to-Earth certification. Then, when his turn finally came, the medic had been—quite rightly—methodically careful. Heart sounds, blood pressure, lung function, muscle coordination, strength, and tone. On the bicycle pedals, any joint pain in hips or knees? What about the feet? “Never had to work up anyone from Mars before,” she explained. “And you were up there so long. Some of your numbers are outside the box."

"It's all right,” Don said. He'd learned patience during all those years.

"Really, it's an honor to serve you, Mr. Tenbrook. But to let you go down not able..."

"I understand,” Don said.

* * * *

With the clearance chit in hand at last, the lift capsule boarding-pass station came next. After checking his mass and asking about luggage—Just that little carry-on? Really?—the attendant gave him the ticket and told him the wait would be something like twenty-two hours. Time for a nap in a cocoon, a few drinks, and a meal or three at the food bar. With only the thousand dollar “distressed seaman's” card he'd been issued, not to be squandered, none of those had been practical options.

Well, let it go. Glumly he pocketed the document and made his way hand over hand though the 3D network of grabhold lines to the beehive section, belted into a bucket, and began a scan-through of the entertainments offered by the pasttime display. Not that he could afford to actually call up anything, but merely the titles could give him clues about the world he'd come back to. Speculating what they might be would keep the brain circuits working. Ballet? Drama? Game? Something to read that wasn't engineering specifications? Whatever, it didn't matter. The grim, plodding business of staying alive was done with.

Drowse came. Then—

"Excuse me. You're Donald Tenbrook. Right?"

He blinked awake. The man looked ordinary. Somewhere past thirty-five, for a guess. Round face and dark hair, but a bald spot like a patch of desert beginning to take over. “Don,” he said in automatic correction, forgetting momentarily that now he was in a place where he no longer knew every face and every face knew his. His next thought came automatic too: what did this man want?

Then he remembered. This was a man never seen before. “That and a hundred buys you half a dram,” he said.

The man chuckled at the ancient wit. “You've aged some from your pictures."

"It happens,” Don said. “We didn't waste transmission power on portrait stuff.” Scant and unbalanced rations had taken their toll, but that he did not add. He wondered what this stranger had been doing, looking at old pictures. “You're...?"

"Marvelous job you did up there,” the man said. “Marvelous!"

It wasn't an answer. “Everybody did their share,” Don said. “Not everybody made it."

"But if you hadn't ... Did you know they use it for a case history at Harvard Business? Crisis management?"

"Hadn't heard,” Don admitted. It explained, though, how this man knew his face. Maybe. He kept his reserve. “Most of it was just common sense."

"That's what somebody in my class said. Know what Prof. Edelman said back?"

Obviously he was going to be told. Don turned an ear.

"He said," the stranger said, "'In difficult times, common sense can be a very rare commodity.'"

"Not really true," Don said. "In my experience, when the situation calls for it, most people do the smart thing without stopping to think. It's afterward they get the wobbles."

"That's short term. You carried it for years."

"Didn't have much choice," Don said and asked again. "You're...?"

"Uh? Oh. Sorry. Nick Cavelli. Never heard of me, of course. But look. Only reason I'm bothering you, you want to get down the skein soon as you can. Right?"

"Get it over with," Don admitted. "Longer I'm weightless, the tougher it'll be when I do. But—"

"I've got a layover at Footprint," Cavelli said. "Appointment in Sao Paulo next Tuesday, so to me it makes no difference. My pass is for the capsule after next. Trade?"

"One thing I did," Don said, "I didn't take advantage of being ... well, man running the shop. Took my turn, not somebody else's." Surely this man would know—Harvard Business, hadn't he said?—how much it had mattered not to set himself more equal than others.

"That was then. It's different now."

Don supposed it was, and it tempted. Each passing hour eroded some fraction of the gain he'd made during the long trip home. Neither did it make sense to argue trivial things. "Well..." he said.

"It's a deal. Uh ... just ... well, could I ask? Would you sign your pass? Before we trade?" Seeing the caution come to Don's eyes, he hurried on. "I'm not thinking investment. I promised my boy a Moon rock. I got him a few, but they look sort of ordinary. If I had something you'd signed..."

"How old?"

"Twelve. Almost thirteen."

"Mm," Don said. Not fair, to think his handwritten name would open doors. Bad habit to get into, besides. But...

He patted an empty pocket. "Got a pen? I don't..."

Cavelli had one. The bucket-arm's display provided a writing surface. Don paused; it had been so long since he'd signed anything with his full name he wasn't sure he remembered how. The result looked almost pathetic. Awkward, somehow.

Cavelli reached for it; Don gestured him to wait. Still with pen in hand, he added: *This is the first signature I have given upon my return from Mars, and the first time I've written my whole name in years.* Scribbled initials—*DTb*—completed it.

They made the exchange. Cavelli stared at his prize. "Oh Lordy," he gasped. "This could pay his way through university!"

Don shrugged and pulled his sling bag around, slipped the knot, and fumbled inside. "He wants a rock?

Give him this."

Inside a plastic bubble, it was a stone the size of a nut, angular but with edges rounded, black with a dusting of rust. Also within, a scrap of, well, it looked like paper. Plastic, actually, cut by hand from a bulk fluid container. *Mars specimen,* it said, with the same initials. *DTb.* "Mostly brought 'em for my brother's kids. And theirs. If they're interested. Got some extras, though."

* * * *

There was still the business of clearing the exchange with the boarding attendant. Differences of mass had to be kept track of and adjustments made. The attendant goggled at Don's name. "Mr. Tenbrook. Should have said something."

It was stenciled on his jumpsuit but, engrossed in routine, the attendant must not have looked. "Didn't want to make a fuss," Don said.

The attendant looked about to say something more, but then thought better. He called up their pass numbers. "Masswise, you're within five keg of each other, so that's all right. But..." He looked straight at Don. "Really no baggage? Don't you have...?"

"Just carry on," Don said, and made show of his patch—rag sling bag. "Traveling light." Anything he'd had, they needed more on Mars than he needed to take with him. Aboard the *Burroughs* they'd given him a toothbrush, this jumpsuit, and all the freeze-dried food he could stomach. What more did a man need?

"Let mine go down with him," Cavelli said. "Nothing I'll need, 'tween times, and that way you don't have to adjust a thing."

Thinking it through, the attendant paused. "Only the claim ticket code," he said at last. "And the information that you won't be down to pick it up for a while. No problem. Uh, and..." He looked straight at Don and, hesitantly, offered his hand. "Mr. Tenbrook—am I the first?—welcome home."

He wasn't the first, but no harm to let him think. With a shrug he took the hand, let it go, and turned away. In many senses of the word, he had no home.

* * * *

In the descent capsule, going down at terrible speed but felt not at all, he slept for several hours. When he woke, deceleration phase had begun and gravity or its equivalent was beginning to take hold. The steward offered him breakfast. Conventional meat and eggs? Cereal, hot or cold? Rice with brown sugar? Pancakes? Waffles?

Just the thought of bacon and eggs made Don's mouth water. It had been so long. Oh sure, the *Edgar Burroughs* had been provisioned with, among other things, powdered eggs and something that passed for bacon but wasn't. Not the same. Likewise the soymilk concentrate that made cereal almost edible. To have the real thing at last...

But caution intruded. The uncertain condition of his gut came into play. Also Doc Hilliard's advice: one new thing at a time, and that one thing a small portion. Don settled for oatmeal; the milk—pasteurized, but otherwise straight from the cow—would be new.

Coffee? Tea?

The coffee; it's the powdered stuff?

Oh no. Fresh ground.

All right. Coffee with real cream.

Hours later, with G force bearing almost its full force on him, he accepted a ham and cheese sandwich, warmed, and spiced with a single slice of pickle. He took it one slow bite at a time. O, the luxury!

* * * *

II

The shuttle car slowed as it rounded a curve. Over a rise the airport terminal came in sight. It looked different than he remembered, but he'd seen it from another angle back then. Besides, old memories couldn't be trusted. Beyond the terminal, apparently silent, a sleek, golden aircraft shot steeply into the sky. Then, as the shuttle car slotted into a loading bay, the thunder came.

The car's sides opened. The automatic annunciator skreeked for attention. “Ambulatory passengers may now disembark,” it said. “Those who require assistance, please wait. Attendants will be with you shortly.” After a pause it repeated the formula in other languages.

By the time it concluded, something like half the passengers had stepped off and walked away. With limbs that felt heavy as lead, Don waited. A huge cargo handler advanced to collect the baggage module. Only when it had trundled off did a team of attendants with mobilities swarm onto the platform.

"Good afternoon, sir,” said one to Don as he came up beside. “May we assist?” Hardly waiting for reply, he spun Don's recliner sidewise and rolled it out next to the mobility he'd dismounted from.

"Think I can manage,” Don said. With effort he sat up, got feet under him, and found a handgrip to help himself with. The attendant hovered close, ready to intervene.

"Were you up there long?” he asked.

"A while,” Don said, and didn't explain.

Settling into the mobility took all the strength of his arms. “Comfortable?” the attendant asked. “If there's a crease in your clothing..."

His jumpsuit's fabric was too thin to be a problem. “Think I'm all right,” Don said. “And you're familiar with the controls?"

The controls were a toggle-sized joystick at the forward end of each armrest; activate one or the other. Forward to advance, backward to reverse; lock at center to stop. Thumb to one side or the other to steer. All functions programmed to respond with careful sluggishness. “Had some practice out at Footprint,” Don said. “I'll be all right."

The attendant stepped back. “Then welcome home, sir.” With a nod, he indicated Don was free to go, but watched for a moment more to be sure Don had control.

Home. That word again. For a wanderer, not really true. And, for nearly twenty years, de facto, Mars had been home.

Already a scatter of people were coming to board the shuttle. Outward bound. Some—old hands?—walked easily. Others hurried as if eager. Well, yes. To go up the skein could be considered exciting, though for most it would mean going into a confinement of one sort or another, and for the duration they would be at the terrible mercy of imperfect systems and machines. Don put the thought aside. Not his problem. Not ever again.

At least that no longer weighed on him.

Though he tried to keep out of their path, people coming toward him dodged out of his way. Sometimes, though, it meant footwork on their part and hasty corrections on his. Once he had to come to a full stop. Apologies were exchanged. Then the way opened out. He rolled past the security check—that was for outbound traffic—into the terminal's vast and echo-filled hall.

There he had to stop to take bearings. A bold sign with flickering arrow indicated the baggage claim. Yes, for people newly down that would be the obvious need. For him, though, not. What else?

Airline check-in stations everywhere, each with its logo or name emblazoned above. A snack bar offered perfunctory food and booths promised downloads of reading material, video, music, and games. Sectors of bench and buttbucket seating all around. Also parking areas for mobilities, some with fold-up seating around the margins for mixed parties. Everything nicely arranged for people who knew where they were bound.

For a moment, the overload of information bewildered. Through a gap in the crowd's random movement, at last, he glimpsed the helpdesk out in the center of everything. Yes, the logical place if he'd been designing things, but someone else might have thought different. He made his way there.

A blind man wearing a GPS headset was carefully making data transfer into his omnipod. So they'd cracked the microposition problem? Be interesting to find out how. Don stopped a few meters off to allow a hazard-free space. Then it was his turn.

The neatly coiffed young woman adjusted her station down to his mobility's level. “How can I help?” Her fingers poised over her display panel, quick to enter whatever was called for.

"I asked to have my travel arranged,” Don explained. “They said they'd have somebody meet me. Where...?"

"Name, sir?"

"Don Tenbrook."

Her mouth shaped a wordless O. “Of Mars?” As if she had trouble believing. “The one who saved the colony?"

"I didn't save it,” Don said. “All of us did."

"We weren't expecting you yet,” she said. Hand slipping under the counter, she came out with a boundpage book with a decorated cover. “Could I ask you to sign my book? My daughter wants the names of all the famous people we see. She's only nine. We don't get that many."

To refuse would be churlish; but famous? Him? It felt not right. “No objection,” Don said. “I'll need a pen."

She had one. He signed the first blank page he found. The page before was inscribed *Very truly yours,* followed by a scrawl he could barely make sense of. “Who's Hastings Bigart?"

"The webfacts examiner? You have to ask?"

"Been a bit out of touch,” Don said.

"A thing on the web, until he has confirmed, you don't know if it is true,” she explained.

One of those, Don thought. “And who checks him?” he asked, but shrugged. It didn't matter. To his signature he added: *On the day of my return from Mars.* “What's the date?” he asked; he wasn't sure. She told him and he added that plus his initials, *DTb.* Handing back both book and pen, he said, “Where do I go?"

She looked at what he'd written. “Oh, she'll be thrilled. Thank you!"

"Where do I go?” he asked again.

For answer she pointed to one of the seating areas where, after a dumb moment, Don saw the placard-size sign propped against a man's knee; the man himself was tapping an entry into a hand unit. DONALD TENBROOK the sign said.

Well, it answered his question. He fished a stone out of his sling bag and placed it on the counter. “For the kid,” he said, and rolled away before she realized what it was.

* * * *

He stopped in front of the man. “Looking for me?"

The man looked up from his hand unit. “You're...?"

"Don Tenbrook,” Don said with an ironic nod toward the placard. “From Mars."

"Uh...? Oh. You've lost some weight."

"Mass,” Don said with the twitch of a smile. “Weight I seem to have gained.” “Umm. Yes.” The man adjusted his face, pouched his unit, and started to get to his feet. Seeing Don sagged down in the mobility, though, he reconsidered. Bending far forward, he extended his hand. “Welcome home."

They shook. For Don it was an effort; soon as the man let go he let his arm settle back on the rest. “You've got my travel plans?” An uncertain pause. “Not even sure where I'm going."

"Our plane's at ready and hold. But I'll have to say we didn't expect you so soon."

Don had the odd feeling they were talking past each other. Things that needed explaining hadn't been. “You're...?"

"What? Oh, sorry. Brian Scarborough. A pleasure to meet you, sir. An honor! I'm your minder."

"My what?"

Scarborough pulled a phone from his pouch. “One moment,” he said, and touched a preset number. “You'll be—” At a voice from the phone he broke off. “Melanie? Pass a note to Miz Ell, would you, please? He's here already. Should be airborne in ... oh, about fifteen minutes. Just time to grab his baggage."

All Don heard from the other end was squawks and gabble. “No baggage,” he said and made show of his sling bag. “Just this."

"Love you too,” Scarborough said, thumbed off, and pouched the phone. “A minder is ... well, the next few days you'll be meeting a number of people in a very public way. A webcasters conference, of course; the news service people are mostly a sedate lot, but some of the op-edders can be terribly obstreperous. Agendas of their own and wanting to put words in your mouth. All that bother. And President Habib wants a video op. Same for the House and Senate committees. We need to schedule

those. Landmark moment, after all these years..."

"It's not done yet," Don said. "Five hundred thirty-three still up there, if some haven't died since I last heard. Don't want to forget them."

Scarborough appeared to bite a lip. "My understanding..." He unpouched his unit and touched up a code. "...the *Schiaparelli* took eighteen on board three months ago and is on the way, and the *Lowell* will dock at Mars Synch Two in about three weeks and should be able to take another twenty one. Same for the *Bradbury,* also en route outbound."

"Means a long wait for some," Don said. "And some, too sick to travel. What's to be done about them?" Hard questions. He hadn't planned to bring them up so soon; probably this man wasn't the one to talk to, either.

"Still a lot of work to be done," Scarborough admitted, too quickly. "I understand the repatriation schedule has been structured as efficiently as ship capacity and the orbital situation allows."

"Mars Petro had eight ships," Don said. "What happened to the other four?" Useless to negotiate with this functionary; other people made the decisions. Regardless, things had to be said. Over and over. Until things got done.

"My understanding," Scarborough said, and checked his unit, "to replace Mars Synch and restore the cable skein, the best judgment was that four ships would be adequate. The other four would have been excess capacity."

Don quirked something that could pass for a smile, but let silence speak. Mars Petro had gone into receivership only days after Mars Synch fell out of orbit; something like half a year later, after haggling, the bankruptcy trustees sold the *Burroughs* and the *Schiaparelli* to Space Administration for the relief program. Later, when the repatriation project was authorized, Space Administration bought the *Lowell* and the *Bradbury,* but not the remaining four. Who did the deciding—and why—Don hadn't heard. That he and his people up there had been beggars dependent on the generosity of ... well, he wasn't sure exactly who ... made him stay quiet. He'd had to make a few hard choices himself.

"Right now they're mothballed," Scarborough said. "With the infrastructure between here and Mars Toehold restored, there's talk of reviving Mars Petro. Or possibly a new corporation. Certainly their market value—not to mention the four we hold—is greater now than it was." "The trustees wouldn't sell?" Don asked. "Wanted too much, maybe?"

"It's possible they were looking ahead," Scarborough said. "I don't know. I only came to Space Ad eight years ago, so it was before my time."

"Long time for money people to hold their breath," Don said.

"I'm told Rome wasn't built in a day because the cost estimate was out of line," Scarborough said. "Old joke. But there's times it makes sense to be patient. Mars Petro was a long-term development, I seem to recall."

Don had to nod. Let it go, he decided. For now.

"But I was explaining my own function," Scarborough said, and pouched his unit. "A minder is to help you negotiate the ... call it a labyrinth, in which persons not accustomed to being public figures find themselves. For example, you'll be meeting with the web people. The mainline services will be mostly interested in factual material, but the op-edders ... you have to understand, a lot of them cater to

audiences with preconceived notions. Frequently, I'd have to say, they're rather paranoid. They'll ask questions in a way that, so they hope, you'll answer with words that tend to confirm some rather outlandish theories. Even if they have to carefully select from what you actually say."

"Such as...?" Don asked warily. Did this man hope to tell him what he should say instead of actual facts?

Scarborough pursed lips, as if to gather all threads of thought into one handful. "Well," he said, "most of the theories center around what really happened. One holds that Mars Petro was an elaborate swindle; that the prospect of ever showing a profit was either small or nonexistent, and that the organizers schemed to pay themselves huge salaries while establishing the necessary infrastructure—that would be the magnet ships, the Mars Synch station, the cable skein, and the facilities at Toehold; all that—and then, intentionally, allowing Mars Synch's orbit to degrade. The corporation would be essentially ruined, at which point the organizers would walk away with all those years of executive salary in their pockets."

"I'm supposed to know something about that?" Don asked.

"You won't be asked directly," Scarborough said. "They'll ask what you know about the skein coming down. What you think made it happen and so forth."

"Uh huh." Don thought it through. "Seems to me, Space Administration spent two, three years looking into that and came out with a report too big to drop on your foot. I looked at the summary. Nothing I'd argue with."

"Meaning you agree? That's what they'll ask."

Don shrugged. "Don't know. I'm to argue with seventeen professors from big universities and people who've done real work? While they were poking around, us up there were trying to stay alive. Why it happened wasn't what mattered."

"The Special Commission's report would have been a government product," Scarborough said. "Therefore, in the opinion of the people you'll be dealing with, automatically suspect."

"About that, you'd know more than me," Don said.

"Exactly," Scarborough said, and grimaced.

"Also," Don went on, "seems like I remember, Shuster and company took a lot of their pay in stock options."

"Which they could exercise. A lot of them did, and then sold on the open market at a hefty profit. You need to remember, people who've lost money on an investment don't always think clearly, and people like Bilakis and Jack Sato came away with more in the bank than when they started. By quite a large margin. Shuster, well, it's a bit more murky. But the point is, the theory tends to fit the known facts."

"Uh huh." Don let it rest a moment. "Well, I'd say I don't have anything to add to all that, it's speculative, and it happened down here. We were up there. All right, I'm warned."

"There's some other theories," Scarborough said. "That it was sabotage by some outside group. The popular targets are either a petrochemical mining company down here who wanted to eliminate a competitor, or some bunch of whackos that didn't like the natural beauty of Mars being spoiled. Other targets, pick your hobby horse and there's someone who'll take you serious."

"Natural beauty?" Don wondered. He gave it a half smile. "Got sort of tired looking at it, to tell the truth."

"Looks best from a distance," Scarborough said with dry inflection.

Don shrugged. "Like I said, we had more important things. You're worried they'll stuff words in my mouth? Make me say something they can grab and run with?"

"I'm saying beware of questions that suggest a phrase for your reply. Also, questions based on incorrect assumptions."

"Do I have to talk to these people?"

"They will want to," Scarborough said. "And until they've had the satisfaction they can be terribly obnoxious. They'd claim you're concealing something. Therefore, best to have it over and done with."

Don gave it thought. "So you want me to tell them...?"

"I'm here to advise you what the game will be. Not to instruct what you should say."

"And you work for...?"

"Space Administration, Office of the Mars Repatriation Project." He fished in his pouch. "My card."

With a practiced hand he flipped open a credentials wallet to show a reasonably standard 3D mug shot and thumbprint ID, data chip embedded in the lamination. The holographic eagle and shield looked official; without a hand unit of his own Don had no way to make sure. Neither did he know what new techniques of fakery had emerged while he was away. "And you're holding my travel tickets, reservations? All that?"

"Understand, we have no brief about what you should tell them. We only want to see the business conducted in orderly fashion. The op-edders ... we're confident that, regardless what information you give out, few minds will be changed."

About that he was probably right. Don let it go. He'd have preferred to just vanish into the mass of humanity, but it had been a long time since he had control of his life. "So do we get on with it?" he asked.

* * * *

III

Scarborough checked that he had everything properly pouched, then got to his feet. "Baggage?" he asked, and took a tentative step toward the claim area.

"Traveling light," Don said, and made show of his sling bag.

"But...?" Whether question or simple disbelief, Scarborough failed to make clear.

"Anything I had," Don said, "my people needed up there. No such thing as personal stuff."

"Uh..." Scarborough let a few heartbeats pass while he adjusted his mind. "Yes," he said at last, turned, and started off in another direction. "We go this way."

Not toward one of the broad, long walkways leading to boarding gates, Don saw. Well, he supposed Scarborough knew what he was doing. Breaking free of the crowds, they passed through a gated portal—AUTHORIZED PERSONS ONLY in five languages—that gave way to Scarborough's thumb, then down the spiral ramp beyond. Footfalls whispered in the silence. Softly Don's mobility whirred. Out of long habit, he adjusted its power system to recapture mode; energy lost to friction braking would be gone forever and, up there on Mars, wasted energy would have meant less oxygen to breathe, less heat

to warm the bones. Also, possibly, a morsel less to eat. “Where...?” he asked.

"Our plane's down here,” Scarborough said. He took out his phone. “Fred?” he said into it. “We're on our way. You can start the preflight."

The phone gabbled a few quick words in reply; Don couldn't make them out. He told himself it didn't matter. “Not a commercial flight?” he wondered. “All I asked for was..."

"We decided this would serve us better,” Scarborough said as he returned the phone to his pouch. “You're not what we'd think of as an ordinary traveler."

Don could think of a dozen objections, but he let them die. At the bottom of the ramp another gate yielded to Scarborough's thumb. “He's with me,” Scarborough said to the uniformed man who stepped into their path with a hand drifting close to a sidearm, and flipped out his ID.

Without a word the man moved aside.

They emerged into sunlight. Don felt a warm touch of breeze that took him a moment to make sense of. Commonplace, he realized then, and felt dumb. Down close to the horizon, cottonball clouds crowded like a herd of sheep. Far to his left, made threadlike by distance, the twin skeins of cable traced upward until lost in haze. At eyeball level, the land sprawled emptily.

Almost like Mars, Don thought, but here his wheels rolled on grey pavement; up there he hadn't needed wheels. At the horizon's edge he could make out touches of green.

"Over here,” Scarborough said, and nodded to their right. Several aircraft of assorted design and color trim hunched down on their hulls like cattle at rest in the day's heat. “Number three."

Number one was a module hauler being fitted with a freight pod, the pod's logo not the same as the one on the hauler's nose. Number two was a blunt nosed whale body merely taking up space like a fallen log of outrageous dimensions. Only when they'd gone past that one did Don see more than the knife blade prow of number three. Sleek and somehow a sinister outline, silver metal glossed to a mirror finish, and all sharp angles. Stubby retractable wings like the fins on a fish. Don's thumb on the control of his mobility flinched, making it surge and subside. “That?"

"Somebody decided you deserve the best,” Scarborough said.

Don wasn't sure it was the best, or what the best might be. He halted his mobility to look up at it. “It flies?” he asked finally.

"They tell me it can do figure eights around a mosquito,” Scarborough said.

Don did a rough calculation in his head. A thing like this probably went suborbital. “Big figure eights,” he decided.

"Maybe they exaggerate,” Scarborough said. “It's not my department."

"Where we going?” The deep suspicion he was being controlled could no longer be ignored.

"DC,” Scarborough said. “Does it matter?"

"All I asked, travel to a good medical center with a GI specialist,” Don said.

"Bethesda,” Scarborough said. “You're all set up."

"Isn't that government?"

"So? You qualify."

To Don that was news. He tried to wrap his mind around it, but it fitted poor. “Among other things,” Scarborough said, “they're wanting to check out all you survivors. Something like twenty years in low G, cosmic rays, and ultraviolet. All that with malnutrition and a chronic shortage of medical supplies. Lots of other nonstandard factors. Stuff to be learned, they tell me."

Don could think of a thousand objections, but his situation didn't give a whole lot of choice. “I get any say about all this?"

"I didn't make the decisions,” Scarborough said. “Something wrong?"

Don didn't know if there was or wasn't. Bethesda, he supposed, was as good a place as he could ask for, and things learned might help the people still up there. “Well...” he said, and shrugged it away. “How we get into this thing?"

"Boarding steps, around the other side,” Scarborough said, started to move, but stopped. “I don't think anyone thought...” He let eyes dwell on Don's mobility.

"Maybe I can,” Don said, and rolled himself forward to where he could see. Midway back along the aircraft's long body, the boarding steps arched up, bent like a feeding insect, and descended to an open hatch. “Can give it a try,” he decided.

It took effort, and each small step he had to plan. At the foot of the steps he forced himself to sit up straight, got feet under him, and with a deliberate heave made it all the way to a standing posture in one quick coordination of moves. Bone, then, could take some of the strain. Gripping the handrails of the steps on both sides helped too. After a deep breath, he levered himself one step upward. Then again with the other foot. Then the first foot again. Using arms as well as legs, step by step, he made it up, paused for breath, then carefully let himself down through the hatch, which was no larger than it had to be. All those hours in the *Burroughs'* exercise compartment had been worth it, after all.

Inside, the cabin looked more capacious than possible, given the aircraft's external dimensions. Softly upholstered armchairs waited in apparently random arrangement; gratefully, Don sank into the first he could get to. Scarborough, who had come up behind, came past and took one facing him. Don looked around; no windows—suborbital craft kept such amenities to a minimum—but large display screens forward and on either side, blank for the moment. Presumably they'd give an outside view once they were aloft. The closed door left of the forward display would lead to the cockpit, he assumed.

As if to confirm, it opened. A dark face showed. “Mist’ Scarborough? We're ready any time, ‘cept for runway clearance. Shall I?"

"Shake hands with Don Tenbrook,” Scarborough said. Something close to astonishment showed. “The Mars man? That's who we came for?” He stepped all the way into the cabin. Almost timidly he extended his hand. “Really?” Don lifted his arm. “Sorry not to stand,” he apologized. “The gravity here..."

"Hey, man. Sure.” His grip gentled; Don responded with all the strength he had.

"You're...?"

"Fred Ramsey,” Scarborough said. “Our pilot."

"I'll try to keep the G force down,” Ramsey said. “Just the necessary.” He turned eyes to Scarborough.

“Can I talk about this?"

"It's not confidential,” Scarborough said. “He'll be meeting the web people when we land."

It was news to Don, but he kept a straight face.

"Oh, my boy will be excited,” Ramsey said. And to Don, “You're one of his big heroes."

"Nothing heroic about it,” Don said. “Just a long, hard job."

"Sometimes that's what it takes,” Ramsey said. He sounded puzzled.

"Ask for runway clearance,” Scarborough said.

Ramsey grinned. “A pleasure.” Then, to Don, he corrected himself. “An honor, sir.” When Ramsey had returned to the cockpit, Scarborough fished out his unit again. “Need to make sure we have our information right,” he explained. “Some of the webbers will expect a handout; too busy to look things up. Born in Alliance, Nebraska? In ‘27?"

"Correct. Sort of,” Don said. “'Liance is where the hospital was. And the county seat, except it was one county over, if you know what I mean, so that's where the records got kept. Our spread was something like an hour out of town.” Wry smile. “By road that is. If the weather was good.” Not sure an urbanite could understand about weather, he paused to let it sink in.

"And that's where you learned self reliance?"

Funny way to put it, Don thought. “That's not really it,” he decided. “It's...” He tried to put the idea together. “Well, it's like when Mr. Ungrodt up the road broke his leg. We went out and found him—if he hadn't had his phone, he'd have been there till spring—and took a door out of his house to slide under him—Pops and m'brother did that; I just held on to his leg, and him yelling and fighting—strapped him down and loaded him in back of the bucketer with a couple of sofa cushions under it, and—"

Scarborough was pecking notes into his unit. “Bucketer?” he asked. “Standard range vehicle. Go anywhere, do anything. If you ever rode in one, you'd know why it's called that."

"Ah,” Scarborough said. “Then?"

Don shrugged; he thought he'd told it all. “Drove him to town. M'brother did that. I sat in the back to hold his leg and make sure the blanket didn't blow off. And pound on the cab if things turned bad, except they didn't. Pops stayed out to look after the stock, which is how he'd broke the leg to begin with."

Scarborough pecked another note. “No airlift available?” he wondered.

"Not in a blizzard, which is the other part of how he broke the leg. Sheriff's car met us somewhere on the way and did us escort.” Another memory made him smile. “Deputy shook our hands when we got there and told m'brother he drove real good and sort of didn't think to say he looked kind of young to be driving. Didn't ask to see a license, either, which was a good thing because he didn't have yet."

More notes were entered. “I don't think that's shown up in any of the bio pieces we've seen,” he said.

"What's to show? I only mention because, well, that's how the life was. Where's the self-reliance?"

Scarborough worked on it a while. “Not sure I follow."

"What I'm trying to say,” Don said, “it's not just counting on yourself. It's ... well, you see a job, you go

do it best you can and not be ashamed to ask for help. Out there, Pops was on the phone to the hospital people. They told what to do, and they buzzed the sheriff's people and I guess got the road folks to plow out some of the snowdrifts. I forgot to mention that. All we did was get Mr. Ungrodt to a place where people knew how to put him back together."

"And you see nothing exceptional in all that?"

"It's how the life was," Don said. "When your name comes up out of the hat, you do what's needed. Simple as that."

Scarborough was still trying to digest the idea. Don felt a small vibration as their aircraft powered up. The display screens came alive, showing some of the airport terminal building and the line of aircraft crowded up to it. The deck tilted slightly and seemed to rise a few centimeters. Air cushion undercarriage, Don realized; so they'd worked out the bugs in that concept while he was gone. He wondered what other surprises waited.

"So you don't think you did anything out of the ordinary," Scarborough said.

"Just held onto his leg and got almost frostbit in the back of the bucketer."

"When?" Scarborough asked. "How old were you?"

Don had to think back. "Going on, eleven. Larry—that's m'brother—he was fourteen."

"So you'd describe it as a community coming together toward a common goal," Scarborough decided. "As if Norman Rockwell never died."

Don's turn to be puzzled. "Who?"

"Sorry. Old family joke. My grandfather. Or his. Rockwell was ... oh, twentieth century. He painted pictures. Something of a romantic, I guess. People doing ordinary things. Being, oh, just people. Except, somehow, a lot of undercurrents. Ideals and values and basic decency. That sort of thing. You'd have to see some of his pictures to know what I'm talking about."

"Sounds like it," Don said.

Utterly smooth, their craft was taxiing now. The right side display showed the terminal building off at an angle while the ones forward and left looked out on a broad, almost featureless expanse. Far off, another aircraft was moving also.

Scarborough consulted his unit. "No athletics in school? We've found no mention, but..."

"Lived too far out. Took too long getting home."

Another entry tapped into the unit. "And then you went to the university at Lincoln," he said. "On scholarship." He waited then to have it confirmed.

"Couldn't have paid for it without," Don said. "Wasn't all that big a scholarship, either. State government."

"Mm. Yes." Another uncertain pause. "And graduated with a degree in engineering. We've searched, but we find no record of advanced degrees beyond that. Just a routine bachelor's. Correct?"

"Anything else I got from the college of natural perversity," Don said.

"Uh?" Scarborough wondered.

"Old joke," Don said.

"Oh." Scarborough seemed to understand. "And you worked on various projects around the world. Primarily energy systems."

"Wind and sunlight, mostly," Don said. "Includes storage and real-time distribution. Couldn't always get the harvest when it was needed most. Or the right place."

"The list we have, besides North America, you worked Siberia, Arabia, South India, the Philippines, the Sahel Federation, several Pacific islands. So forth and so on. I miss anything?"

"Antarctica," Don said. "But that was a god-awful mess. Nobody puts it in their resume."

"I was coming to that," Scarborough said. "Your work there is what brought you to Mars Petro's attention."

"Nobody ever told me," Don said.

"We have it direct," Scarborough said.

Don shrugged. "If you say so."

Their aircraft paused, turned, and hummed like a person biding his time. Fred's voice came through an intercom. "Waiting for the go signal. Ready back there?"

"We need to buckle," Scarborough told Don, and found his seat restraints. "All sorts of accelerations and letups coming."

"Been a while," Don admitted, and searched for his own straps. They were under him, of course, so getting them out and secured was a struggle. Scarborough waited for Don to finish before telling Fred they were ready.

"Tally ho!" Fred replied, and they began to glide forward.

Very quickly, the force at Don's back multiplied. Though he'd traveled by air many times before he went to Mars, he remembered no time when such asymptotic power had been called on; neither, though, had he seen an aircraft like this. Well, in twenty years a lot of things must have changed. With no sound but an almost subliminal hum they leaped aloft. A slight thump signaled retraction of the stubby wings. In the displays the land below shrank as if under a microscope, then wheeled as Fred set their northward course. Don saw a sinuous river, hardly more than a thread, winding through an expanse of green; all that water with nothing better to do than flow down to a sea so vast his imagination could not hold it. On Mars, each drop had been a treasure.

The force at his back drained away. Scarborough unpouched his unit. "Still some items to go through," he said. "What got you into engineering?"

Don had to think back; it had been so long ago. "Well, several things, I guess," he said. "To begin with, it was always sort of understood m'brother would take over the spread, him being three, four years older then me. That meant I'd have to find my own way in the world. Besides that, truth to tell, by the time I got to Lincoln I'd put my foot in all the cow pies I ever wanted."

He took a breath. "The next thing, we had six or eight of those big windmills on the spread, and the

company paid Pops a good bit to have them there. That was handy when the beef prices were down, which seems like they were a lot of the times when it came time to sell. And sometimes I'd be helping the men who came to collect the charge from the capacitors—winter, when the drifts got deep sometimes, and spring when the ground got soft in the hollows. Naturally, I'd talk with them, and they'd explain that the windmills turned turbines that generated power, and that was because when you passed a wire that was part of a circuit through a magnetic field you got a current, and when you passed a big bunch of wires like that through a strong magnetic field you got a lot of current, some of which you could use to maintain the field in the first place. And I asked where the magnetic field came from, and someplace ‘long about there it got complicated. Seemed like every time you got an explanation it left something more to be explained. Like when you turn over a rock and all you find is another rock under it. I must have said something about that because then they told me it didn't so much matter why things happened. What counted was that, if you knew what happened, you could wiggle things around to do what you wanted instead of how things would happen if you left them alone. Like this thing we're sitting inside of right now."

Scarborough chuckled. “So you liked the idea of making things happen."

"Well, doing things,” Don said, and made a twist of the mouth. “Either you do things, or it gets done to you."

"Mm,” Scarborough said, and spent a while putting entries in his unit. Finally: “Anything more?"

Don had to think. “Well, you learn engineering, you learn what it's not possible to do, so you might as well not try. But you learn to look at why it's not possible. Maybe there's some way around. And, the other side of things, you learn what ought to be possible, only nobody's figured out how yet. Like, well, again this thing we're in. Show it to Orville Wright, he'd say you'd never get it off the ground."

"I'm told we're supported on a cushion of compressed air,” Scarborough said. “Sort of like water skis."

"Uh huh.” Don let doubt speak for itself. “That's been how it's done for a hundred years. But it takes energy and some way to convert it to thrust. Back before I went to Mars you'd have needed a body twice this size to hold the charges and engines big as elephants to do the work. I looked at this thing. I didn't see ‘em. So there's been some breakthroughs nobody told me about."

Scarborough was quiet a moment. “I suppose there have,” he said. “I don't know the details, but—” He hesitated. “I'm told your situation up there stimulated work in that area. Also, I understand you made a few innovations yourself, which people down here improved on."

"Anything we did wouldn't be commercial,” Don said. “Not big enough and too expensive. You'd have to be desperate, which we were."

Scarborough tapped another note into his unit. “As I said, some people down here saw ways to build on it,” he said.

Don folded his arms. “I'll be interested."

Now the external view displays showed patches of cloud, open water, and scattered islands lushly green amid the blue. By their presence, some of the islands disturbed the shape of clouds in their vicinity.

"We're digressing,” Scarborough said, “and we want to have this completed before we land. So we don't have much time. You'd say after graduation you worked ... well, pretty much all over the world. Correct?” Don shrugged. “Pretty much."

"A journeyman engineer, primarily working in energy systems."

"Electrical," Don said. "But that included some mechanical stuff. Where the two came together, that is." He thought a moment. "Not much nuclear or hydropower, and with the hydropower it's only if you count flow systems instead of impoundments. Mostly just wind and solar, with a little bit of temperature differentials."

"Yes. We have that." Pause. "Now, we've searched, but it wasn't possible every place you were. Some of the places, records aren't kept very good—"

"Aren't kept, period," Don said.

"Well, yes," Scarborough admitted. "We need to know, any brushes with law enforcement?"

"Just the usual shakedown stuff," Don said. "Off the books tax collection and personnel fringe benefit."

Grimly, Scarborough smiled.

"And had to testify when a yak farmer sued for his herd being poisoned by transformer coolant. They had hoof and mouth disease, and nobody else for a thousand klicks knew something about both. Does that count?"

"Probably not," Scarborough said with the twist of a smile, but made a note. "Now, similarly, we've found no record that you ever married. Correct?"

It was an oblique way of asking a question almost never directly asked, and still an edgy issue in some backward parts of the world. Buried inside was the presumption that a lifelong bachelor had some wires loose. "Thought about it real serious once," Don said. "Wouldn't have worked, and she saw it sharper than me. Wanted to change the world. Me, I just wanted to find a place where I'd fit."

* * * *

IV

It took him back.

Jeni. From whom he'd learned so much about how things got done in the world; mostly because, in the classes she took they were telling her how they got done and it made her mad. Bad systems, bad centers of power, and bad people. Wrong things done for wrong reasons. All that.

Full of ideals, which he'd liked her for. But maybe short on the reality. As if by the touch of a keypad, he was there again.

Jenifer (only one "n" if you please!) LaTouche (which she pronounced LaTowsh; French language purists could go storm the Bastille) came from Out East where her father did something with money in the City. Why she'd come so far west for college she never said. In the autumn of her freshman year she pledged a sorority; Kappa something or other. She'd chosen to major in political science and was trying to make up her mind about law school.

He, Don Tenbrook, was from the far western edge of the Nebraska sand hills where his father raised beef cattle that he sold to feed lots who—to hear them talk—did all the work. Also, by some strange coincidence, they got most of the money. Socially undeveloped, accustomed to solitude, young Don went to Lincoln to make himself into an engineer.

In an orderly universe they would not have met. The universe, however, is messy. Random forces

intrude.

What happened, in his sophomore year, as he buzzed eastward to Lincoln at the end of the winter holiday break, his GPS/Realtime picked up the advisory about a storm in the Missouri valley. No problem; he was only going as far as Lincoln. Also he was driving the spread's old bucketer. Pops had somehow scratched up the cash for a new one so Don would have something to get around Lincoln in. By the time he reached Grand Island, with night's dark settling down, the advisory had expanded to include the lower Platte. Still no problem. Lincoln was west of there and a bucketer could get through anything short of a glacier.

At Grand Island he merged onto the feeway but, because of the worsening weather, he opted off from accepting autoguide. He was running into snowfall by then, which meant the advisories were not keeping up with the facts. In his forward beams the flakes streamed past on either side like meteors. When they thickened to where he could see little else, he switched the front window to digital and kept going. Rutted patches of snow began to show on the pavement, capriciously snatching at wheels, then letting go. By then the advisories had the feeway closed east of Lincoln, all the way to Omaha and beyond. He saw an eight unit freight string gone fold-up in the center median, warning flares and flashing strobes declaring the effort to sort out the mess.

So it was no surprise when he came to a roadblock thirty klicks west of Lincoln, sending traffic off the feeway onto local roads and, presumably, toward shelter where they could sit out the storm. What surprised was the state trooper who waved him out of the line of exiting vehicles.

He buzzed his driver's side window down. Wind driven flakes stung his cheek. “Something wrong?” he asked as the trooper came up.

"You a volunteer?” the trooper asked back.

Don knew nothing about volunteers. “Just going far as Lincoln,” he said.

"Call's out for volunteers,” the trooper said. “Road up ahead's a mess. Big strings all over the place. Cal'fornya pilots never saw a snowflake b'fore, know how it is?"

Don sort of knew. The feeway was one of the main transport routes, West coast to East. It meant freight pilots—ordinary people besides—not experienced with winter conditions and all the troubles that made. “Just headed back for school,” Don said. “Hadn't heard about volunteering. You need...?"

"Looked like you got the ‘quipment,” said the trooper. “Lincoln you should make all right. But—"

The upshot was, the storm had made more mess than organized highway service could deal with. A call had gone out for citizens able to help; a bucketer and its operator could. The trooper directed him to the road service yard on Lincoln's west edge. There they checked his bona fides, made sure he knew how to use the bucketer's winch—"Pulled cows out of bogs with it. No, didn't hurt the cows; they're worth money."—swore him as a deputy, issued him a box of flares and a rack of charges (there'd be people who'd squandered their charges to keep warm), and sent him out.

A bucketer hadn't the power or mass to handle big freight components, which were what was needed on the feeway, but there were plenty of reports of cars waiting for help all over the county. They assigned him to work his way north on the road toward Wahoo. Most of it was simple cases of cars off the road, either spun out, stalled in drifts, or lost sight of pavement in the snow. All he had to do was set out flares to warn oncoming people who'd been dumb enough to come out in this weather, hook the winch cable to the chassis frame, power the plow blade down to hold the bucketer in place, and reel in; see that the people were all right and give them a charge if their power was down, then move on to the next. He kept

in touch with a dispatcher by phone, but the instructions were that if he saw an unreported vehicle he should check it out; if abandoned, leave it; if it had people, help.

Cold work, of course. Already the temperature had dropped deep in the negative Celsius and deeper all the time. Windborne snow made it worse and wallowing in snowdrifts to secure the winch cable to a car frame wasn't exactly warm work, either. He was dressed for it, though, and between jobs he was inside the bucketer's cab where it wasn't as bad. He passed a snowplow going the other way, leaving a meter high ridge of hardpack snow on that side of the road.

His sixth or eighth job—he hadn't kept count—the dispatcher had a report, some hours old, of a car off the road on the southbound side. Not heard from in some while, so possibly got out on its own or abandoned, but, last report, the phone had sounded weak, so possibly now out of battery. The dispatcher gave him the GPS. Check it out.

At the GPS spot he saw nothing, but you couldn't count on different units giving the exact same location. Besides, taken some while back—car's or the phone?—it had been taken from different satellites than now. Wasn't supposed to make a difference. Complain to Murphy.

He stopped the bucketer in the roadway, activated flashers, planted a line of flares on his back trail, and went for a close look. Driven snow pricked at his face like insect bites; he had to shield his eyes with a glove as he climbed the ridge the snowplow had left on that side of the road.

Nothing in sight, but the snow and wind made the seeing bad. He swung his flashlight's beam both directions. Not much chance a car would be far off the road. All he saw, snowdrifts and shadow.

He walked back south thirty paces; at least it put his back to the wind. There he climbed again and searched both ways. Still nothing. He noticed, though, his bucketer's flashers came only faintly from that distance so, retracing his steps, he paused at fifteen paces for another try.

His light caught an odd glint in, well, looked like just another snowdrift. He waded closer. Yup. A car's rear wheel at an odd angle bumped his knee. He brushed snow off, found a fender and a back window. Now he knew how it lay, front end angled down in a snow-filled drainage ditch. Feeling along, he found the door handle's cavity. It resisted his heave. Locked? No, but compacted snow had to be cleared away. Still it wouldn't come until he realized it opened gull's-wing style instead of sidewise. Then it came easy and, balanced by springs, knocked his cap off on the way up.

Dark inside, he used his flashlight. She was huddled on the downward side, shaking with cold. Not dressed for the weather: lightweight jacket and some sort of tight-fitting leggings. She uttered a cry, whether of surprise or fear he didn't know. She seemed to cringe.

"Don't be afraid," he said. He remembered an old joke. "I'm from the guvvmunt and I've come to help."

"Oh, please!" she managed through chattering teeth. "Please!"

The car lay steeply canted. A roadskimmer, the gull's-wing door had told him. No business on this road or in this weather. Getting her out was a job; she was shaking too bad and frantic besides. Leaning far in and yelling instructions that she had trouble obeying, he got her positioned at last so he could lift. Surprising how lightly she came.

Staggering, stumbling, he carried her bridegroom style up over the ridge, legs going into the snow sometimes up to the hip. Twice he almost dumped her into a drift with himself on top. Managed not to, though. Teeth rattling, she didn't talk much sense, not that he listened much.

Somehow he heaved her into the bucketer's cab, turned the heat up all the way, and started the coffee maker. She could have coffee, hot chocolate, or chicken broth; the tea option wasn't loaded but would give plain hot water if she preferred. Then he went back out to see what he could do about getting her skimmer back on the road.

The snowplowed ridge and deep snow beyond made a problem. He'd repositioned the bucketer and was setting out another string of warning flares when a northbound snowplow came along. It stopped. “Need help?” its pilot called.

He had the plow cut a ten-meter breach in the ridge, then let it go. Burrowing and working by feel, he fixed the winch cable to the skimmer's frame and returned to the bucketer.

By then she was better. She'd spilled hot chocolate on the seat and tried to apologize. Among all the other stains, he told her, who'd notice? Was she up to helping get her car out?

Still trembling some, she wasn't sure. In the dim light of the bucketer's cab her face was a pattern of highlight and shadow. She'd opened her jacket, the better to absorb the cab's warmth; the blouse underneath was some sort of glossy fabric with a laced-up opening six or eight centimeters wide slanting up to her left shoulder. It didn't actually show anything, but hinted that she might have something worth being displayed.

Least of his worries. Other people up the road still waiting for help. He poured her another cup of chocolate and asked again if she was ready to help get her car out. Real soon, she said, but didn't sound eager.

He went back down to her car and slotted a fresh charge. Fumbled with the keypad until heat started to come. Went back to the bucketer; “Now?” he asked.

"I guess,” she said, finished her chocolate, and put the cup in its holder. Slowly fastening her jacket's clasps, she said, “You're from the university?"

"Going there,” he admitted. “Dig people out just sort of a hobby. How...?"

She pointed to the parking sticker in the corner of the bucketer's windshield. “You saved my life,” she said.

Not true, he thought. Shivering hard as she was, she'd been way short of hypothermia. He told her that, and also that somebody would've come. But he'd been the one who did, she said. He'd been asked to, he explained, and to cover the moment's awkwardness, he took her phone and gave it a new battery. Good idea to always have a spare handy, he told her. If she needed anything, just whistle. She thought he meant it personal; asked his number. Rather than explain—he'd meant the universal emergency code—he gave it, and she made the entry.

"Now,” he said, decisive this time. One look at her feet—impractical feminine shoes—he knew she couldn't walk it, so he carried her back down the same way he'd carried her up. “Don't try to run power,” he instructed. “Just steer to keep going straight back. Can do?"

She thought she could, but with the door open all the heat was getting out. He backed off to let her close it and tramped back up to the bucketer for the fourth or fifth time, thinking as he struggled through the drifts that it was two or three times too many.

Thanks to the gap the snowplow had cut, winching her car back up to pavement gave no serious trouble. As it came, it yawed this way and that, but she made corrections just fine. Disconnecting the cable was

more trouble—skimmers had almost no clearance—and he had to take off a glove before his fingers found the release. Blowing on his fingers to warm them, then, he walked all the way around looking for damage. The downside front fender had a bad crack, but that was all. He had her test lights, power, and steering—no problems—and told her the road to Lincoln should be all right, just guide by the snowplow's ridge. If she came up behind a plow, stay behind. Don't try to pass. She promised not. He watched her taillights vanish in the gloom, then climbed back into the bucketer to phone his dispatcher for the next person in trouble.

Some time after a bright winter sunrise—calm, cloudless air—his dispatcher told him no more cars reported off his piece of road. He did one last southbound patrol, saw nothing, and wearily found a slot in his university dorm's parking tower. The cafeteria gave him a double order of sausage and scrambled eggs. Coffee? No thanks. He went up to his room and crawled into bed. When he finally woke, the Sun had already gone down.

That should have been the end of it but, given a phone number, anyone with even rudimentary database skills can track down anybody. Next evening she showed up at the door to his room. Before he could utter a word beyond admitting it was him, she'd put a long, rectangular something in his hands. “Uh?” he managed.

"And listen,” she said. “My house has a social Friday night. You're my guest. All right?"

"Well...” he said.

"It's seven thirty, so I'll be here seven fifteen."

Quickly, then, she was gone.

The rectangular something was a box wrapped in gold gift paper with a big red and green bow. Christmas leftover, he supposed. Unwrapping, he found a bottle of wine. Dumbly, unfamiliar with wine, he put it on his desk. Later, one of his roommates came in. He noticed. “Where'd that come from?” he asked.

"Girl I pulled out of a snowdrift,” Don said.

His roommate looked closer. “Hey, that cork's real cork."

"So?” Don wondered.

Roommate picked it up, inspected the label. Paper, glued on the glass. To Don it looked primitive, probably cheap. “Jesus,” said roommate, and carefully set the bottle down.

Friday night, chipper and modestly dressed, she was at his door. He went with mixed feelings; a sorority social was something outside his normal range; he was sure he'd fit like an ape in evening dress. One of his roommates had loaned a dinner jacket, which all of them advised he should wear. It fitted decently. Otherwise he'd just have to wing it.

The girls, though, were nice. They talked friendly, asked a few questions about where he was from and what he was studying, and let him be himself. They wore name badges—first names only, and many of those in shortened form. One, whose badge said *Mimi,* told him that, to hear Jeni talk, they'd expected a guy at least two meters tall and something more than half that wide at the shoulders. Uncomfortably conscious of his unspectacular hundred eighty centimeters, he explained that his outdoors jacket—maybe she'd noticed when he came in—made him look bigger and, by way of banter, suggested maybe he should go home and not come back until he'd grown some more. She laughed and said it was interesting

to have a guy here who actually did things. Meaning what, he wondered, but carefully didn't inquire.

The other guys there were from fraternities, the future accountants, lawyers, and business executives of the world. Pops had his own opinion about such; that they were the people who made things so complicated that only members of their profession could wiggle their way through the maze. A contrivance for taking money from the people who did real work. Don wasn't so sure, but wasn't sure, either, that it didn't contain an element of truth.

They had name badges, too. Theirs showed full names and, all but his, their fraternity affiliations. In place of two or three Greek letters, some of which Don hadn't learned, Don's said HERO; Jeni's idea, of course. She'd meant it nicely, but...

As a consequence he spent significant time explaining that this girl—yeah, this one right here—was making a big thing out of nothing. A hero was somebody who did something dangerous to accomplish something that shook the world. That wasn't him. All he'd done was snag her car out of a ditch.

A few of the guys quibbled. Didn't smaller things matter? Didn't going out in that weather when nothing forced you count for something? Shucks, said one guy who'd been coming from Chicago that night. He'd caught the advisories and went to ground in Des Moines until stuff got cleared up; whole lot of nothing from Des Moines to Omaha, the map said, and coming through two days later he'd seen freight strings, cars, and all sorts of other machinery messed every which way and still digging out.

Don explained it had been just a piece of work that needed doing and, because of being where he was, equipped like he was, he'd been tapped. Social contract.

Hadn't really had to, one of the guys objected. Then it was Don's turn to quibble.

As only a pledge, she wouldn't move into the sorority house until next fall. When the guys began to leave—Don had noticed no signal, but perhaps in this rarefied realm none was necessary—he walked her back to her dorm. It was a typical winter night, moonless and the sort of cold that bit sharp. Against the cold, all she had was the same lightweight jacket he'd seen before; he settled his own work scarred jacket on her shoulders; girls didn't feel cold like guys did, she objected, and really, her jacket was warmer than it looked. Besides, her dorm wasn't all that far.

He insisted; this dinner jacket he'd borrowed was a bit on the warm side, he said. She made a show of reluctance, but he reminded her how cold she'd been that other night. She let his jacket stay.

Another awkward moment, in the lobby of her dorm he wasn't sure how to handle the end of their evening; he mumbled a thank you for inviting him, she shrugged out of his jacket and handed it to him, smiled, patted his arm, and without a word walked off toward the elevators without looking back. Well, it solved that problem.

That could have been the end of it, too, but middle of the next week she was on the phone. She had tickets to a concert tomorrow night—the Anchorage Symphony on tour—and suddenly no one to go with her. Not fun to go alone. Could he? Please?

Symphony? He didn't know much about classical music, and that string quartet he'd been inveigled into attending last year had been a monumental waste of time. What was the program?

She sounded puzzled, as if what the music would be didn't matter. A Dvorak overture, she said, and a Beethoven concerto—Yamaguchi the soloist—and then a symphony by somebody named Creston. Twentieth century, she thought.

Twentieth century. He'd heard bad things about the weird stuff most composers wrote then. “Well...” he said, indecisive only because he didn't really want to turn her down. She said *Please* again and he weakened.

The Dvorak was nothing much and the Beethoven went on too long. The Creston, though, was boisterous, flamboyant and, above all, loud. It blasted cobwebs from the hall and nearly took the roof off. Walking back to her dorm she was euphoric; who said serious music was stodgy? Still numb from sensory overload, he had to agree.

Same sort of evening's end awkwardness as before. She had a more substantial jacket this time, the scent of newness strong about it; he wondered if it was because of something he'd said or done, but carefully didn't ask. She thanked him for coming with her; he thanked her for inviting him. With a smile and a pat on the elbow she headed for the elevators.

It could have ended there, also, but he felt a need to reciprocate. The Information Company, where he'd taken a part-time job for pocket money, was sponsoring an eclectic tenor's concert. Not a sellout, so he was able to deal for a pair of tickets at reduced price. Would she like? Sure. Why not?

She wore her new jacket. The tenor sang everything from *Poisoning Pigeons in the Park* and *The Green Eyed Dragon With the Thirteen Tails* to *Shenandoah, Greensleeves,* and such other chestnuts as *Leaving on a Jet Plane* and *Send in the Clowns,* which, with style, he made new. Joined by an undergraduate from the music school, he did the duet from *The Pearl Fishers* and *Perhaps Love*. In the lobby of her dorm, this time, she gave him a quick, happy hug before going off toward the elevators. It left him wondering what he should do about her.

After that there were other concerts, student productions of *The Tempest,* an Arthur Miller play that was neither *Death of a Salesman* nor *The Crucible,* a ballet, and *Boris Gudenov.* A touring troupe of dance/percussionists came to Omaha; she said, “Oh, let's,” and they went in her skimmer. She discovered he worked three afternoons a week and sometimes a Saturday at the Information Company and contrived to stop by at times when he could take a break. They'd go to one or another of the ‘spresso joints the next street over; she had a yin/yang spinning coin that they used to decide who paid. It became a game; how it worked out that she paid twice as often as he, regardless whether he did the spinning and she called or the other way around, he never found out. All he was sure, it was her coin. Her sorority had socials every two or three weeks; he was always her guest. His name badge still said HERO, but by then it was old news.

She got him involved in some of the campus organizations dedicated to correcting wrong things about the world. She was in all of them. It meant sitting through long, dull meetings full of talk that seemed never to accomplish a whole lot. It was a matter of changing minds, she explained, both at grass roots level—whatever that was—and in the Offices of Power. If you changed enough minds at the bottom, she explained, you'd change them at the top. Privately he had doubts, but it was time spent with her. That made it worthwhile.

Over the summer, while he tended cattle and she shopped, played, read books, and talked with people Out East, she was on his webline almost every three or four days, never saying a whole lot but projecting an excited delight in everything she did and saw. Also that she could hardly wait for fall and back to school. Pops and Mom remarked on all these messages but knew better than to ask deep questions.

At the football games that fall, her seat in the stadium was not far from his; whether by chance or by some trick of hers he didn't ask. With a bit of persuasion and charm, she improved their proximity until she was next to him. The team was good that year, winning more than it lost; to Don it hardly mattered. Warm and happy, she was beside him, sharing the excitement of each victory, the letdown of the

occasional loss.

* * * *

"When was that?" Scarborough asked.

Real time and memory work at different speeds. For a moment, Don wasn't sure where he was, then realized only a second or two had passed since he'd said that once he'd thought very hard about marriage. "Lincoln," he managed, and took a breath. "The university. Before I knew where I'd go or what I'd do." Scarborough made busy putting entries in his unit. "Not the best time," he said, sounding as if he agreed with what Don had tried to imply. "But then, it never is."

Still remembering, Don had to nod.

* * * *

Some time early in things, coming out from a performance of *Cyrano de Bergerac,* she said, "He was an idiot. He should have said something."

Don's own understanding of such matters wasn't strong, though with reflection he might have known Cyrano's state of mind more clearly than she. What he said was, "Wouldn't have had a story, then."

"Oh, I suppose," she said, exasperated. "That doesn't mean he wasn't stupid." Then, *non sequitur*—or was it?—she announced, "I'm not going to think about marriage for a long time."

"Uh...?" he uttered, his usual response when she went off on a tangent.

"I'm like one of the girls in my house," she said. "She says it's like never before she'll sign up to wash a man's shirts for the rest of her life."

Don heard it with a doubtful ear. Though his understanding of the female mind was thin, he'd noticed enough among his classmates, both in high school and now, to recognize the echo of sour grapes. "She'll change," he said. "She'll meet some guy who flips her switches and she'll turn around like ... well, an electron in an alternating current."

"You think it's that easy?" she asked. "Then she's got to figure how to flip *his* switches."

Something in her vehemence triggered an insight. "You've had that happen," he said.

"Last year. High school," she said, still an edge in her voice. "What he wanted, I didn't. And the other way around. We call it the Cure."

He'd seen a lot of that happen, too. Neither did he understand what girls really wanted, but he knew her world wasn't his. "Not sure I wanted to know that," he said with a terrible feeling of emptiness. Between the spoken words she'd told him that, though she was palling with him, he shouldn't get too serious.

Thinking about it in the weeks that followed, he realized two things.

First, that he wasn't sure why he wanted what he wanted. Her face was nothing exceptional, but to him it was beautiful. He didn't know why. As for the rest of her—a guy could hardly not notice—she was middling tall, slim, moved easy, and an hourglass figure that a twentieth century *noir* writer would have described as right on time. Those details, though, were not important. What mattered was the person behind those perfect blue eyes. He wasn't sure of the why about that, either. All he knew, she knocked sparks off him. Blew from his mind the cobwebs of long held assumptions. Like music and dance, he didn't understand why he liked what he heard and saw. All he knew, she mattered in his life.

But she'd said don't get serious. It would spoil things.

Second, they came from different worlds. By peculiar happenstance their lives had become entangled. Moment to moment the entanglement felt good. Neither wanted to terminate but, unless her switches flipped, the time would come when the path of their lives would break apart. Were he to force the question would be to hasten the moment.

So it stayed platonic. Not once did they, as the going phrase put it, get down and gloriously dirty. From time to time they hugged affectionately, as when the Cornhusker team crazyplayed an impossible touchdown for a last second win, but almost never did they kiss. The time he remembered...

A midwinter day, deeply cold but windless, they came back from his ‘spresso break but lingered at the Information Company's door, prolonging their time together with talk of no great consequence. She hadn't sealed her jacket; styled for show, it closed with long, tapered rods that fitted through loops. He was in shirtsleeves, but in her presence the cold didn't matter. As they talked, hardly thinking what he did, he began to connect the rods and loops. Suddenly she noticed.

"What are you doing?” she demanded and, mockingly, put a thumb to her mouth. Treating her like a child, she meant. Bundling her up against the cold.

Sigmund Freud could have explained what he was doing, but no one took Old Sigmund seriously anymore. Taken by her jest, though, his reply came automatic. Not touching her otherwise, he bent to kiss. At the last moment she saw it coming and turned her head so it found her cheek instead of her lips, but that was all right.

Laughing—secretly delighted?—she backed a step. “You nut,” she bubbled, quickly turned, and walked away.

Next afternoon, she showed up at the Information Company again. Things were busy; word had just got out of a more-than-routine update in the genome assay textbook, and everyone taking the course had to have it down copied to their units Right Now. There were all the usual compatibility and unit capacity problems, plus update status of each unit's copy and a few unsanctioned or pirated copies turning up. Those often caused the copy to be scrambled. That, just as often, caused the unit's owner to blame the Information Company instead of the textbook's copyright holder, so it had to be watched for. All those details had to be patiently checked out and explained. It took time. Lines formed.

Normally, when things were like that she'd smile, wave friendly-like, and go away. This time, though, she hung around until Mr. Nordstrom noticed and sent someone to take over Don's station so he could go. Peter Nordstrom was a nice guy to work for; he understood things like employee morale and what it was like to be young.

On their way to the ‘spresso joint he explained what the problem had been. She replied with something unclean about how the Big Bucks entertainment lobbies had made a greedy mess of intellectual property law, which then everyone else with a foot in some branch of the business tried to take advantage of. She was always blowing off about things like that. Most of the time she was dead on right and he liked her for it. Now and then, though, something could be said for the other side.

"Mr. Nordstrom says it's a lot of work to make a textbook,” he told her, “and the workers have to be paid. Students, if they didn't have to pay, they wouldn't, but then there wouldn't be the book to begin with.” He didn't add that—so he'd heard—a bunch of information tech guys had cracked into a federal surveillance system and, through that backdoor, were quietly selling down copies at half the publisher's price. Not relevant to the conversation.

"Oh, I'm just a nut," she replied. He understood instantly; she'd hung around because she wanted to apologize for calling him a nut, but, equally, didn't want to be direct about it. Nice of her, but she needn't have. He'd felt fine.

Things went on like that. He continued to hope her switches would flip but never heard the click. Instead, he suspected she was using him to fend off any more determined suitor. That further discouraged him from speaking his mind.

He graduated in the upper fifteen percent of his class. Good enough to assure employment but not instant standing in the first rank. Neither was Nebraska Engine one of the top tech schools in the country.

She didn't stick around for the ceremonies; her own classwork was done for the year, she had another year to go, and meanwhile her dad had wangled her an intern job in Washington for the summer; she had to be there, bright and eager, next Monday morning. Early.

He helped load her skimmer. Her stuff made a tight fit, but eventually they got it shoehorned. All that remained was to face each other. He had a job waiting down in New Mexico where a wind farm was being renovated. Nothing had been said about when he'd see her again.

He reached, whether to kiss or merely to embrace ... well, he hadn't thought that far. She saw it coming and backed a step. "Friends," she said firmly, and offered her hand. "All right?"

It wasn't all right. It was a javelin to the heart.

She must have known that, and had she not known she'd have seen it on his face. It was, though, her choice to make and too profoundly vital to dissemble about. Neither, having never dared to speak seriously, had he any right to protest.

Therefore, suppressing his pain, he gripped, lingered, and let go. "Keep in touch," he mumbled.

For reply she moved her lips without making a sound like she did sometimes, met his eyes for a brief, uncertain moment, and turned away. Boarding her skimmer, she pulled the door down and, not looking his way again, boosted quickly away. He watched her out of sight and then, for a time he never measured, merely stood. He felt like a small boat found adrift, empty, far out to sea.

* * * *

V

Scarborough fiddled with his unit, whether to check an entry or to let the silence speak, Don didn't know. For the moment the external view displays showed mostly clouds and open water as their craft streamed steadily north. Off to the west near the world's curved edge lay a scatter of blotches that might have been islands. Don found his voice. "And after that," he said, "a lot of the places I found jobs, you wouldn't want to take a woman. Not one you cared about."

Perhaps Scarborough heard a nuance. A few heartbeats passed before he said, "You acquired something of a reputation, you know. You'd go places others wouldn't. Did you know that?"

"Nobody told me. Some, I know they offered me first."

"Any connection, do you think?"

Don was slow to understand. "What you mean?" he asked, "Because I hadn't anyone but me?"

"Well, yes."

Don had to think; it was all so long ago. “Growing up where I did, sort of empty country, you got accustomed to being off by yourself,” he said. “Nothing much to do except the work.” Maybe it was truth; if it wasn't, this man didn't need to know.

Scarborough let another silence pass; Don knew better than to break it.

"And can we presume,” Scarborough said at last, “no children?"

"None I heard about,” Don said. Absolute truth, but something of an evasion. His few involvements had been brief, care had been taken, and both he and the women had known they'd be moving on. “Can't guarantee,” he added, “but I don't expect.” Shrug. “They'd have to be full grown by now."

"We did have a few claimants turn up,” Scarborough said. “The usual frauds and opportunists. Didn't check out, of course."

Don let a heartbeat pass. “What's to claim?” he asked.

"People like to feel important. Kinship to a public figure can give that, and some will cheerfully lie for the privilege. Others—I should think you know—in the early days, all of you up there, no one thought you'd survive."

Don remembered that bleak first year, a Martian year long. “We didn't, either,” he said.

"And even if you did, no one imagined that you'd ever get home again."

True, Don thought, and nodded.

"That would mean there'd be an estate to collect."

"Huh,” Don humphed. “Shirt off my back. Come up and get it."

"Also, your name was the one people heard,” Scarborough said. “I'm not suggesting these people were anything near smart. Very easy to disprove."

"Hardly needed to bother,” Don said.

"Perhaps not, though—I don't have the particulars—you'd have had some sort of retirement fund, wouldn't you?"

"Not much of one.” “We had to see to your interests,” Scarborough said. “All of you. Some would have owned property. Debts and taxes would have to be paid or put in suspense. Some, inheritances might come up. All sorts of things had to be looked after."

Don frowned. “Not sure I follow. Who was doing all this?"

"When the Mars Repatriation Project was established, someone realized you folks were not well positioned to manage your affairs. We—Space Administration, that is—had to set up an office to deal with such matters. Sort of a trustee arrangement."

"Had to?” Since when did government do anything it didn't feel like doing?

"Specified in the legislation for the project."

As if legislators had the slightest concern for the needs of ordinary people. Don tried to adjust his thoughts. It sounded off center.

"I'm sure you'd have been informed at the time," Scarborough said.

At the time, other matters had pressed more urgently. "Might have," Don admitted. "Some stuff we never got, and a lot we didn't pay much attention to." Just the day-to-day business of staying alive, regardless what piece of essential equipment failed, had been top on the priority list. "So you checked out my kids and found out they wasn't?"

"Exactly."

"And you kept a finger on our business? All of us, I mean?"

"Precisely," Scarborough said. Don thought it through. Before he'd gone, he'd asked Larry to keep eye on his earthbound concerns. Not that he had all that many. "Most of us made some sort of arrangement before we went," he said.

"True. However, you only expected to be gone four or five years. When it became clear you might be up there indefinitely, the need for something more durable was obvious."

Possibly obvious, Don thought, but...

"Why?" he asked. "I mean, that makes it government's business?"

Scarborough shrugged. "Why Congress decided as it did, I don't really know. I've only been with Space Ad the last eight years, so I wasn't around when the legislation was made. What Congress was thinking, and why they thought it ... I suppose there was input from a lot of sources. But when a law's being written, a lot gets done where nobody sees. The reasons for a particular provision, or where it came from, sometimes even the people who worked on it don't remember."

An engineer who worked like that would be asked to turn in his unit. Don reminded himself it had been lawyers at work. "And the arrangements we set up?" he asked.

"Were kept in place. Under oversight, of course, to ensure no one took advantage. Where time's passage made adjustments necessary, they were made under standard advocacy rules." Now it sounded like government meddling. Good intentions, perhaps, and in his own case not likely much damage could have been done. For others...

"I'll get to talk to these people?" Don asked.

"We have it on your schedule. When they're done with you at Bethesda, we'll set up a meeting."

Don shrugged and let it go. If a mess had been made, he could deal with it later.

Scarborough consulted his unit. "Let's go back a bit. This woman you thought about marriage, would she have any claim on you?"

"Not likely," Don said, so quickly it came almost before he had breath to speak with. Inwardly though, came a small cry of pain. So after all these years, it could touch him still. "She's the one broke it off. Long time ago."

* * * *

VI

He never saw her again. No message ever came. His first few weeks, down there in New Mexico's emptiness, blundering around in the new job, too much demanded attention for thoughts of even the most

vital things in his life. All the same, thoughts came. Like Cyrano, maybe he should have said something, either then or before. But, well, he hadn't. Now, too late. Nights, if sleep came slow, the hurt would come back. Then he'd sleep poorly and, though he did not remember dreams beyond the first minutes of waking, he knew they were disturbed by her. Her face, her voice, and that devastating word she'd spoken.

Give it time, he told himself. Neither could he think what he should say if/when they met again.

Some time late October, Ma phoned; he'd be coming for Thanksgiving, wouldn't he? Sure, Ma; he'd have a half week off, wouldn't miss. Then he thought Lincoln wouldn't be that much farther. Jeni would be going home, too, he supposed, to be with family. But maybe not. And if she didn't...

Wouldn't hurt to ask.

But her web address came back: “Vacated."

Could something have happened? Something bad?

For a day while he struggled to calculate the requirements for alternating current output synchronization for direct line transmission from seventeen generating units of assorted capacity, automatic shunt to on-site charge cells when/if demand tapered down, he dithered. That evening he made a direct voice phone call to her sorority. Was she all right?

The girl who answered told him Jeni wasn't living there. Was she a member? Who did he say was calling? With mounting anxiety and clumsy words, Don explained. The girl decided he should talk to Melinda. Melinda came on. She was membership secretary, and yes, she remembered him. The funny guy who actually did things instead of just talk himself big. So here's what. Jeni had zipped them a note. She'd decided to take a year off to think about what she really wanted to do. A lot of us girls, Melinda said, did things like that; know how it is? And just so nothing from outside would nudge her one way or another she was dropping out of her webname and all that stuff.

Don wasn't sure he knew how it was, but it calmed his worst fears. Sort of. He thanked Melinda and signed off.

It left him wondering. What Jeni wanted to decide about wasn't clear. Oh sure, there was the law school thing, but there'd been a lot of other things, too, including maybe things he knew nothing about. Tempted—hoping?—he let himself imagine, just possibly, it was himself she wanted to decide about. Telling himself she'd already made up her mind about him didn't make the hope go away.

So, well, if she decided in his favor, he'd hear. If it was something else, or if she decided negative, he wouldn't. And, thinking hard and sharp, if she did not want what he wanted, well, foolish to want it himself. To protest, therefore, would be absurd. Let it go.

That spring a team was being organized to evaluate a combination wind, water flow, and solar cell installation down in Honduras. Was he interested? The New Mexico job was winding down, so he went. Other jobs followed. From Jeni, nothing ever came. After a while, he knew nothing would. She became just a photoprint card in his credentials wallet, rarely looked at. Then, edges worn soft and 3D scuffed to mistiness, it got left aside when the wallet wore out and Larry sent him a new one for a solitary Christmas in a village five bad-road hours southwest of Ulan Bator. That's how life was.

* * * *

VII

"Why did you go to Mars?" Scarborough asked.

Hard to put himself back in the moment. "Didn't go looking for it," Don said at last. "They came to me. And, well, after Antarctica, jobs seemed to be thin on the ground. Worked a few months, feasibility study for a site up on Baffin Island, which was sort of a joke, but that was about it. So when they knocked on my door, I didn't say I wasn't home. Thought it was a crazy scheme, of course, but they kept talking. After a while, taking it as an engineering problem, it started to make sense."

Scarborough considered. "You weren't excited at the prospect?"

"I'd thought Antarctica made sense," Don said. "Didn't need another mess on my record." At first look, to imagine a resource could be mined on Mars and delivered to some point on Planet Earth more cheaply than it could be taken from Earth's crust had seemed absurd. No way could such an enterprise be made to pay.

The people who created Mars Petro, though, had given it a more thoughtful review.

* * * *

Already in place were the geosynch stations with their skeins of fullerene cable down to Ground Zero in Brazil and Kenya. Traveling those skeins up and down, elevator capsules made inexpensive the delivery of great masses of material from Earth's surface to orbit or from orbit down, the only requirement being that, in keeping with the laws of energy conservation, the masses transferred up and down should be somewhere near equal.

Already on the edge of feasibility, spacecraft of tremendous capacity taking energy from the Sun's radiation and able to navigate between the planets through the interaction of their own controllable magnetic field with that of the Sun and such other worlds as had magnetic fields that the spacecraft passed near, if any. A bonus would be that energy spent on a flight outward from the Sun—say, to Mars—could be largely recovered and stored in charge cells during return to the orbital neighborhood of Planet Earth. Not swift, perhaps, but economical to operate once built. Only one factor would limit their ability to move huge masses of freight: Because their method of propulsion worked by cumulative effect, they could never touch down on a world's surface.

Already practical, the construction of a geosynch station orbiting Mars and, from there, skeins of cable down to a toehold on the planet's surface. Similar to Earth's geosynch stations and their skeins, the technology was well developed and completely understood. (Famous last words!)

All these made it possible to establish a mine on Mars. Energy for operations would come from sunlight—photoelectric panels and/or solar heat collectors. Also, perhaps, wind driven turbines if a windmill able to draw power from Mars' thin atmosphere could be designed.

Given these developments, a mineral deposit on Mars could be worked and could deliver its product to Earth at a cost competitive to a deposit in some remote corner of Planet Earth itself. This was especially true if, on Planet Earth, the business of extraction was hobbled by problems of pollution or other damage to the environment, legal ownership of the land and/or its mineral rights, relations with local (and frequently greedy) political entities, and the purely aesthetic desire of troublemakers to preserve the site's natural beauty, if any.

But ... a mineral deposit on Mars? Once, long ago, Mars was geologically active, creating such spectacular features as the chasms of the Valles Marinaris, shield volcanoes big as Texas, and vast river channels that, at flood, would have made Earth's Amazon a trickle by comparison. That episode, however, was brief and early in the history of the solar system. The consequence: with one major exception, few mineral deposits could have developed to the point where a mine would make sense. The

exception, though, was huge.

Petroleum.

Not oil in the truest sense, it should be understood. On Mars, with its largely depleted atmosphere, nearly all volatiles had escaped from the tarry substance left in the ground. That was all right. The easily vaporized fractions, once used primarily as combustible fuel, had been replaced in earthbound technology by electrical charge storage systems. All major deposits of terrestrial petroleum having been exhausted—wasted, some would maintain—what little still could be extracted at a reasonable cost was too valuable as a feedstock in chemical industries to be wantonly burned. Therefore, the deposits discovered on Mars promised almost at once a potential bonanza. Only engineering problems stood in the way.

Tremendous investment and years of dogged work would be required, of course, but ultimately the patient investor would have his reward. Meanwhile corporate shares could be issued, sold, and traded endlessly. As the project advanced and its prospect brightened, the market value of a share bought early could be expected to increase beyond one's most sanguine calculations. Money waited to be made!

Therefore, out of enterprise and cynical calculation, Mars Petro, Inc. was born.

That Mars might possess so much as a gram of petrochemical matter, let alone vast deposits, came as a surprise. In hindsight it shouldn't have, but hindsight always functions with a sharper eye. As early as the latter half of the twentieth century, robot survey instruments saw dark material apparently emerging from deep-buried strata in a portion of that monstrous gash across the planet's face, the Valles Marinaris; taking note of this feature, one investigator writing in a scientific journal proposed it was evidence of ongoing volcanic activity, even though it resembled earthbound volcanic activity remotely at best.

Forgive him. He could have been led astray by a suggestion published some years previous that dark features telescopically observed on Mars might be ash from furiously active volcanoes, continuously deposited in regular patterns by prevailing winds. Quickly dismissed—terrestrial volcanic ash was well known to be light in color—the idea of Martian vulcanism could have subconsciously lingered, only later to be massively reinforced by the startling first images of Olympus Mons and its lesser siblings.

Sometimes great discoveries are delayed by such missed chances.

By early in the twenty-first century, a number of other dark seeps from less deeply buried strata had been noticed. Traces of methane—natural gas!—had been detected in the atmosphere and an astronomer known for his fearlessly wild but sometimes correct speculations had proposed that at least some of Planet Earth's natural gas was primordial, having been trapped within its solid body as it created itself from the dust and gasses that swirled around the newborn sun; a test of his proposal by deep drilling into precambrian rock failed to find confirmation—the methane leaking out was synthesized by more or less common bacteria—but the basic hypothesis was not firmly disproved. Meanwhile, the distinctive spectra of complex hydrocarbon molecules had been identified in the radio waves coming from gas clouds outside the solar system, meteorites of a type believed to have formed in the cloud of matter from which the solar system evolved had been found to contain large, complex hydrocarbon molecules, and the surfaces of several moons of the outer planets appeared stained by some indefinite but probably complex hydrocarbon material. Saturn's moon Titan was well known to have a hydrocarbon atmosphere and pools of hydrocarbon on its surface. To suggest that Mars could have been similarly implanted was not preposterous.

When the presence of large molecule hydrocarbons on Mars was confirmed, it was tempting to suggest that Mars had once harbored life. Possible, yes, but proved it was not. Under primordial conditions, light

hydrocarbon molecules such as the radio spectra had shown in interstellar space could have undergone numerous combinations and recombinations without activity by a living thing. To hypothesize biological forces was therefore a complexity not required by the facts. Neither did analysis of samples returned to Earth by a manned expedition answer the question one way or the other. Though in aggregate a solid, or nearly so, the molecules had evidently migrated into the strata in which they were found from someplace else. Over cosmic stretches of time many things can happen, during which information can be confounded or lost.

Also, the rules of human discourse can confuse an issue. Sometimes the unlikely, and therefore doubtful, turns out to be true.

To Don, it seemed he'd been hearing about Mars Petro most of his adult life, but it had been blue sky stuff. The first magnet ship was constructed. It began its first flight. A founding module had been placed in Mars geosynch orbit. On and on. Meanwhile he was trying to figure out how, and how to prevent abrasive sand grains getting into the bearings of windmill turbines in the hills of Mauritania, even though, at seventy five meters above ground, the turbines stood above ninety eight point three percent of the airborne sand measured at that location. What was happening out around Mars was background noise.

That was before George Jongue, personnel vice president of Mars Petro, knocked on the door of the camp trailer in which he lived.

He'd been almost a year without work, so he listened. The first cable strand from Mars Synch had been put down and anchored. Work to complete the elevator system was under way. To establish the toehold station and mine, an energy acquisition field would be needed. Acres of photoelectric panels and/or solar collectors. Possibly wind turbines, also. Don Tenbrook, they'd decided, was the man who could do it. They offered good pay, stock options, and full benefits.

Don wiggled the numbers, both the set Mr. Jongue supplied and a few other sets he pulled out of the web. With a few finagle factors, yes, it could be made to work, but he said he wasn't interested. It was too far from home. Also, while the technology of contained ecologies had been thoroughly worked out at the lunar stations, a station on Mars still sounded farther out on the edge than he cared to try. Neither did he need another fiasco like Antarctica in his history. Mr. Jongue doubled the pay offer. Upped the stock options. Benefits, which included tax exempt contribution to his pension fund, were already at the hundred percent mark. Three year contract on site, plus a year or so traveling to and from. Four years total.

Well...

Don Tenbrook would have final say, all specifications. Same for suppliers. Quality control on the hardware. He'd be in charge.

He'd heard those promises before. They only held until the bean counters punched their time clock.

They'd be in his contract. Ironclad.

Don needed work. Engineering had always meant a compromise between perfection and the practical. He said he'd think about it.

* * * *

VIII

"So you felt nothing romantic about going to Mars," Scarborough said. "It didn't excite you?"

"I'd seen deserts. What I knew about Mars, it was more of a desert than most. What's to get excited about?"

"There was a time..." Scarborough said, but let it go.

"Oh, I know what you mean," Don admitted. "It's salesman's talk. Engineers don't think the same."

"But anyway you went."

It took some thinking back, what had tipped him one way or the other. "It's not like I was headed anywhere in particular," Don said, and only in that moment realized that if things had gone different with Jeni he'd never have gone. Grimly he smiled. Lot of places he wouldn't have.

Scarborough ticked a note into his unit. Then he paused.

"Now," he said. His inflection declared the pause had not been only for breath. "This is something we've never understood completely. According to the records, Peter Ballard was the on-site manager. Then, abruptly, you were manager—"

"Acting manager," Don said. "Nothing official about it. Ever."

"In effect, for all intents and purposes, manager," Scarborough said. "The man in charge. Suddenly, there you were. And when it was questioned—several times, the record says—all that came back was that Ballard had died. Requests for details never got a reply."

Long ago, Don thought. Funny how some things stuck in the memory while others took work to retrieve. Several heartbeats passed while he put the scattered pieces together.

"Communications were a muddle, just then," he said finally. "Our primary link had been by way of the synch station, which we didn't have anymore. Also, it happened when Earth was one side of the Sun and us on the other, so all we had was relay through a couple/three of the magnet ships with a transmitter never built for it. And just about then Petro went for bankruptcy. Some stuff got through and a lot didn't. Both ways, I guess. We had to concentrate on what mattered."

"That's not really an answer," Scarborough said carefully.

"What do you want?" Don asked.

"A full account. Ballard was thirty-nine, no health problems we know about, so how did he die? How did you take his place?"

Don took a deep breath. He'd always known, if he lived long enough, the question would come.

"He went for a walk," he said. "Outside. Without his suit and bottle. Air bottle, I mean. Made it something like sixty meters. Crawled the last five. Later, we had a few others do it, but he set the record. We didn't like to think about it. Took to calling it taking a walk."

It silenced Scarborough for a while. Finally: "Suicide, you mean."

"He was a personnel man," Don said. "Work schedules and so forth. Need a man for a job, he'd give you the right man—well, the best available—every time. Suddenly that wasn't what we needed."

"I'm not sure I follow," Scarborough said. "He wasn't the man for his job anymore," Don said, but knew it sounded not right. "I'm probably making it sound more logical than it was. Things like that never are."

Scarborough took a while to work it out. “So he appointed you?” he finally asked.

He wasn't explaining well. “Maybe we need to back off,” Don said. “You probably know more than us about what took the synch station out of orbit. What made the skein come loose. All we knew, we stuck our heads out one morning and it wasn't there. Some of the cables may have wrapped all around the planet, or maybe they burned up when they hit atmosphere. We found some strands that reached from here to there, but our machines didn't have the range to trace the whole distance. The anchor pier was a wreck, of course."

Scarborough consulted his unit. “Yes. We have all that. Go on."

"It took us a while to find out things. To begin with, our beam wasn't on the station because the station wasn't where we thought. Tumbling, besides. And some of the time it was all the way the other side of the planet. And the crew up there was busy trying to make it stop tumbling and to talk to the *Bradbury* —I think it was that one—the magnet ship that was scheduled to dock something like twenty days forward. That was because, the orbit they'd dropped into, they'd impact atmosphere thirty or forty days up the line. The only chance they had was if the *Bradbury* could dock and take them off."

"Which it did,” Scarborough said after a spell with his unit. “But what has that to do with...?"

Don plowed ahead. “So the first day or two, we just went on with operations like normal. The miners dug product and loaded another lift capsule, and we did the habitat chores and so forth. Didn't know what to do about the skein, so we didn't do anything. Then, when we did find out what happened to the synch, took us another two or three to realize how much trouble we were in.” He paused. “I guess we didn't really want to think about it, Peter maybe more than the rest of us."

He discovered he really didn't want to talk about this. Ancient history, sure, but still it had a lot of weight. “Go on,” Scarborough said.

"The skein was all that connected us to the rest of the world,” Don said. “Everything we lived on had to come down that string, only now we didn't have it. And Peter, he needed a new work plan—how to deal with the situation—and he wasn't doing it. Spinning his wheels, I guess, and not talking to us. Didn't know how to start. That went on three, maybe four days."

"Not sure I understand,” Scarborough said.

"Peter was first rate if you gave him a project, but he had to have a work plan. Suddenly he didn't. Didn't know where he was or where to start. And, stuck there like we was, he couldn't just quit, either."

"So he went for a walk,” Scarborough said.

"That was step two. Or maybe three. Before that, I got to talking with Dick Bender—he was habitat maintenance—and Brian Schedrin—the mine boss. Maybe some others. And—we'd been sort of numb—we finally got it. We were like Eskimos on an ice floe that broke off from shore, and too much water in between."

"Umm,” Scarborough said. So perhaps he understood.

"So we cornered Peter. Told him how we figured it. And he put on his top boss face—except I think it was just a bit more of a mask than most of the time—and he told me to work up an estimate. Where we stood, sort of."

"So he did appoint you."

"Just to work up an estimate," Don said. "And I went and talked to everybody and collected inventories, everything we had, and crunched the numbers. They didn't come out too good. We'd have water for a while, except there'd be loss and what we didn't lose would degrade. Repurification would need consumables—filters and sequestrants and such—that would run out in about a year. Oxygen production, the algae tanks were pumping it out all right, but the die-off rate said we'd be breathing more than they'd replace in fifteen months, give or take. Food stocks, normal consumption, would last about seven months. Half rations would stretch it to twelve or thereabouts, but after that we'd have to start eating each other. Then there'd be attrition on equipment—disposables plus parts gone bad—but that would take longer unless some keystone item went, so not to worry, that department. Air, water, and stuff to eat would get us first."

"So you could make it for about a year," Scarborough said, and fiddled with his unit. "Petro's operational plans aimed for that number. The maximum survivable interruption of supplies."

"I never knew that," Don said, and remembered the bleak horror he'd felt back then. "Well, I showed my numbers to Peter, and he knew as well as I did it took something like fifteen years to make the synch and cables, just from when the first module got put in orbit. That meant likely it would take about as long to do it again. Well, he said something about he'd have to think. Next morning, couldn't find him anywhere until somebody looked outside."

"So you took charge."

"Not exactly," Don said. "There I was with my numbers, so I got together the other section heads and the senior people from the science guests—that's what we called them—and laid out the situation. And I said something about it being an engineering problem. Any ideas? Right to start, they didn't. I told them go, walk around, think, and talk to people. After a while, they started coming back."

"You took charge."

"I never asked for it. I got them together again to talk about some of those ideas, and somewhere in it I said something about we needed somebody to decide things. Dump the bad ideas and pick out the good. I sort of hoped somebody would take the bait, but they just looked at me and finally—I think it was Walt Burstein, the atmosphere studies guy—said it looked like we already had one. So there I was."

IX

Crisis management, that guy up at Brazil Synch had called it. Nonsense. Crisis was when time ticked swiftly down toward utter disaster and panic yelled as it slid toward the edge. Up there on Mars it had not been like that.

Rather, it had been the slow, downward slant of a graph toward a foreseeable breakpoint and extinction. The laws of thermodynamics enforced, like all natural laws, with pitiless exactitude. Against it, fingers in the dike. Firebreaks carved against relentless flame. As a closed system, ultimately hopeless, but time gained would be time forever had. And as Max Litvinov, the senior geology guy, pointed out, in the universe as a whole no lesser system is truly closed. Also, you could argue about what composed the universe as a whole.

And, said another man—was it one of the science guests? Herman Prekates, perhaps?—the synch and cables might be gone, but technology had existed since the twentieth century for landing a package—say, a cargo pod—on the Martian surface, close enough to Toehold that it could be retrieved.

Relayed past the obstructing sun by the *Bradbury* and, farther back from Marsfall, the *Lowell*, the appeal was beamed. Help needed. Don laid out his numbers. They allowed something like a year, Earth

time, before the situation would crumble irreversibly. The laws of celestial mechanics dictated, therefore, that a resupply effort should begin at once. Almost an afterthought, to make it look businesslike, Don put his name on it: Acting Manager.

Back came the news that Mars Petro had gone into bankruptcy. Obligations outnumbered funds and future delivery contracts on cargoes expected from Mars—which included several not yet on the way—had already been sold. That meant no new funds would come and therefore that no help could be sent. The *Lowell,* for lack of a synch to dock to, warped course for a return to Earth while the *Bradbury* jettisoned its cargo module, leaving it lost in orbit around the Sun. By thus reducing mass and forcing its magnets beyond design specs, the *Bradbury* then was able to change course and intercept Mars Synch's decaying orbit. With computational power, a dock by eyeball maneuver, and a piece of luck, the Synch personnel were rescued.

For the people down at Toehold, no such rescue was possible. No existing ships but Mars Petro's could reach Mars, and even those could not land. Now Mars Petro was out of the game. Toehold's situation was nobody's job.

That should have spelled the end. All that remained, the playing out of an unwinnable game of solitaire.

What happened then...

Jeni had told him once how bureaucracies, whether government or corporate, seemed automatically to extend their reach. It was something in the human psyche, as natural as food, breath, or the reproductive urge. They seemed to need always new missions, new realms to administer.

Ego aggrandizement, she'd called it.

Perhaps, therefore, it was inevitable that, in Space Administration, some unidentified functionary would decide it was Space Ad's job to do what no one else seemed interested, ready, or able to do. That its activities would expand to the vacuum beyond the Earth-Moon system—possibly someday to the outer planets and even to other stars. Well, that was just fine also.

Congress, master of the purse strings, could have stopped it cold. Some members loudly opposed taking on Mars Petro's failed responsibilities. The plight of the people up there—regrettable, yes, and dire—did not call for government action. Surely they'd known the risks. Why should taxpayers be expected to pay? The Mars Relief Program would take years. Maybe forever. Billions and possibly trillions of dollars drained from the public treasury. For what?

Five or six hundred men and women who had knowingly put themselves beyond reach of practical aid.

Practical, that is, dollar-wise.

What deals got made outside of public sight, Don never heard. Nor any of the hows and whys. Mentioned names became a muddle and the remarks of commentators outside of government were ripe with cynical pontification. Politicians, some said, rarely objected to a new initiative; it's the old ones that get left to languish and, ultimately, terminate. That parties in and out of government might meanwhile gain from the effort, well, un-American to bring that up. Anything government did meant a profit for someone. Let it go to our friends.

Therefore, somehow, legislation moved, and the president, with a cautious, clear statement of misgivings, signed.

The bankruptcy trustees gladly sold two of Mars Petro's magnet ships. Archives were ransacked for the

scraps of obsolete technology that would make possible delivery of cargo pods close to Toehold. Squads of engineers were employed to translate antique designs into modern hardware. After only slightly more than half a year the *Giovanni Schiaparelli* hove forth with a load of robot landers which—so it was hoped—would be released at the proper moment to intersect the rotating world that was Mars, fire solid-fuel retrorockets at the exact right instant for the perfect duration and vector to fix time of arrival at atmosphere entry precisely when Toehold lay below, at which moment ablative heat shields of water ice would slow their fall to a speed that would allow huge parachutes to deploy and further arrest descent through the thin atmosphere until, as the ground was approached, fat bladders would inflate to soften the jolt of touchdown. Somewhere in all that, the holy name of Rube Goldberg would be called upon.

The *Schiaparelli* took seven months to reach the vicinity of Mars. As it approached, it released twenty-seven pods. Well, that is, release was attempted. Three failed to separate. Of the twenty-four actually launched, six either failed to ignite their retrorockets, had their direction of thrust incorrectly oriented, or burned either less or more than the correct duration. On Mars itself, an erupting dust storm with erratic winds increased the confusion. Heat shields were inadequate, guidance systems were unable to adjust, parachutes failed, and bladders deflated prematurely. Of the twenty-four pods launched, four came down inside the retrieval zone. One of those hit hard, burst, and only part of its load could be salvaged.

Not bad for a first try.

Already the *Edgar Burroughs* was on its way with twenty-seven more. Anticipating problems, technicians had been put aboard to make adjustments and design corrections, but time was short and some modifications would have required tools or materials not on hand. The score, Toehold retrieved five intact. Two others crashed. One, having come down outside the optimum zone, was finally recovered three Earth years later. Though air pressure had been lost and the arid cold of a Martian winter had also made damage, most of the food was edible and some of the other cargo could still be used.

Par for the course. From the outset Don had known all would not go smooth. Also that whatever food came would not last forever. Therefore, though he allowed the commissary to serve a celebratory meal when the first pod was brought in, he didn't otherwise relax the rationing rules. A few people grumbled, but even they understood the necessity. That the pod had included, unexpected, a cache of peppermint ice cream helped ease things. It carried the message that somebody down home truly cared.

That someone down home had taken thought was also evident when inventory of what had come showed that each pod had been loaded with assortments instead of just one thing. Rice and soybeans, powdered milk and eggs, powdered coffee, and dehydrated potatoes. Baking flour, yeasts, and flavorings. Frozen peas, carrots, fruit juice concentrate, and corn. Numerous varieties of hybrid food crop seeds to be tried, computer core replacements, machine and pressure suit parts. Pressure suit sealant gel and patching tape. Lubricants, some types usable inside the habitat and others for outside. Solar panel replacements and energy charge spares, medical supplies and equipment. Basic clothing and footwear. Algae spores. Remnants of the massive heat shields, usually found not far from the pods they had protected, would help replenish the water supply.

Down home, someone had taken into account that not all the shipments would get through.

Also, each pod had a number. Beamed back down home, they told which had made it and therefore, matched against manifests, what supplies had not and therefore still were needed.

Each pod also had a surprise. The ice cream in the first was followed by an immense stock of frozen

strawberries in the second. A third had chocolate bars, some of which included nuts, dried fruit, or crunchy nuggets. The last of the first four—the damaged one—yielded a vast assortment of nuts. Every kind Don could think of, roasted, shelled, and salted. For people malnourished and half starved, fine dining. Knowing to expect food crop seeds, Don had ordered an aboveground greenhouse built beside the algae vat housing. Like the algae vat, though, it would have to be kept warm. That meant more solar panels would be needed. Attempts to make them from local materials failed. Don tinkered with the fabrication process; he knew a few tricks that, down home, the bean counters wouldn't have allowed. Some of the science guests had tricks also, as did the repair shop staff. Ultimately, though, output was still not good. Panels were scavenged from the idled mine's machines and added to the field until the reserve of electrical cable ran out.

Meanwhile, bearings fouled by abrasive grit, the windmill turbines were failing. Don let them go. Sure, windmills had been worth a try; Martian winds blew swift, and those tall, knob-topped pylons had stood on the ridge above the mine like five—armed, cyclopian giants. At that height, though, Martian air was too thin. The energy content just wasn't there. Don had them pulled down. Their electrical cables could be salvaged and used elsewhere, and the pylons could be scavenged for metal that the machine shop could convert into things needed more.

But then, planted in tubs of Martian soil, most of the seeds didn't sprout. Many hadn't survived the trip from down home, nor was the soil right. It lacked organic material. The chemistry was wrong other ways, too. Though he himself had never grown so much as a potted geranium, Don wasn't surprised. Deeply aware of his own incompetence, he went around, talked to people, and found out who understood the work of keeping a garden. He gave them the job. On a hunch, though, he also assigned several from among the science guests as inexperienced as himself, but who knew the value of keeping records. Which seeds in soil of what chemistry, and what resulted from how much water with what impurities and acidity. How much light. What pollination methods worked best for what type of plant in the absence of bees.

Similarly, thinking ahead, he'd held back something more than half the seeds for a second try. Sludge from the algae vats—dead algae—mixed into the soil helped, as did matter from the septic tank. Dryland irrigation techniques also brought results, but even with all that more than a few plants grew sickly or strange. Stalks lacked stiffness. Leaves were chlorophyll deficient. Blossoms withered in the bud or unfolded wrong. Martin Magnusson of the science guests found that the sunlight coming through the homemade glass had too much ultraviolet and, otherwise, not strong enough. Trials with glass made from carefully selected base material, and translucent rather than transparent, stopped the ultraviolet but also filtered out other, beneficial wavelengths. Systems of reflector panels had to be devised. As for cosmic rays, hopeless to stop them. Some types of plant, though, or certain strains, would be affected less than others. Observe with a critical eye. Keep records. Do not fear to play a hunch.

Gradually, over several cycles of growth, productive types of soil and breeds of plant were identified. The garden began to produce. Then, in the slighter gravity of Mars, the maize and sugar cane grew too tall. A second greenhouse had to be built with a loftier canopy.

Somewhere in all that, unforeseen, oxygen production began to outstrip the need. The problem became fire prevention; measures had to be taken to keep the habitat's oxygen concentration from getting too high. Scale back the algae tanks.

So it went.

After the *Burroughs* had made its flyby the wait for more supplies stretched long. Both ships took months returning to Earth, after which something like an Earth year passed before orbital positions made another pair of flights even marginally practical. For Don and the people of Toehold it meant month after

month of making do with short rations of beans, potatoes, and cabbage. Never enough of all the things they had to have.

It gave time, though, for engineers down home to review the results of their first attempts, make changes in hardware design, and refine their guidance system and atmosphere entry programs. To take into account the actual conditions encountered.

Also, during that long hiatus, Space Administration rethought its long-term plans, bought the *Raymond Bradbury* and the *Percival Lowell,* and commenced the studies that, in the end, transformed the Mars Relief Program into the Mars Repatriation Project. A new Mars Synch would have to be built and then a new skein of cable spun. Nothing technically impossible about all that, but the monetary commitment would be huge.

Neither did anyone know how long it would take. Years for sure, and actual work could not begin until the cause—or causes—of the original Synch's failure were known; the same mistakes should not be made again.

It promised, though, sort of, that the people of Toehold could hope someday to go home. How, why, or by whom the decision was made, Don never heard, but amid the general rejoicing he merely felt wore down. To go home, they would have to stay alive long enough. That was not guaranteed.

* * * *

X

"It surprised us," Don said. "Build another Synch...? We had some idea what the first one cost. Never had the brass to ask for it."

"Actually," Scarborough said, "it was somewhere in the thinking from the start. The legislation for the relief program called for a feasibility study. Somebody was thinking a long way ahead."

Don adjusted his mind to this new fact. "That's where the commission came from?"

"Once we had its findings, the possibility of a replacement was clear. Ultimately, less cost than just keep sending supplies, besides."

Pops had always grumbled that politicians never thought beyond the next election. Don hadn't been sure, himself; sometimes, once a project got started, Jeni had said, it took years to kill no matter how dumb. He'd seen one or two like that first hand. "Well," he said, "we're not complaining."

"There'd have come a point, also, where there'd be too few of you left to sustain the colony."

In his darker moments, Don had thought about that. He'd never been able to think of a solution. "Outpost, you mean," he said. "As we died off."

"Well, yes," Scarborough admitted.

* * * *

From the first, the engineers who planned Mars Synch had known a perfect, utterly stable geosynch orbit couldn't exist. Countless gravitational fields saturated space, resulting in a summed force on every particle, which shifted subtly from one instant to the next as the source masses altered their relative positions.

For the Brazil and Kenya Synchs, in orbit above Planet Earth, three gravitational fields were dominant. Earth's, obviously, was primary, but also acting on the Synchs were Earth's moon and the Sun.

Disturbance from these sources largely canceled in the course of the orbital cycles involved and, for the most part, could be ignored. More troublesome over the long term, Earth's poles—and therefore its equator—slowly and infinitesimally shifted as icecaps, air masses, ocean currents, and the endlessly jostling tectonic plates of its crust slightly changed the world's distribution of mass. Without intervention, therefore, the Synchs could not forever maintain precise locations above specific points on the planet's surface.

Neither did they have to. Their exact altitude above the respective Ground Zeros could be accommodated by allowing their cable skeins to include several tens of kilometers of slack, to be drawn taut or relaxed as orbital eccentricity took them up or down. Their drift to east and west, north and south, could be corrected for by application of magnetic fields interacting with Planet Earth's, power coming from acres of solar panels and kept against need in cubic megameters of charge storage units.

From that innovation had the great magnet ships originated.

For Planet Earth's synchs, that ability to adjust was adequate. For Mars, several additional problems presented themselves.

First, while Planet Earth possessed a robust magnetic field, Mars did not. Corrections therefore had to be applied primarily against the Sun's field, which, at Mars' distance, was not nearly as powerful and, further, constantly changed both strength and direction. In consequence, greater energy had to be applied and the Sun's field had to be closely monitored. Similarly, greater energy storage capacity would be needed. Maximum real-time requirements were therefore calculated and incorporated into the designs.

Second, Mars possessed not one moon but two. Both were small, but nevertheless of significant mass; their gravitational fields could be expected to perturb a synch station's orbit. Even more troublesome, the larger moon, Phobos, orbited the planet in less than a Martian day, which meant its orbit would carry it closer to the planet than the synch station's. An additional complication, the plane of Phobos' orbit was only minimally inclined to the plane of Mars' equator, meaning that Phobos could be expected to pass very close—albeit at varying distance—to the skein between the station and the Martian surface. This would mean the station would have to constantly maneuver to prevent Phobos from colliding with the skein. Meanwhile, regardless, with each close encounter Phobos' gravity would tug at the skein, inducing long, slow vibrations much like the plucked string of a musical instrument. While some encounters might moderate the effects of others, others would magnify.

All these factors could be dealt with, of course. Enough that they should be taken into account in the finalized plan.

Considered negligible and therefore not incorporated in the specifications, the fact that Mars' orbit was more eccentric than Planet Earth's, which meant its distance from the Sun varied more greatly. Solar energy reaching Mars, therefore, waxed and waned to greater extremes. Also ignored, the tiny influence of Jupiter's gravitational and magnetic fields. Likewise the slight but ever-changing distribution of mass in the asteroid belt. Real-time observation and powered maneuver would correct for any effects from those sources.

In short, keeping a Mars Synch and its skein in stable orbit could be done.

Yup. Sure. But capricious Nature has a way of keeping engineers humble.

The commission charged with understanding what happened came to no firm conclusion. Lost data prevented an exhaustive analysis. That said, the probable cause was found in an unlikely combination of events.

Mars had been approaching aphelion, its farthest distance from the Sun. Its solar panels, therefore, had been delivering less power than average. A series of close encounters between Phobos and the skein had required energy expenditure both to prevent collision and to damp the skein's induced vibration; this had drawn down the power available from the charge storage units so a few degrees of drift had been deemed acceptable. Further complicating the matter, three pods of cargo had been ascending the skein, contributing centers of mass at random points along its length; their inertia generated secondary, more complex vibrations from the pulses caused by Phobos' close passages. Another factor, possibly affecting events, an expanding cloud of charged particles from the Sun, technically known as a Coronal Mass Ejection, had been passing within a few thousand kilometers of Mars at roughly that time; it would have distorted the magnetic lines of force in that region of space. Finally, Jupiter had been approaching opposition as seen from Mars; its magnetic and gravitational fields may have contributed additional small disturbances. Members of the commission disagreed on that detail.

What happened, powerful vibrations in the skein reinforced each other, building into a force that tore it from the anchor at Toehold. Wildly flailing, it then broke free of Mars Synch. Like the crack of a whip, this sent the Synch station tumbling with its orbit disastrously changed. Tumbling, its solar panels faced the Sun for only moments at a time, so they delivered almost no useful energy. Some also broke free. Days passed before the crew aboard was able to restabilize with power from the depleted charge storage units. Their decaying orbit they could do nothing about. As for Toehold, its people were left on their own.

Predictable? In hindsight, yes. The fact remained it was not, though after the commission made its report a junior member of the planning team claimed that, with known failure rates for both charge units and solar energy panels, he had recommended contingency factors be entered into the specifications; overruled, he'd been told that quality control in component selection would deal with those problems. That may or may not have been done.

For the people at Toehold, what counted was that, yes, a new Synch could be built and its programs and design could be made to work under real conditions. Regardless, it would take many years.

* * * *

XI

The kitchen ran out of flour. Such a simple, dumb thing. Well, the corn meal might be made to last until the growing maize matured, and then, tightly rationed, it might tide them over until the ships came again. Also, a sort of powdery stuff for baking could be made from potatoes or freeze-dried soybeans. Meals became a monotonous business of taking on enough to make it through the day, but there was never quite enough. Doc Hilliard reported signs of malnutrition; almost everyone had bleeding gums and a pinched look to the face and limbs. Don talked with the kitchen staff and let them serve the barbecued chicken that had turned up in the last pod retrieved of the *Burroughs'* delivery. He'd been holding it back. Then, at last, the rice began to produce, and the sugar cane. Not enough, but enough to retard the decline.

He'd figured the size of greenhouse needed according to average terrestrial crop yields. Dumb. Production was nowhere near that mark. More greenhouses had to be built. That, though, meant men had to work outside, first to quarry stone and gather the other materials needed for glass and caulk, then for the actual construction. It meant also more energy needed, or the greenhouse couldn't be kept warm enough for anything to grow. Homemade photoelectric panels couldn't do the job, so try metallic mirrors to concentrate sunlight; but to be effective they had to be kept turned toward the Sun as it crossed the sky, same as the photopanels. That meant manual control, mechanical systems, and consumption of energy. Efficient? Depends what you mean by efficiency. Do it regardless. Pressure suits were wearing

out, and a man couldn't survive outside without one. Looking ahead, enough pressure suits still had to be serviceable when the supply ships came again or the recovery teams would not be able to go out to retrieve the—as it were—manna from heaven. Don had to decide what gambles were worth the prize. Everything had to be kept in balance.

Tom Wilbur's suit popped a blister. He taped it tight quick enough, but then the rupture propagated and he had to stop and add more tape before he got back inside. It made a huge, ugly bruise on his thigh. Don ordered all suits inspected and a physical inventory of all suit segment spares. Sure enough, the true numbers came out not good, with left leg components totaling out to only four full replacements. One look at the suit failure rate told Don the spares wouldn't last until the ships came again.

It was a bad moment. He talked to the machine shop people; they came up with a plastic patch that, heat-sealed to the inner surface of a suit, worked. But the patches chafed the suit's wearer and wore out something like every twenty hours of logbook time. The plastic, though, could be made from the semisolid product of the mine, of which huge piles had been dug out before the synch station came down. No shortage there, but a work detail—wearing suits, of course—had to be sent out to bring the stuff in. Five hours of logbook time per suit, minimum, and at least three suits per work detail. Do the math.

Outside workers developed sores, but the sores healed in a few days most of the time. Some ulcers, though, persisted. Malnutrition was a factor, Doc Hilliard said. Well, all right. Outside task assignments had to be juggled. After a man had gone out for a few days, he stayed inside for a few and got preferential call on the nutritional supplement supply. Protective bandages at friction points helped also, but Doc Hilliard reported they adversely affected blood circulation.

And the twenty-hour number was an average, not an absolute. Some patches failed at ten or less. Some suits became crazy quilts of repair.

As always, engineering was the art of the possible.

Time passed. On a starkly clear, almost warm day Jake Lingon and Ellen Watanabe went for The Walk Outside. Together. A work detail coming back from cleaning dust off the solar panels found them, seated on the portal abutment, still holding hands. Doc Hilliard said Jake had a bone cancer; medicine had stabilized it, but the medicine stock was running low. Why Ellen had chosen to go with him ... well, either you understood or you didn't ask questions like that. Don assigned people to doorkeeper posts at each of Toehold's three portals. That kept more walkers in check until, one night, a doorkeeper went. After that people signing up for the doorkeeper job had to be looked at carefully. Don got Helga Orbison aside. Morale needed a boost. After evening mess and after announcements, could she...?

With a voice that carried and a striking sense of presence, she could have been a professional singer. Instead, after vacillating in college, she'd opted for a degree in climate science and, as a graduate student, somehow had wound up at Toehold as a one-year science guest. At the wrong time, just her luck. She was out of practice and she'd need an accompanist, but John Dempster had a keyboard and so did Vlad Vysotski. And both Cornell Wang and Leon Crozier had guitars. Might take her a few days.

One last point, Don added. It would be her idea. Understood?

For a moment she didn't. Then she grinned. “Gotcha.” If people thought it was her idea, it would brighten their lives; if his, it'd be Don Tenbrook tweaking them.

It went over good and got things rolling. Gruff Mel Farley became a passable standup comedian, gallows humor a specialty. Quiet George Howard sang duets with Helga in a surprisingly excellent baritone. Several groups began contriving skits, dance routines, and scenes from Shakespeare or Aristophanes. There were even some attempts at Kabuki, though only Ken Mishikawa and John Ishiguru could claim

any links to Japanese culture. Hank Fulton did poetry readings, both his own—awful—and classic, some of which he did very expressively. Anything to take minds off of where they were and what their prospect looked like. Even hunger and teeth coming loose could be lost sight of for a while.

Somehow—Don had nothing to do with it—a committee came into being to take charge of who performed when and to procure or create props and stage sets.

Though communications equipment never built for the task meant not much personal news came from down home, bits and pieces did arrive. Births, marriages, deaths, and all the other milestones marked by close kin. Thus Don learned that Ma's contrametastic medication was holding and the primary tumor—encysted—was turning necrotic. More serious, though, Pops had gone in for a ventricle patch and, to meet the cost, they'd dipped into his—Don's—retirement fund. Larry said it had cleared legal and he hoped it was all right; if beef prices held, they should be able to pay it back before he got home.

Least of Don's worries, just then. Unsure he'd ever see Nebraska again and knowing the prices were unlikely to hold, he messaged back that he'd settle for a side of that beef.

* * * *

Finally, the ships set forth again. All four, refitted and the targeting of their deliveries much improved. At least, so the engineers down home assured. The electronics shop cobbled together a radio beacon that the entry vehicles could target on. Don took a cold sober look at the projected accuracy data—dangerously theoretical—and had the beacon set out fifteen klicks south of Toehold. Too far, some said. It meant some of the pods would come down too far to be retrieved; he explained that to have several tons of vital supplies impact directly on Toehold had to be guarded against in spite of all other needs.

Some of the retrieval men huddled. Fred Canning had bossed in the Antarctic coalfields, so he had a sense of what could be done under frigid and otherwise hard conditions. If some way could be developed for a team to stay out in the overnight cold...

It would require an insulated, portable habitat and the retrieval vehicle would have to be rigged to go much farther at a sitting than its power system was built for. Already it was modified from one of the mine's big ore haulers, but it shouldn't be too hard to hang a few extra charge racks and some extra panels.

It tempted, but think real hard, Don said. It would mean going out beyond radio range. What was the chance of a breakdown? Breakdown would mean an impossibly long walk home and probably loss of the vehicle. That meant two vehicles, minimum, had to be fitted to go, each complete with vehicle recovery ability. Ideally three or more. How good was the navigation? How well would the location of the pods be known? Sure, they'd have homing transponders, which would be nice if they came workable through atmosphere entry, and if the shop could build a receiver to sniff out the signals. Sure, also, the magnet ships could track their fall, but how big would the error factor be? This wasn't like down home, where you had GPS and all those other bells and whistles.

He talked to a few of the science guests. The planetary studies people understood how celestial navigation was done, even though they'd never had to do it. Already in terrible pain from the sores erupting everywhere on her body—Doc Hilliard could do nothing about them—Gwen Suskind worked out the methods for finding one's way on Mars before she died.

And the geology people; could their seismograph array be tweaked up to locate an impact point if it wasn't too far away? Maybe, they said, but because the impact assembly would bounce somewhat randomly several times before it came to rest, the signal would be muddled. Might narrow the search

zone, though.

And it would mean spending energy. How much, and could that much be safely spent? What else would it be needed for?

Consider, too, the anti-rad medication requirement. That meant Doc Hilliard had to be brought into the circle. Men outside for that long at a sitting meant cumulative cosmic ray exposure. Solar wind particles, also. How did that measure against the medication supply? Could we count on finding a fresh and usable supply in the pod brought back? Let's see some numbers.

When the portable habitat—an awkward assemblage of metal and plastic that they called the pup tent—was completed, Don had them test it just outside the portal for ten days. It turned up a lot of problems they hadn't thought of. Just putting it together took hours; that wasn't acceptable. It had to be simplified without sacrifice of essential qualities.

So the project took almost three quarters of an Earth year. Worth it, though. The second cargo pod brought in, from something like a hundred klicks out, they found packed end to end with sides of beef from the Nebraska Cattle Raiser's Association. Larry's doing? Don never heard. People came from every corner of Toehold to see with their own eyes. More than a few broke down and cried.

How about a three-day excursion, Fred suggested. How about four?

Go for the easy ones first, Don told him. Then, well, we'll think about the ones farther away. How much cosmic ray exposure are the men getting? Should we wait until a solar flare reduces the density of the rays, or would the rise in solar wind particles make the total exposure worse? What do the numbers tell us?

He kept on like that, balancing risk against prize. Rivalries emerged. He was taking it too careful, some said. Others said not enough. They complained he didn't listen and his priorities were wrong. He hadn't considered this or that. What if...? And so forth.

Actually, he listened a lot and consulted a lot. As a journeyman engineer, he knew too well that he did not know everything, could not anticipate everything, and that the things he was most sure about were the ones most likely to turn and bite. He sat through long meetings, made sure everyone, especially the most reticent, had their say. He got people aside and probed for their afterthoughts. He ruminated for his own.

Still, unavoidably, the resentments surfaced. Department chiefs accustomed to running a shop their own way chafed at having their way overruled and their view of what mattered not recognized. Endless one-on-one discussions did not always result in a changed mind, either his or theirs, and sometimes action was needed at once, regardless how misguided or shrewd. Tempers flared. These were anxious people, desperately aware that a slow, incremental doom prowled just outside.

By necessity, he learned ways to smooth a ruffled feather and the diplomatic wisdom of not winning a game of chess. Along with everyone else rated for such work, he took his turn at outside tasks and often contrived to be near the end of the chow line; most times that meant lean pickings but, well, very unwise to put himself first among equals.

All that helped. Now and then someone would walk away in rage, then come back hours later to apologize—not for being wrong, you understand. For getting mad.

He was putting too much electrical charge into storage, Rick Selby complained. They needed the energy now. Maybe, Don admitted, but was the need utterly desperate? Then a perihelion dust storm erupted. Output from the solar panels dropped to ten percent or so. After the storm subsided, it took weeks

before dust could be cleaned from all the panels and the field brought back to something near full power. In the greenhouses, crops died and oxygen output faltered. A near thing, that was.

And what about the suicide policy, someone asked. If a person saw death as an escape from a situation they could no longer endure, wasn't that a matter of personal choice? Under normal conditions, Don admitted, personal choice it was. But here, he said, and now, Toehold was an organism larger than the individuals it contained. In that situation, suicide by any individual was the ultimate of selfishness. Like cells in a body, each person had talents, knowledge, and skills that others did not. What might be needed at some future moment, neither he nor anyone could predict. Each person's death would weaken the community. Better to have and not need than to need and not have.

At the time, his only thought was their immediate situation. He never imagined that, answering as he did would enlarge the sense of personal worth of every man and woman in Toehold. Maybe it saved a few lives. Years later, when the first few strands of the new cable skein had come down with a pod full of bottled champagne for ballast, a half drunk Hank Fulton got him aside, thanked him, and told him why.

* * * *

XII

"Where did you learn your management skills?" Scarborough asked.

Skills? It took Don a long moment to find a reply. In the external view displays all he could see was open water and patterns of cloud. They could be anywhere in the world.

"Some of it was just bumping around till I found what worked," he said at last. "Otherwise, well, I'd worked under some good people and some bad people, and I guess that gave me a sense of things. Try to be like the good ones, that is. Then I bossed a few jobs myself, so I had some idea of what to keep in mind. Think at least a little way down the line, take a deep breath before doing anything, and not act any bigger than my boots; that sort of thing."

Not, in truth, a full answer, but he hoped it would do. Before everything else, though, it had been Jeni; he didn't want to talk about her. Never had. Never would.

Governance, she'd called it, and it should be about responsibility, not personal power. Presidents, prime ministers, tyrants of every stripe—never mind the fancy titles—for them, too many times, it was an ego thing, more appropriate to a troop of baboons. Personal glory? Napoleon grabbing an imperial crown and putting it on his own head? That sort of thing? Utterly stupid! Service was what it should be about, she'd said, and the public good. Not personal gain.

And another thing, she'd said, but maybe that was another time. Machiavelli—whoever he was—telling his prince he should make himself feared instead of liked. Dumb, she'd said. Sure, maybe in a dog-eat-dog time like his it had been halfway smart, but you'd have everyone sharpening a knife and looking for your back. True leadership called for respect and true acceptance; you only got that if they saw—and wanted—the goal you were leading them toward.

Remembering that, Don permitted himself a tiny smile. There on Mars, survival, for however long life lasted, had been a goal few could argue with.

"So you took charge," Scarborough said. "You never put it to a vote?"

"Depends what you mean," Don said. "People that didn't like how I was doing things, I explained what else I had to think about. All they had was one piece of the elephant; I had hold of the whole critter. If they wanted the job, they could have it. Most times, about there they'd back down. Nobody wants to be

captain of the *Titanic."*

"Uh?" Scarborough asked.

"Sorry. Something Pops used to say. Big ocean ship nobody thought could sink, but sank anyhow. Long time ago."

"Oh."

"And when a lot of them took to yelling, one thing or another—and I don't say I figured right all the time; I didn't—I'd go for a confidence vote. Lost a lot of times, but then there'd be nobody think he could do it better. Same story. I was stuck." Don paused. "Most of the time, people aren't much different from a herd of cows. Somebody takes the lead, they'll go along. Not as hard as go your own way. Besides which, the situation we had, everyone taking his own direction wouldn't have worked. We had to stay structured, and all of us thinking ahead. That meant somebody running the shop."

"It meant you had to be right more times than wrong," Scarborough said.

"Or not so wrong as not to get by. Or—" Second thought. "—see I was wrong and change my mind quick enough." Pause. "I did a lot of that. Later, when we had things settled better and the cargo pods came on target, they got the funny idea I'd been smart all along."

"Weren't you?"

"Ever try riding a surfboard?"

It made Scarborough go silent a moment or two. He fiddled with his unit. "Well, you made it."

"Some of us didn't," Don said. "Don't lose track of that. And it was everybody doing the job that got the rest of us through. How much was me, how much was dumb luck, and how much was what you people did for us, ask a hundred people and you'll get a hundred fifty answers." He thought a moment. "And if it wasn't for the cargo pods we'd be nothing but a lot of scattered bones."

"You looked ahead and saw what you'd need. Everything."

"Any fool could have."

"You're the one who did."

"Just happened it was me."

"There's also the matter of timing. You saw what was needed long enough forward and got the requirements to us with enough time window that we had time to get it up to you."

"It's what the numbers told me. If you've got numbers, you don't hardly need to think."

"Numbers," Scarborough said, "don't make decisions. People do."

"What else could we have done?"

"You made the right choices at the right time," Scarborough said. "There's not one study that says different."

"That's bean counters talking. Pick up the pieces when it's over, it came out all right, so must've been the thing to do. Leaves a lot of possibilities, only we hadn't the sense to think of them."

"No one else, with hindsight, has come forth with a set of practical alternatives to the choices you made."

Don showed empty hands; let it go, he meant. More credit than his share, but to argue would change nothing. “Did what we had to,” he said. “What we could think of with what we had."

Oddly, Scarborough seemed satisfied. “Excellent,” he said. Then, more slowly, “We expect you'll have some detractors among the web people. Op-edders, especially. Sounds like you know how to answer them."

So it was what Don suspected; Scarborough was probing for how he'd react to provocative questions. Feeding him additional things he could say. Watching for spots he might put his foot wrong. Well, he'd learned long ago there was more than one sort of cow pie.

"Anything else I'll need to watch for?” he asked.

Scarborough gave him a look of appreciative surmise. “We think it likely,” he said then, “you'll be asked how it comes that you're in the first small group to be repatriated. They'll wonder if you took advantage of your position to put yourself at the head of the line."

"Uh huh.” Somehow, Don wasn't surprised. “Well, they'll think wrong. I think you know that."

"True, perhaps,” Scarborough admitted. “But how would you answer them?"

Shrug. “Tell ‘em what happened."

"Which is?"

* * * *

When the first passenger capsule came down—with people aboard, that is—it delivered a team of Space Medicine men to staff the hospital module already down. Also aboard, without advance word, one Wallace Fortney from Space Administration to take over from Don.

Bumped aside, he might have resented but, burnt down to a nub, he hadn't. “You'll be wanting to go home, too,” Fortney said.

True enough, once he thought about it. “Not right away,” he said. “Lot of us not in good shape. They get first call."

Docked to the new Synch, preparing to go, the *Edgar Burroughs* had capacity to take eighteen. Huddled with Doc Hilliard, Don had already decided how the lucky few would be picked.

"Wally was smart,” he told Scarborough. “Good at keeping a balance, and he'd studied up on what he was coming to. Spent a lot of time with me, bolting him down, up and running. If I've any complaint, I'll keep it to myself. Fair?"

"Excellent,” Scarborough said. “But that's aside from what we're asking."

Almost all were sick, to tell the truth. Everyone had malnutrition or the aftereffects. Many had lung trouble. Also there were ulcers and digestive upset, neurological dysfunctions, and tumors. Mitch Blumenson had gone delusional and Jay Cooper's diabetes had resisted all Doc Hilliard's attempts at reversal. Only insulin cooked by the science guests’ chemistry lab—which had never been equipped for it—kept him alive. So on and so forth.

Working from Doc Hilliard's records and the physical exams they did themselves, the medicine men did

triage. Also, of course, they talked with Doc Hilliard to measure the imponderables.

They constructed three lists: those who stood likely to survive the trip, which would mean, don't forget, a threefold increase of ambient gravity; those whose condition might be improved to where, someday, they would be able to go; and those who could not survive without continuous treatment and would therefore have to stay on Mars, perhaps forever.

How Don had planned it, the names on list number one would be given numbers and the numbers would be put in a mess hall serving pot to be drawn one by one. Eighteen, plus two alternates on the odd chance that, at the last moment, a winner or two turned out unfit to go. Knowing that they themselves had no such hope, persons from list number three would draw the numbers. Cruel in some senses, perhaps, but as close to fair as possible in a universe that was not fair.

Fortney reviewed the plan, pursed his lips, and asked questions. Why not let the medicine men pick the numbers?

"They're who made the lists," Don said. "Likely they'll know the numbers, who's which, and got some judgments of their own. And they're outsiders. Not sure we can trust."

"We?" Fortney asked.

"I talked to people," Don said. "When I say we, I mean all of us. Only thing worse would be if we let you pick the numbers."

"They'll trust?"

"We've had to trust each other for almost twenty years," Don said.

"The situation's changed."

"Not for the ones on list three," Don said, but softened a point. "I don't say it's perfect. No such thing. But the number pickers won't know ahead of time they'll be picking a number, and they won't know who's got what number."

"Puts a lot of responsibility on who's holding the numbers list," Fortney said.

"I'll be looking over your shoulder. So will Doc Hilliard. Likewise somebody else from list three."

Fortney thought a moment. "How about we add someone from list one?"

Don considered. "What if his number comes up?"

Fortney smiled. "The rest of us will congratulate him."

"Deal," Don decided. "But one other thing. They put my name on list one. It comes off."

"You don't want...?"

Damn right, he wanted. But ... "Nobody gets to say I rigged it."

"Mm," Fortney said. Don could almost see his brain grinding out conflicting thoughts. "I'm in charge now."

"That's not how they see it. You're not one of us. You say something, they look to see what I say."

It was a flat-out truth. Fortney had to nod. “As long as you're here, you'll be a distraction."

"You want me gone."

"Well, yes."

"Tough,” Don said. “Things held together because I didn't pull rank. We don't start now. Going home matters too much."

"You have a point,” Fortney admitted, and let a silence pass. “It's not just myself who wants you gone."

It had Don off guard. “Who...?” Something clutched at his gut like it did sometimes. “Doc Hilliard? He know something and didn't tell me?"

"Oh, no one up here. Down home. Where it's from, I wasn't told."

Don's turn to be quiet a while. “My name's off,” he said firmly. “And stays off. And we do a double check: one number to a name and each number only once in the pot."

Fortney appeared to give way, but ... “And when the *Schiaparelli* comes?"

"Off,” Don said.

"And the *Bradbury?"*

"Off. I don't go until everyone else who can."

Fortney let silence gain weight. “As you wish,” he said at last.

"No tricks,” Don said.

Wallace Fortney bobbed his head. “No tricks,” he agreed, but with the hint of a smile.

* * * *

"So how did you rig it?” Scarborough asked.

"I didn't,” Don said. “Wally ... about him, I'm not sure. Either we both made a mistake or he pulled one. After we did the drawing we posted the lists, numbers and all. His idea. Then somebody noticed my name didn't show on any, so Wally explained. Next thing I know—here's the part I'm not sure about: it's possible Wally got to them behind my back—the winners went on strike. Said it wasn't fair. Wouldn't go if I didn't."

"Ah,” Scarborough said, but then thought some more. “So...?"

"I tried to face them down. Cussed ‘em and said it was nice, but that didn't make it fair. Also, if I went, one of them wouldn't. Made ‘em uneasy, but they stuck."

Scarborough frowned. “Hold on. You've been saying eighteen, but it's nineteen came on the *Burroughs."*

"That was Wally's doing, too. I don't know, possible he had it schemed that way all along. What he said, he talked to the *Burroughs'* crew and they said maybe they could squeeze in an extra. Trim the rations. Play some games with the bunk time rotation. That sort of thing."

"And?” Scarborough asked.

"They had me boxed. And..." Deep breath. "...I knew it wasn't good to have the old boss still around while the new boss is trying to get stuff done. I made 'em put it to a vote, everybody, secret ballot—none of this show of hands stuff—and just to look at the piles of paper you'd know they wanted rid of me. And, well, not as if I didn't want to come home."

"So here you are." Scarborough tapped an entry into his unit. "I don't know if it will satisfy the op-edders. Probably not." He paused. "The part about pressure from down here, best you don't mention. Sounds too much like us manipulating things."

As if they weren't? Don cocked an eye. "Got anything on that?"

Scarborough tapped another entry, scowled, and tapped again. "Absolutely nothing." He let it hang a moment. "That sort of thing, well, not everything gets into the official record. Know how it is?"

"Sounds like somebody wiggled things," Don said, and wished he knew what Scarborough's unit really showed.

"Some things, it's best to leave out. Do you really want to know?"

Don did and didn't. Give it up, he decided. "If these op edders ask, I'll tell 'em go ask someplace else."

"Oh, they'll ask," Scarborough said. "Be sure of that."

"And if they don't like how I've told it, they can go ask the rest of us. They'll be coming down the next day or two. 'Cept Guido, maybe. Wasn't taking the heavy G too good. Talked like he might ask to go to the Moon."

Scarborough consulted his unit. "Yes, we have that. But the docs have cleared him to come down. It's his option." "Good man with machinery," Don said. "Saved us a hundred times."

"But the op-edders," Scarborough added, "it's our experience they're not interested in facts that disagree with what they want to believe."

Don shrugged. "Their problem."

* * * *

XIII

The outside view still showed nothing but patterns of cloud over water. Looking hard, Don could make out a few flecks that might be ships but, just as possible, flaws in sensor or display. Maybe some islands under the clouds, but impossible to know.

As if, Don thought, Planet Earth was an amorphous something where every point was identical to every other point. Not correct, he knew, but for twenty years it had been just that sort of abstraction. He tried to adjust his thoughts.

"Here's something," Scarborough said. "We have a memo. Someone thinking ahead. Reminds us the public mind tends to forget a job before it's finished. Now that we have all the systems in place, we could have a problem to keep the repatriation program going. Budget cutters will want to trim it down to nothing and move the money to something else, so it'd help if we had a man outside the agency to remind people there's still five hundred of you up there. You'd be a perfect fit."

No accident, Don thought, that the memo had turned up now. "Seems to me we've already talked about it," he said. "Eighteen or twenty bods per trip, four ships, it'll take about two thirds of forever. Doesn't

count the ones too sick to travel, either."

"That's why we need you," Scarborough said.

"Need?" Don asked, perhaps too archly.

"To keep our projects funded," Scarborough said. "We're developing a module with a larger passenger capacity. To fit onto one of the ships. And a traveling treatment facility for the ones too sick. Costly, that one, but seems like the only practical solution. Otherwise, if the talk about a new Mars Petro develops into be more than just talk, we see a few possibilities. Too soon for any details, but you could be a help there, too."

To Don, the idea of a new Mars Petro felt unwise, but leave that aside; he didn't understand how business people thought, anyway. "You want me to sign up," he said. How much it would cost him—time, cash, or frustration—he didn't know. "Dress me up and push me out to yell to heaven. What makes you think I can make people listen?"

People with power, he meant. People who controlled the money. The ones who decided. Bitterly, Jeni had talked about them. Too often, their only concern was how much would land in their own pockets.

"You're the hero and the public face," Scarborough said. "You could make it a public issue. Being a government agency, we'd have trouble."

"Uh huh." So there he was. Well, not as if he'd ever had control of his life. "You think that's why somebody wanted me down here?"

"It's dated only six months ago. You were already on the way."

"Doesn't mean it wasn't in somebody's head," Don said. "Mind telling me who?"

"It's not signed. Came from Senator Trombley's office."

"Who's he?"

"Right now, chair of the subcommittee that oversees Space Ad. Other times he's just been senior minority member. I don't know how much you know about the committee system, how Congress does its business, but..."

"Somebody told me once," Don said.

* * * *

Jeni had complained about it many times, how both House and Senate divided their work and had committees do the hard part, often far outside the public eye. And the congressmen and senators all had huge staffs and the committees had staffs besides. To do all the dog work.

It put too much power in the hands of people never elected to have such power, she said.

Once, when she was blowing off, he'd answered with some thoughts out of basic engineering: that while some ways of doing a job might be more efficient than others, choice of tools and technique mattered less than the intrinsic worth of what was made. Also, that you had to start with what the bedrock presented.

She stayed annoyed. "You mean accept a clunky system with all its potential for crooked deals, and use it to get done what needs doing? That's criminal!"

He didn't know if it was clunky or not, nor what potentials for corruption it had. Just that he'd opened his

mouth without thinking deep. “If it needs doing,” he found himself saying, “and it's the machinery already in place, what else can you do? Dig down to the world's core and build back up from scratch?"

She wasn't satisfied. “Oh, I suppose,” she'd said disgustedly.

Funny, how some things stuck in the memory. Where he'd been with her, what they'd been doing, and how the subject came up, all that was lost. Just that it was one of the world's imperfections that exasperated her. To Scarborough, now, he said, “So it was this senator who...?"

"Or someone on his staff, taking care of details. He's had his weight behind the repatriation project since before it was authorized. And before that, the relief program."

Now it felt like some politician's meddling; what did he get out of it? “Umm,” Don said. “Why?"

Scarborough shrugged. “Side of the angels, I guess. All that was before I came to Space Ad, so I really don't know. He was only a congressman then, and not even on a committee that involved us, but—what I'm told—we started getting questions from his office—what were we doing, and why not, and he got some other people interested—and, well, the rest is history."

"You're saying we owe him."

"Well, yes and no. It gave him some political muscle. Helped him move up to the Senate. Painted him a good man who got right things done. Basically—I don't mean to sound cynical—I'd say he saw a good issue and rode with it."

"Doesn't mean we don't owe him,” Don said. So it had been the senator who'd wanted him home ahead of everyone else. He wondered what kind of coin he'd be asked to pay. A nice big stone from Mars for a paperweight? Not likely. Something more.

"This memo,” he said. “It say what he wants me to do?"

"Not specifically,” Scarborough said. “Just that you'd be useful as someone outside of channels who could—Oops! ‘Scuse, please."

His phone had birdchirped. Quickly, he unpouched it. “Scarborough here."

Gabble came back. A woman's voice, it sounded like, but Don couldn't make out the words.

"Right in front of me,” Scarborough said. “Want talk to him?"

More gabble replied, too much for a simple yes or no. Don had tensed but, as the talk went on, let himself relax again.

"Check. Right. I'll tell him."

Gabble.

"Uh, certainly. Uh...” He covered the phone with a hand and raised his voice. “Hey Fred,” he called. “Miz Ell wants our ETA?"

Fred answered with only a heartbeat's pause. “Twelve minutes to ground, if they don't make us hold. Maybe three to gate—no assignment yet—depending on traffic."

Scarborough repeated it to his phone. Gabble came back. Finally he clicked off and pouched it. “She says they won't make us hold,” he called to Fred.

"I'll wait for the official," Fred replied.

"Oh sure," Scarborough said. "But she wags the world, you know."

"So I hear," Fred answered. "Only, comes a time the world wags back."

Scarborough grimaced, but nodded also as he turned back to Don. "Miz Ell says—" he said, voice back to normal, but with eyes turned eyes oddly to make clear it was a vacuous expression. "—give you her love and she'll talk to you when we land."

"Uh huh," Don said neutrally. "This is besides the web people?"

"Before," Scarborough said.

So, whoever this Miz Ell was, she had some words to stuff in his mouth. Well, find out the words, then decide. Questions took shape on his tongue, but Scarborough spoke before they broke free.

"Where were we? Oh yes. Your medical problems. It's none of their business, but the web people are sure to ask."

It wasn't where they'd been, but Don let it pass. "That's for the docs to figure out," he said. "Doc Hilliard couldn't."

Scarborough offered a wry grimace. "Well, yes. But, well, how would you describe?"

How much to tell this man? How much to tell the world? Don shrugged. "Doc Hilliard said it came out of stress, which was something of a joke we had. Every now and then the gut clutched up, sort of like a turbine with its bearings shot. That's as far as he could take it. Most times medicines—if we had—and a few days of do nothing would fix it, but pretty bad when it came on. Not easy, either, if stuff we couldn't put off happened while I was trying to shake it, which is how things went most of the time."

"Umm. Well, I suppose we'll have to leave that for the doctors to work out. No problems otherwise?"

"Not that I know about. Doc didn't always say all he knew."

"They never do." Quick glance then to his unit. "Now, during your long trip home, I'd expect you thought about what you'd do. After being away so long, and the hardships..."

Oh, he'd thought. "No sense to make plans until the docs are done with me."

"True," Scarborough admitted. "But given that, surely..."

"Nothing big," Don said. "Try to make some noise about getting the rest of us home, like we've already talked. Go out to the home spread. Get caught up with the folks. See what weather and the varmints have done to my trailer. I left it there. Pretty soon, try to find work." That would be tough; he wouldn't know all the new tricks and changed standards of the profession. "And if I can't get myself back to standard G, may have to go live on the Moon." Another wry thought. "Or back to Mars." He paused then. Maybe he'd said enough. Scarborough, though, stayed quiet. "Don't have a lot of working years left, either," he went on. "And my retirement fund ... left it for Larry to manage, and they had to dip into it when Pops got his heart patched. And that comes after I had to dip into it after Antarctica. So, well, don't know what sort of shape it's in."

Maundering, he decided, and stopped.

"It should be better than you think," Scarborough said after touching his unit a time or two. "When we

bought the *Lowell* and the *Bradbury,* with the repatriation project starting up, the money wasn't paid to the corporation. It went into an escrow fund to continue, more or less, the wages of Mars-based personnel, to be apportioned to returnees if and when. Otherwise, dependents or heirs."

Twenty years' back pay stacked up? Don felt a strange numbness. "I hadn't heard that."

"It was in the legislation when the purchase was authorized," Scarborough said, and shrugged uneasily. "Technically, it's compensation for you being stranded up there and being put in danger of your lives. A lawyer acting for you would have argued that the corporation was negligent, so any other application of the money—say, toward other debts—would have been a misappropriation. Congress must have realized that. Naturally—even back then it was billions already—some of Petro's big creditors dragged it through the courts. The whole thing took years." Another shrug. "They lost."

Since when, Don wondered, did congressmen trouble themselves over things like that? "Who do we thank?" he asked. Somewhere, he suspected, some sort of payback was owed.

"I have no idea," Scarborough said. "Could have been some anonymous staffer. A lot of things happen that way."

In other words, Don thought, he'd have to ask someplace else; but Scarborough was still talking.

"As for finding work—with the settlement, I don't know if you'll need to—"

Not have to work again? Ever? More stuff hard to believe.

"—we have a file of people who want talk with you. Consultant. Corporate board. That sort of thing. And if Mars Petro resurrects—"

"'Scuse please, folks," Fred's voice came over the intercom. "Flight program says descent starts, one minute. Recommend you make secure."

So soon? Don checked his seat belt; seemed all right. Scarborough cinched his.

"Best to have your chair faced forward when we touch," Scarborough said. "The thrust can hit pretty hard."

Don wasn't sure he understood; a fast aircraft coming down, wouldn't the backward thrust of slowdown throw a passenger forward? On top of that, he was still wondering: Him? Corporate board? Uncertainly, he shifted his chair; nothing seemed to hold it to the deck, so how did it make him secure? Too much about this world he'd come back to that he didn't understand.

The wait had a long, slow feel. In silence Scarborough let it happen. Then, on the forward display, the whole world seemed slowly to rise. Don recognized Cape Hatteras, though westward from there much else was obscured by patches of cloud. Every part of his body felt the drag of gravity relax. "Ah," he uttered. Hadn't realized how oppressive it had been.

"We'll be there in minutes now," Scarborough said. "Miz Ell wants to talk with you privately. Just you and her. She'll be in the VIP lounge. That's first. Then the web people."

"So you said," Don said guardedly. "Who's she?"

"Senator Trombley's chief of staff." Scarborough let a heartbeat pass, then corrected himself. "Actually, right now, chief of staff of his subcommittee. When he's chairman, like now, she switches over. I don't know if you know how it works; when his party has the majority—"

"Got told about it once," Don said. "Back when I was in school. Not an efficient system, but I get the idea they don't want it efficient."

"It's been commented on," Scarborough admitted. "Depends what you mean by efficiency. There's getting things done, and there's getting them done in a way that everyone's willing to live with."

"So I've heard," Don said. He'd talked through the theory and practice of decision achievement with Jeni too many times. Different people put different price tags on things. Not always in money. "What does she want?"

"She didn't say. For a guess—just a guess, understand—wants you to remind the web people her senator had a lot to do with the repatriation project. He doesn't go for reelection for another three years—if he runs; he's seventy plus already—but it's never too soon to start the campaign."

Likely, Don supposed, and it would fit with his own objectives. Churlish, besides, to refuse. Nevertheless...

"What's he like?"

Scarborough arched an eye; so he understood Don's caution. "Decent. Takes his job serious. Sometimes stands for things that would be nice but not a hope of passing. Some would say he's too ready to spend federal money on things not practical; like—" He gestured uncomfortably. "—sorry—your repatriation project. He's got enemies, of course, but mostly they're the sort it's an honor to have. Longtime congressman; moved up to the Senate, oh, something like fifteen years ago. Third term puts him fairly high on the seniority list."

Don considered. A political record wasn't the whole man. Jeni had complained that too many shaped what they stood for according to poll numbers; could be his good deeds were nothing but the outward show of a cold-blooded reptile. "You don't know him all that well," he inferred.

"Only been face to face with him two or three times. Mostly, when I have to coordinate with his office, it's Miz Ell I talk to. Her, or somebody farther down the totem pole."

"Like now," Don said.

"Exactly."

"So it's her I deal with."

"Oh, you'll meet the senator before you're done. Talk to his committee and so forth. That's another thing she'll maybe want to talk about."

"But right now it's her," Don said.

"Well, yes."

"So what's she like?"

Scarborough considered. "In my experience, all business. No small talk. Been with the senator a long time and runs his office like a clock. For us in Space Ad, what she says, it's like he said it."

So he'd be boxed in a corner and given instructions. Well, maybe. "You're saying, play along."

"My impression, we have the same goals. Like we've talked, the repatriation project's not finished by quite a margin, and if Mars Petro does come back there'll be a lot of details to nail down. Maybe, with

them wanting to move cargo to and from, we can get them to take over the job. Sell them the ships, maybe for dime on the thousand, but with some understandings. Fix it so everyone wins. Things like that."

Possible, Don thought cautiously, and probably already being talked about where nobody watched. Nothing guaranteed, though. A lot of ifs to be transformed into something more solid; not a chance he'd have the final say. The best hope, that he could nudge things one direction instead of another.

Beginning with Miz Ell.

"Where's she from?" he asked. People from different parts of the country had different ways of thinking. An individual wouldn't automatically fit the template, and Scarborough had implied she'd been in Washington a long time so it might not be much help. Regardless, every scrap of information had to be gathered.

Scarborough's answer came doubtful and slow. "Could be New Jersey. Senator's from there and she might have come with him. But the District's full of professional aides and it's smart, a new man in town, to take on some staffers who know the turf. Her, nobody's ever mentioned. To me, that is."

Information that didn't inform. "Been with him since forever, you said."

"Since he was just a congressman, what I'm told. I wasn't here, then."

"How old? Fifty? Sixty?" Some people, getting older, got testy and inflexible. Positions of power made them worse. Maybe he was coming across a bit crotchety himself.

"You got me. Women, you know how they make themselves look younger than they are, even when it's obvious they're not." But he caught Don's thought. "She's okay, though. Even lets us call her Miz Ell to her face. Like somehow it amuses her."

Don's ears pricked. "That's not her name?"

"It's what we call her. Actually, it's ... oh, one of those names, you see it written, you don't know how it sounds. Say it wrong, you're on the wrong foot from word go. So we call her Miz Ell and everyone's happy."

"Uh huh," Don said, and let the wait drag long.

"Actually," Scarborough said, "it's ... well, I'm told the French would say Latoosh. Otherwise, maybe you'd think L'tutch. Maybe La-too-shay. How she says it, it's Latowsh."

* * * *

XIV

Somewhere along the line, Don had learned to keep his face plain when he had to. And, piece of luck, this time he'd had a moment's warning. Last seen, he thought numbly, headed for a summer job in Washington, then gone as if the earth had swallowed her.

A surge of gravitational force as their aircraft changed its flight path saved him from having to speak at once; preparing to touch down already? Tread careful, he decided. Too many times, he'd looked through phone lists that showed how many people in the world had that for a last name. "What's her first name?" he asked, perhaps too sharply.

Scarborough cocked an eye. Odd question? Let him wonder. "You've got me," Scarborough said after a pause. "All I have are initials. How she signs her memos. J.L.L."

Jeni's middle name had been Lyn; just one *n,* naturally. Hardly ever used it, though, in spite of the lilt it gave. How far could ordinary coincidence be stretched? How far did he dare?

Slowly though, as his world skidded sidewise, he understood that he and his people had been saved by something other than a politician's whim and the chancy roll of dice. Unless, that is, he quibbled over when the dice were thrown. It fitted. All of it.

No such thing as a closed system.

"And she keeps an unlisted phone," he said.

"With all the hackproofing hard cash and a top line classification can buy," Scarborough confirmed. "How'd you know?"

"Got told once how people in that line of work rig it." By Jeni herself, he realized with a pang and then an ironic jolt. She'd complained how people in positions of power set themselves apart from the rest of humanity. Unavoidable, he'd told her, straight from the course he'd taken in communications design. People worth talking with would know the number. Others, let them call the office and leave a message on the memory for a staffer to sort through, summarize, and pass upward to be dealt with. Or not. Otherwise the torrent of talk would devour their days.

"Never had the privilege, myself," he said, but cautioned himself that the obvious conjecture still might be wrong. False hope could fool a man.

Well, he'd know soon enough. If it wasn't Jeni, after a lifetime of letdowns, he could survive one more.

"What school she go to?" he asked. Maybe that would nail it down. "What she study?"

It got him a shrug. "For all I know, the Senator hired her out of kindergarten."

Another blank line. As if she'd schemed things so that nothing would be known about her but that she did the Senator's work. "What's her husband do?" he asked.

Scarborough frowned; another off-center question? "Don't know if she has," he said at last. "Kids either. Like I said, with me anyhow, no small talk."

Information that was not information. More troubling, why had he asked?

Don't think about it. He felt the shifting G forces as the aircraft settled its flight path. With a gentle thump the wings extended and locked. On the displays the world steadied and enlarged. Highways sprawled and tangled. Dendritic rivers caught glints of the Sun. Deliberately nonrectangular suburb enclaves filled space between clusters of taller structures. Patches of green were either parks or golf links. Off to the left rumpled ridgelines crowded one beyond another, smoky with haze.

"Anything else I should know?" he asked. A million things, he thought, but most of them this man wouldn't have.

"You're the man with a story to tell," Scarborough said.

And a message to deliver, Don thought. Surely, she would help with that. Maybe it was what she wanted to talk about. Probably, now that he thought, all she'd want to talk about. Nothing personal. No small talk.

But he'd see her again.

After too many years and too much wandering, he told himself. Nothing to be hoped for but another disappointment.

The aircraft was settling more quickly now. It felt like being up on Mars again, but on the displays the world was coming up to meet. The real world, where a man could walk out under the Sun and breathe real air. He could make out individual houses now, and a vast parking lot full of neatly ranked, bug-sized vehicles and a cluster of interconnected, ill-matched buildings at the center. Swiftly now the ground came very near. To forward, abruptly, space opened out. A wide strip of pavement lay below as if coming up to kiss, and to the right a hulking, huge aircraft crouched to let them pass. He felt the slight bounce as the cushion of air replaced aerodynamic lift. Earth strength G-force took his breath and the world seemed to whirl as the aircraft spun a full one-eighty. G-force surged against his back as the jets opposed their momentum; strong at first, then softening. Odd, he thought, that engineers would think it was the best way to do things in spite of the problems it entailed; maybe someday, when nothing more immediate pressed, he'd ask.

In the displays the speed of the world became mere drift. That changed, though, as—still on its cushion of air—the aircraft turned to taxi toward a distant terminal around which other aircraft huddled like cattle at a water tank.

"Welcome home," Scarborough said.

As if he'd ever had one, Don thought. In the left hand display he saw an aircraft, small in distance, leap skyward. The same one he'd glimpsed as they came down? Did it matter? Everyone was going somewhere.

That reminded him. "VIP lounge, you said. I qualify?"

"I'd say so," Scarborough said. "It's an informal classification. Anyone who needs to be insulated from people in general. Anyway, if you don't, she does."

"Uh huh." With a shrug, Don let it go.

"It'll be a bugproof suite. Between users they sweep it, and it's got active interference systems. Anything said goes no place. She instructed me to tell you."

Nice to know, Don supposed. As if anything he might say would need that sort of protection.

Now the terminal was very near. Their aircraft turned to a new taxiway and coasted past an assortment of backswept tailfins, found an open slot, and nosed in.

"You said private," he said, and a new uneasiness came. "You'll be showing me where?" When they met, if it truly was Jeni and not some alien Miz Ell, it should be for their eyes only. Ears likewise. And what could he say? He felt the aircraft settle as its flotation deflated. The skids touched. The aircraft's subliminal trembling stopped and the displays went grey.

"Someone from the terminal will take care of that," Scarborough said.

Fred came back from the cockpit to unseal the overhead door. Almost at once the forepart of a boarding steps assembly came down, found the deck, and stabilized.

"While she's talking to you—" Scarborough touched up his unit as he spoke. "—I'll background the web people. Then she'll bring you out. Half an hour, give or take, she said. All right?"

All business, Don thought. Well, after so long, ridiculous to think it could be anything more. "Should be,"

he said, and tried to believe it didn't matter. “You'll tell them what to think?” he asked.

Scarborough crimped a wry smile. “Hardly. They catch me at it, automatically they think the opposite. Or sideways. No, I bring them up to date, status of repatriation and your place in it. That sort of thing."

It sounded all right; if Space Administration wanted to pin medals on itself, it wasn't his affair. Scarborough rose and came over. Offered a hand. “Need help?"

Don nodded him away. “Think I can,” he said, found purchase for hands and, with strength from shoulders to assist the legs, forced himself up. For a moment he swayed, but a deep breath and pause brought steadiness. Sort of.

As ever, he thought, not in control of his life. A stumbling, uncertain step brought the boarding steps’ handrail in reach. He turned and started up. After three, with eyes out into open air and legs already feeling weakness, he paused for breath. The scents of ozone, hot metal, and lubricants came. Keep going, he told himself. So he'd see her again. Another forced step. Count on nothing. One more. Now he was completely outside. Breeze touched the fabric of his jumpsuit. From somewhere came the roar of an aircraft thundering for altitude. Everyone was going somewhere; lives that had a direction as his had not. Now he was at the highest point. It looked a long way down.

There, one hand on the backrest of a mobility, a young woman waited. Not Jeni, though. Someone from the airport staff. Dark haired and dressed in some sort of uniform. No, the all-business Miz Ell would wait for him to come to her.

Going down would be easier than up, but had to be done with care; until the docs did a sonic on his bones, best not to put too much sudden load on limbs perhaps brittle from years in feeble G. Gripping the handrail, he let himself down one cautious step at a time.

She'd not be the same person she'd been. Dumb to think otherwise. Well, he wasn't the unseasoned kid he'd been in those days, either. Of what had been—what little it had been—there would be nothing now. She would let him shake her hand. He would thank her for all she and her senator had done for him and his people; she would say it was what friends were for, would caution him not to let slip that they had ever known each other before. Then they'd get down to the business of what the web people should be told. Perhaps an opening statement? A list of other debts to be acknowledged? What—and how—should he say about all those others still waiting their turn to come home? All of that.

Almost down. He gripped the handrail tightly, knowing that if he let his hands relax they would tremble. The wobbliness in his knees, he told himself, was a consequence of unaccustomed gravity. Nothing more.

But he would see her again. Whether it was wise, well, he just didn't know. The past was the past and lost years could not be retrieved. They'd gone their separate ways. To meet now would be both too late and too soon.

Regardless, his blood sang.

Then he was down. A steadying hand still on the handrail, he stood uncertainly. The mobility waited just a daunting step away.

"Tenbrook?” the young woman said. “The Mars man? Who saved the colony?"

"All of us up there saved us,” Don said. “Only way it could happen. And a lot of help from down here."

"Everyone knows it couldn't have without you,” she said. “You did a lot of things."

None of which, he thought, would have changed their fate a millimeter. Jeni had been the difference. All of it.

"All the time I was growing up I heard people talk about you," the young woman said. Young as Jeni had been when he'd known her, he thought, and full of romantic notions. "Me?" he asked. "Or all of us?"

"Oh, all of you, actually. But it was your name, always."

What elaborate tales she'd heard, he didn't know. Neither did it matter. "All I did," he said, "I stuck my name on a yell for help."

"But she's waiting," she said, abruptly anxious. "And I'm making you stand while I chatter. She said be nice to you. You've had a difficult time." She gave a glance to her hand on the mobility's backrest.

"I guess that's true," Don admitted.

She'd hardly paused for breath. "I know some of it must have been awful, but what a marvelous adventure!"

She didn't know, he thought, but let it go. "I suppose every life's an adventure," he said. "You know her?" Any scrap of information would be precious.

"Never saw her before today, but I know who she is." She indicated the mobility again, and reached out a hand. "Need help? Some people down from the Moon..."

So this one would tell him nothing, either. He looked down at the mobility. A comfortable device. Very much needed by travelers made weak by living too long in light G.

Go to Jeni in that? Some kind of cripple? The used-up husk of a man? Nuts.

"How far?" he asked.

She didn't really know. "Fifty, maybe a hundred meters." She shrugged and looked back over her shoulder. "Just up the ramp and down the hall. Suite number one. The Imperial."

From where he stood he could see the ramp's foot, but quickly it curved from sight behind a partition. Its flawless carpet burned the color of new blood. VIP? he wondered. Imperial suite? Some people mattered, Pops used to say, and then you had a lot of others who thought they did.

Somehow he felt like neither.

"Just one flight up?" he asked. Likely. Best, though, to make sure.

"That's all." For her, a trivial thing. For him...?

Letting go of the handrail, he took a step. Legs didn't buckle, but no sense of stamina, either. For a moment he stood irresolute.

But, well, mountains were made to be climbed.

Another step took him past the mobility. "Keep it handy," he said with a brief backward nod, then turned eyes forward once more.

"Let's see," he said, "if I can make it on my own."

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Reader's Department: **THE REFERENCE LIBRARY** by Tom Easton

In the Courts of the Crimson Kings, S. M. Stirling, Tor, $24.95, 304 pp. (ISBN: 978-0-7653-1489-5).

Hunter's Run, George R. R. Martin, Gardner Dozois, and Daniel Abraham, Eos, $25.95, 303 pp. (ISBN: 978-0-06-137329-9).

The Dragons of Babel, Michael Swanwick, Tor, $25.95, 318 pp. (ISBN: 978-0-7653-1950-0).

Invasive Procedures, Orson Scott Card and Aaron Johnston, Tor, $25.95, 351 pp. (ISBN: 0-7653-1424-X).

A War of Gifts, Orson Scott Card, Tor, $12.95 (hb), 126 pp. (ISBN: 0-7653-1282-4).

The Hidden World, Paul Park, Tor, $25.95, 319 pp. (ISBN: 978-0-7953-1668-4).

In Deepspace Shadows: A Dramatic Poem in Two Acts, Kendall Evans, Mythic Delirium Books (3514 Signal Hill Ave., NW, Roanoke, VA 24017), $5.00, 33 pp. (ISBN: none).

Different Engines: How Science Drives Fiction and Fiction Drives Science, Mark Brake and Reverend Neil Hook, Palgrave Macmillan, $24.95, 258 + vi pp.

* * * *

Many of us were early exposed to Edgar Rice Burroughs and his visions of a Mars inhabited by sword-wielding, egg-laying barbarians riding thoats, where human John Carter could commit great heroic deeds, win the love of a princess, and (despite the egg-laying bit) have kids. It was a crock then (the interfertility was way over the top, even at the time), and it's even more of a crock now (since we know what Mars is really like). But Burroughs knew how to keep a story moving so well that he still has readers. He also has admirers who crave to rationalize his Mars, so meet S. M. Stirling, who gives us an alternate universe in which both Mars and Venus are pretty much the way Burroughs imagined them. Mars is old, dry, dying, and inhabited by sword-wielding folks descended from the same ancestral stock that we are, for 200 million years ago aliens terraformed Venus and Mars and some 200,000 years ago transported early humans to new homes. On Mars civilizations rose and fell, eventually culminating in the reign of the Tollamunes, the kings of **In the Courts of the Crimson Kings**. Technology is weirdly biological, with people bred to their destiny. The Tollamunes have their own distinctive genome. The Thoughtful Grace caste are Coercives, soldiers, guards, and mercenaries. And Teyud za-Zhalt is a hybrid, banned for theft of the Tollamune genome even though she is the last to carry a sizable chunk of it. When the current emperor dies, there will be chaos. That death is anticipated, and several factions are mounting hunts for Teyud. High prices will be paid for her capture, her head, or just her ovaries (since that would be enough to breed compliant carriers of the Tollamune genome).

Into this world comes Jeremy Wainman, archeologist, tall for a Terran and thus nearly a match for the Martians. His mission is to search out a long-abandoned city, and toward that end he hires Teyud and a land-ship. However, it is soon clear that they are being pursued. At the city they have time—despite battles with feral biotech monsters in underground caverns—to find treasures, including one of vast importance to Teyud, before the followers attack. They win, but then new pursuers arrive.

Meanwhile, back in the City that is a Mountain (Olympus Mons), the emperor decides it's time to recognize his daughter as his heir. This puts the enemy into overdrive, and...

So you've got rationalized Burroughs, and an archeologist with a tendency to heroism (though he does

insist that he's not the guy with the bullwhip). The ending cannot possibly be in doubt. The route to it is great fun, and the coda opens up the stage for an expansive future, and perhaps for sequels.

It is worth noting that Stirling waxes very cute in his prologue. It doesn't have anything to do with the story, but it is bound to gratify old-time SF fans. The scene is the 1962 Worldcon, and a number of SF writers—Bob, Fred, Arthur, Poul, Spreggie, Beam, Isaac—are gathered to watch the first Mars landing on TV. Gratifying, yes, but also rather wistful. If only...

* * * *

George R. R. Martin, Gardner Dozois, and Daniel Abraham have conspired to commit a contender for the next round of awards. It even has movie potential! It's **Hunter's Run**, the tale of Ramon Espejo, a man who seems to have very little potential for heroism or nobility. But ... The tale opens in blackness. He awakens, but he cannot move, hear, or even feel. He's not even breathing. But he has a few shreds of memory. He's a prospector on the colony world of Sao Paulo, one among many humans schlepped along by the alien Enye to develop industry and trade (when humans hit the starways, they found them occupied). There's a lady he lives with when he's in town, but he had sneaked out early one morn once his van was repaired. If he was in a bit of a rush, well, there was a bar fight, a dead ambassador from Earth, and the cops wanted him. He would, he thought, get out into the wilderness for a while, until the fuss died down.

So he went out a bit further than usual, hoping to make the big strike that would turn his life around. He made camp and spotted a mountainside with something a bit funny about it. He set a coring charge (for taking samples), touched it off, and watched the side of the mountain fall off, revealing a wall of metal.

He was just beginning to imagine how rich he was about to be when a hole appeared and a flyer emerged. A beam blasted his camp and van. He shot back. And the next thing he knew was the blackness.

That's when he is decanted. Goopy fluid drains away. He hacks his lungs clean. And the aliens tell him he is a pretty defective sort who must now help them hunt down the man who saw it all and fled. To make sure he will cooperate, they attach a living leash to his throat and demonstrate the incredible pain it can deliver.

Now Ramon is not a very nice guy. Not a forgiving sort. Very much a get-even fellow. He swears that he is going to get free of these alien SOBs. He is going to *kill* these alien SOBs! Not that he can do much along those lines just yet, but just wait!

And they're off, hunting for ... Forgive me, for here is a bit of a spoiler. Hunting for himself, for when the aliens blasted him, he lost a finger. That finger went into a vat, and three days later they decanted poor Ramon-on-the-leash to hunt down free-Ramon. Their intent is to remove an incompatibility with their vision of reality, in which they are not known to be hiding inside the mountains. A bit of backfeed through the leash tells Ramon why: Some long time ago, the aliens had contact with the Enye, and one day the Enye landed and began to devour them. Ramon sees the dying babies and the flight of the alien ships. He realizes that the Enye are still hunting their prey, even using humans to winkle it out of dens. And the Enye ships are in Sao Paulo's sky now.

If he can escape, if he can pass the word, he *will* be avenged.

But ... Why did he kill the ambassador? Memory is returning slowly, and there are hints that the man deserved killing. Why? That's part of this novel's punchline, and you should remember what I said about Ramon being an unlikely prospect for heroism or nobility. He's a real man, though, and one of the things a real man does besides get drunk and brawl is protect women and children.

The tale comes to a satisfying ending, but it leaves unresolved the nature of the Enye and what, if anything, can be done about them. This could be the meat of one or more sequels, even a saga, and if the authors are so inclined, their much-pleased readers will be legion.

* * * *

Return to the world of Michael Swanwick's *The Iron Dragon's Daughter* with **The Dragons of Babel**, which begins with the crash of a dragon in a country village. A dragon, of course, is not what you think. This one has fuel tanks, a control room, and a pilot. It's a war craft fighting in a great war between realms, one of which is centered on the ancient Tower of Babel. But at least at first, the war is beside the point. The dragon's pilot is dead, but the dragon, for all that is a machine, is possessed of a mind and a voice and no good will at all. It immediately proclaims itself lord of the village and grabs young Will for its spokesman and lieutenant. This is good for neither the village nor Will, for Will must do cruel things though he resists most temptations to abuse his power. In the end he manages to kill the dragon, but his reward is exile, and just in time, for now he can embark on his true path, accompanying a swarm of refugees leaving a zone due to be destroyed in the war. On the way to Babel he learns that for some unknown reason the witches who are the realm's political police are searching for him. He falls in with a con man, Nat Whilk, who decides it would be great fun to set him up to pose as the heir to the absent king. And then he spots a lovely lass riding a hippogriff who flashes her tits and flips him the bird. He is smitten.

If the setup makes you suspicious, feel free. If parts seem familiar, well, they've appeared in anthologies and magazines over the last few years. But don't worry. Everything has been assembled with grand care, and along the way to the inevitable denouement, Swanwick's patented blending of modern technology with the people and magic of fantasy provides a rich and wondrous reading experience. Don't miss it.

* * * *

Orson Scott Card's “Malpractice” appeared in this magazine way back in 1977. More recently, with “the help of a brilliantly talented young writer, actor, and comic named Aaron Johnston,” he has been learning the film industry, in part by letting Aaron troll through his old stories to see what might be adaptable to the big screen. When Aaron liked “Malpractice,” the result was first a screenplay and then the novel **Invasive Procedures**.

As one might expect from anything Card is involved in, the novel has some interesting ideas. Plotting and action are excellent, and the characters engaging. The basic idea is that scientist George Galen has developed a way to repair genetic diseases by tailoring a virus to fix defective genes. The virus has to be designed to match each patient; if others are exposed to it, their flesh instantly begins to bubble and flow; they die quickly. (Such instant effects are of course impossible, so that the virus immediately gives the novel a major technical flaw.)

Galen has a corps of aides known as Healers. They roam the urban streets dispensing Band-Aids and Neosporin. They also locate people with diseases Galen can treat. Alas, the virus sometimes escapes control, which brings the Biohazard Agency (BHA) into the picture. But first ... As the novel opens Galen and his Healers are collecting a handful of homeless people, promising them a warm place to sleep and a square meal. It is soon clear that he is kidnapping them, as well as a thoracic surgeon (with her son as hostage for her cooperation). Galen is not a nice guy.

Meanwhile, Dr. Frank Hartman is hard at work at the Fort Detrick Level 4 Biohazard Containment Facility, developing a countervirus (drug plus weakened virus to serve as vaccine) for a nasty bug supplied by the BHA. The countervirus works in monkeys, but before he can even begin to plan human tests, the BHA shows up to draft him to their team. They have human specimens infected with the virus, and he can test his treatment on them. Fortunately, it works. And when he is shown a small book by

Galen in which he writes of a prophet and a Council of Prophets who all look like younger versions of himself, as well as of a plan to improve the human species, he begins to get a sense of what he is really up against. So does the reader, who already knows that Galen is *not* a nice guy.

That's the point where Jonathan, one of Galen's kidnappees, fresh from surgery, flees and winds up creamed on the highway. The autopsy reveals a fresh kidney transplant and a strange memory-laden electronic implant in his head. What's going on? Frank will find out when he falls into Galen's hands, and so will you since I'm not saying much more.

Card and Johnston push the budding technology of genetic repair far beyond its current level, though the date of the story seems not far from now. This makes it difficult to believe it could happen. And it doesn't help that they are too willing to wave a magic wand to move the plot along. Instant virus attacks are one such wand. Another is literally a wand, for the BHA uses a “contaminant rod” that detects biohazards when waved over a suspect spot rather like an airport guard's portable metal detector. How it does so is not described (I suspect it emits microwaves that are absorbed by hazardous genes and then reemitted at specific frequencies, but it can't be that because if it were, a simple tweak would make it able to destroy the genes and there would be no need for counterviruses, and hence no story). But I'm quibbling. Such things probably won't bother many people, while the breakneck pace, gore, and derring-do will keep them turning pages late into the night.

* * * *

Is Santa Claus (a.k.a. Saint Nick and Sinterklass *etc.*) a religious icon or a cultural icon? Most folks don't worry much about this question, but some people can get quite worked up over it, seeing the Big Guy in Red as a distraction from the main event, even with malign intent (since Santa is an anagram of Satan, he just has to be a snare and a delusion, right?).

In **A War of Gifts**, Orson Scott Card looks at the question through the lens of his Ender world. Zeck Morgan is the son of a Bible-thumper who rants that Santa equals Satan. He takes Daddy's messages seriously, despite the scars he bears of Daddy's switch, and when he gets drafted to Battle School, he refuses to play war. Peace is his game. And when one Dutch kid puts out his shoes for Sinterklass and another puts a silly poem in one according to Dutch custom, he rats them out as violating the School's ban on religious observances. This leads to considerable ill feeling, rebellious exchanges of small gifts, and exposition of Santa as cultural icon and *not* religious, until in the end Ender brings adult-level insight to the problem.

A nice warm fuzzy. It was published for Card's fans in fall of 2007, but fall 2008 is coming up fast, and if you want a Christmas story for the kids, this could do nicely.

* * * *

I didn't read Paul Park's *A Princess of Roumania*, *The White Tyger*, and *The Tourmaline*, so the concluding volume of the series, **The Hidden World**, really needs the bits of recap Park offers. Here's the gist: Miranda is a young lady of Massachusetts until the world takes a magical turn and she and her best friends, Peter and Andromeda, find themselves in a Roumania where Miranda is a princess of the old regime. The old regime itself has been supplanted by puppets of the Germans, and the Turks, aided by African technology, are battering at the borders. Miranda also turns out to be an incarnation or avatar of the mythical white tyger that appears at need to defend the realm, so she has a way of shedding blood in considerable quantities. One of her victims is Nicola Ceausescu.

As *The Hidden World* opens, Peter is in the trenches, fighting the Turks. Andromeda is meeting with the wife of the dictator, Bocu, and—alas for the wife—they are about to be caught. Miranda is in a mountain refuge with her mother, Peter's mother, and the Condesa De Rougemont, one of the roots of the magic that has afflicted her and brought her to the aid of Roumania. She is also contemplating the magical

tourmaline that lets her pass back and forth between the living world and the hidden world that lies hard by the land of the dead. She is unaware that Bocu has sent a squad of thugs to assassinate or arrest the women, though when they arrive the white tyger sees to it that they retreat in disarray. Afterwards, however, Miranda goes to the hidden world and loses her tourmaline, without which she cannot return to her body. Alas, the jewel has been seized by the spirit of Nicola Ceausescu, who can now reanimate in Miranda's flesh. Miranda must hope that her late Aunt Aegypta Schenck can recover the stone, even as she in the hidden world and Peter in the real world both pursue an African superweapon that has been lost in a train wreck near the village of Chiselet. Since the weapon sounds a lot like an Ebola dispenser, their mission is urgent. However, there are serious obstacles to overcome in both worlds, one of which involves getting Nicola Ceausescu to let go her grip on Miranda's body.

In this series, Park offers a rare, rich blend of reality with magic with alternate history. Lovers of Avram Davidson, R. A. Lafferty, and John Crowley will enjoy themselves immensely.

* * * *

Kendall Evans' **In Deepspace Shadows: A Dramatic Poem in Two Acts** is a brief oddity that is interesting enough to warrant a brief review. As the title says, it's a two-act play in verse, with stage directions. And it could only be SF, if only because the two acts are separated by more than a dozen millennia! The scene is the sail-powered starship *The TransAtlantic Tortoise*, whose robot crew, captained by Gael-All-of-Metal, has been programmed to search for new habitable worlds. However, the captain has other ideas, while the crew wants to go home. Mutiny is in the offing, even as the ship approaches a mysterious dark-matter structure, a maelstrom.

The dialog is a bit heavy on dramatic posturing for my taste. Since I say the same thing about most modern drama, it may suit you fine. The plot is nicely structured, and as a whole the tale is a marvel of conciseness. If you like poetry, order a copy.

* * * *

In **Different Engines: How Science Drives Fiction and Fiction Drives Science**, Mark Brake and Reverend Neil Hook fail to prove their title case. Using an annoyingly breezy style (perhaps because Brake, though he is a professor of science communication, has experience writing for TV and radio), they make it clear that science—sometimes in the form of the speculations and dreams of scientists—influences the form, content, and message of science fiction, some of which is of course written by the same scientists. But when they try to say that science fiction precedes the actual science, it doesn't wash. True, some scientists have been turned on to science, even particular areas of science, by childhood exposure to science fiction. But they do not hold up for inspection a single example of something begun only in science fiction leading to actual science or technology. If science leads to science fiction, which later leads to more science, the link is really from science to science, through an intermediary that gets the word out. That intermediary they recognize as science communicators, among whom they count Jules Verne, H. G. Wells, and many more.

If we call this a fault of the title more than of the text, there is much to admire here, for they provide a history of science fiction set in a context of the development of modern science. The two have indeed grown up together, to the point that we may indeed suggest, as do Brake and Hook, that SF is the soul of science. Unfortunately, as they see that soul, it is riddled with guilt and alarmism. When they discuss biology, they see that "a history can be told of the hopes and fears for biology; a story that spans all ages, from the Age of Discovery [1500-1800] to the Frankenstein century [the current period]. It is a story of the ongoing relationship between science and the cultural skepticism of its fiction" (p. 218). That is certainly true of much SF, but not of all, for there is a component of the field that deals more with "cultural celebration." And though they do hint that that component exists, they pay it very little attention.

One valuable use for this book might be in the teaching of high school science. Because of its approach, it links classic SF to scientific ideas, and it often names movies or TV shows that could be used to illuminate lessons.

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Reader's Department: **ANALYTICAL LABORATORY RESULTS**

It's time again 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 score every item would

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NOVELLAS (1.54)

1. “Murder in Parliament Street,” Barry B. Longyear (2.95)

2. “Numerous Citations,” E. Mark Mitchell (2.74)

3. “The Sands of Titan,” Richard A. Lovett (2.68)

4. “Emerald River, Pearl Sky,” Rajnar Vajra (1.85)

5. “Reunion,” David W. Goldman (1.49)

* * * *

NOVELETTES (1.18)

1. “Quaestiones Super Caelo et Mundo,” Michael F. Flynn (2.25)

2. “The Hangingstone Rat,” Barry B. Longyear (2.22)

3. “El Dorado,” Tom Ligon (1.92)

4. “A Time for Lawsuits,” Amy Bechtel (1.77)

5. “Kukulcan,” Sarah K. Castle (1.65)

* * * *

SHORT STORIES (0.67)

1. “The Astronaut,” Brian Plante (1.76)

2. “Trucks,” Amy Bechtel (1.35)

3 (tie). “The Face of Hate,” Stephen L. Burns (1.29)

"Yearning for the White Avenger,” Carl Frederick (1.29)

4 (tie). “Salvation,” Jerry Oltion (0.88)

"The Suit," Bud Sparhawk (0.88)

* * * *

FACT ARTICLES (1.82)

1. "The Ice Age That Wasn't," Richard A. Lovett (2.86)

2. "De Revolutione Scientiarum in 'Media Tempestas,'" Michael F. Flynn (2.28)

3. "After Gas: Are We Ready for the End of Oil?" Richard A. Lovett (2.21)

4. "The Search for the World's First Equestrians," Richard A. Lovett (2.14)

5. "Beyond This Point Be RFIDs," Edward M. Lerner (2.07)

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COVER (2.00)

1. April, by David A. Hardy (3.22)

2. June (for "The Sands of Titan"), by David A. Hardy (2.64)

3. January/February (for "Emerald River, Pearl Sky"), by Bob Eggleton

* * * *

All categories had clear winners, but there were as usual some interesting patterns among the contenders. Barry B. Longyear's "Jaggers and Shad" stories are still doing well, with first place in one category and second in another. Richard A. Lovett captured three of the top spots in fact articles and also had a novella in the winners' circle; David A. Hardy won three of the top five cover slots. We had not one but two ties among short stories, and a couple of newcomers made strong showings. Long-time favorite Michael F. Flynn scored very high with both a highly unusual novelette and the equally unusual fact article that complemented it.

One of the most interesting patterns was one that you can't see in these numbers, but Ben Bova warned me about when he was turning over the reins: strong stories and articles tend to polarize people. Pieces that don't generate any hate don't generate much love, either. True to his predictions, some of this year's most popular stories and articles also drew some of the most vehement criticism. Moral: Please remember that plenty of others may love what you hate, and vice versa. As for us, we'll just keep trying to please most of you most of the time.

Since AnLab votes are so important to that goal, 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. We recommend voting online at our website; it makes that problem virtually impossible!)

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Reader's Department: **BRASS TACKS**

Stan,

Interesting take on the situation, in your Jan/Feb 2008 editorial, “Attention.” I've thought of some other, possibly more charitable, explanations.

First is the somewhat special case of the classical music station. I haven't listened to it so I can't say for sure that this is the case, but it seems most unlikely to me that they'd interrupt a selection in the middle to run commercials. That being the case (at least for the sake of argument), then the classical music station has a fundamental difference with other types of entertainment shows. The difference is that in other shows, the play (or whatever entertainment is being broadcast) is generally one continuous piece, so that the audience can extrapolate from what he's heard to what he can expect in the next segment. In the case of classical music, that's not true; after the commercial break, an entirely different selection will be presented. Under those circumstances, it is not at all unreasonable for the station to inform the audience what the next selection (or even the next few selections) will be. Even if the underlying motive is to keep them glued to their chairs through the break so that they will not miss the opening bars of the next piece. (And not coincidentally, to not miss the commercial!)

Next is the more general case of the recap after the commercial break. Given that, except for the special case I mention above, the station managers are aware that some portion of their audience does leave the vicinity of the TV or radio to attend to other matters during the break (getting snacks, etc.), the recap serves a distinct purpose. That purpose (in this view, at least) is not so much to remind the audience of what happened, as it is to notify them that the show is about to start again, and to give them a few seconds warning to come back to their chair so as not to miss the beginning of the next segment.

To some extent this encourages the audience to leave the TV at just the time when the sponsors want them glued in front of it, but the station could justify it as “public service."

Howard Mark

Suffern, NY

* * * *

No doubt some of them do, and probably some of the customers even see it as such; everything is liked by some and disliked by others. The fact remains that this gimmick means they're delivering less actual product than they claim—and the “warning” excuse is less relevant than ever in a time when many viewers time-shift most shows via VCR or TiVo and skip the commercials anyway.

The classical music station's main offense is not previews or recaps, but a strong tendency to play only short “pieces"—often single movements yanked from a large piece containing several movements that were meant to be played as a unified whole.

* * * *

Dear *Analog* Editor,

I have read *Astounding/Analog* from the first issues, and my unbroken subscription runs from 1946, to numerous addresses in England and Canada (I am not yet quite as old as Jack Williamson was).I could have written many, many times with praise for your selection of stories, so it pains me to say that Barry Longyear's story in the Jan/Feb issue seems to me to be incoherent, incomprehensible, excruciatingbalderdash.The earlier stories in this series werebarely bearable crude pastiches.The references to English place-names and characters may seem amusing to American ideas of English

manners, but they are pitifully unfunny to anyone who knows better.

I have understood from your editorials that you do not expect to please everybody.However, I hope that we shall not have to suffer through further episodes of this sort of rubbish.You must have something better in your slush pile.

Yours truly,

Donald McCormick

* * * *

Hi,

I'm a longtime subscriber to both *Analog* and *Asimov's* and have enjoyed them both greatly over the years. *Asimov's* has undergone a change in the types of stories they publish and I find fewer and fewer that I like. I may let my subscription to *Asimov's* lapse next time around. I really depend on *Analog* for the hard sci fi and space opera type of stories I enjoy. A story like "The Spacetime Pool" (March 2008) is just the kind of fuzzy, romantic, claptrap I expect to find in *Asimov's,* not *Analog.* I checked the front of the magazine to be sure I was reading *Analog.* Sorry to have my first letter be critical, but I just hate that kind of story. Can't you send that stuff their way instead?

Thanks for listening.

Jessica Koenig

* * * *

Dear Dr. Schmidt,

First let me say that I lived in Mexico for twenty years, returning just two years ago. I found the country and the people most agreeable.

I said the above in hope that you would not mistake what I am about to point out: The theme of the March 2008 editorial can easily be applied to human immigration to the U.S.A.The parallels are clear, I think.

As a child I learned we were the melting pot, where immigrants came to become Americans. As a resident in Mexico, I joined the local chapter of the Junior Chamber International, became a member of the local Lions Club, *really*learned the language, learned some of the *Himno Nacional,* and came to feel almost a Mexican. I would like to see those who come here do something similar, and not be like kudzu vine (I recall watching it grow before my eyes in South Carolina in 1940.) and the other non-native species we now find here in America.

I've been reading *Astounding* and *Analog* since 1939, and I don't think I have missed an issue.

Yours truly,

and keep up the good work,

William (Bill) F. Steagall, Sr.

El Segundo, CA

* * * *

Dr. Schmidt,

I would just like to add a few words to your March editorial, “Which Stitch in Time?” Humans have been slow to understand the full implications of introducing alien species to new habitats. We never received a “User's Manual for Planet Earth” and have had to piece the knowledge together for ourselves.

Some US states and countries do have strict laws about importing species, and the laws are enforced. California, Hawaii, Australia, and New Zealand all have an extensive list of what can and cannot be brought across the borders. Back in the early 1990s, a university in Auckland wanted to do some research on spider silk and tried to import some black widows. But the New Zealand government blocked it. Spiders and snakes cannot be imported for any reason. New Zealand has no native snakes.

The United States bans completely the importation of an Asian animal known as the Raccoon Dog *(Nyctereutes procyonoides).* In some European countries it was intentionally introduced as a fur-bearer or it escaped from fur farms. In either case, it is now established and is considered a pest in most places. The US is trying to not make the same mistake.

These examples are all fine and good, but the real problem seems to be the hitchhikers who travel on people of in containers on ships. Insects and fungus can easily ride over on pallet wood from China to some warehouse in the US if proper fumigation procedures are not followed. With the growth in Chinese exports and the lax reputation China has in enforcing such procedures, it is little wonder we don't have more pests munching our crops or fungi killing our forests.

But it's not a one-way street. I read a few years ago that six of the top ten forest insect pests in China were from North America.

Chris Letsinger

Springfield, Missouri n

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Reader's Department: **IN TIMES TO COME**

Our September issue features “The Last Temptation of Katerina Savitskaya” (which some readers may recognize as a follow-on to Henry G. Stratmann's “The Paradise Project,” though that's *not* a prerequisite). Confront two people with a very big, very mysterious artifact, and they may react to it quite differently, depending on their characters and backgrounds. If it offers new powers, they'll have to decide what to do with them—but there's one decision they *can't* make....

Edward M. Lerner's fact article, “Follow the Nanobrick Road” is an update on where nanotechnology, which you may have first read about here some twenty years ago, is now, and where it seems to be going. It has evolved from a grand vision of a forested panorama in which we weren't yet close enough to see individual trees, to a vigorous field of research in which many scientists and engineers are hard at work among those trees. Not surprisingly, things look different at such close range, and the forms of nanotech we can expect in the next couple of decades are not the wildest hopes and fears that sprang from the initial vision—but they're no less fascinating and full of potential. Lerner's article is a “report from the front,” based on his visit to the 2007 conference on “Productive Nanosystems: Launching the Technology Roadmap,” which brought together many of the foremost researchers making it happen.

We'll also have stories by Stephen L. Burns, David W. Goldman, and Bill Gleason; a timely poem by Geoffrey A., Landis; and last but by

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Reader's Department: **UPCOMING EVENTS** by Anthony Lewis

6-10 August 2008

DENVENTION III (66th World Science Fiction Convention) at Colorado Convention Center, Denver, CO. Hotels include Adam's Mark (party hotel), Hyatt Regency. Guest of Honor: Lois McMaster Bujold; Artist Guest of Honor: Rick Sternbach; Fan Guest of Honor: Tom Whitmore; TM: Wil McCarthy. Membership (until further notice; see website): USD 175; supporting membership USD 40; child (until 12 as of 6 August 2008) USD 45. 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: www.denvention3.org; president@denvention.org. Denvention 3, Post Office Box 1349, Denver, CO 80201 USA.

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22-24 August 2008

BUBONICON 40 (New Mexico SF conference) at Wyndham-Sheraton Airport Hotel, Albuquerque, NM. Guest of Honor: David Weber; TM; Daniel Abraham; Guest Artist: Bob Eggleton. Membership: $30 until 1 May 2008. Info: www.bubonicon.com/, NMSF Conference, PO Box 37257, Albuquerque, NM 87176

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26-28 September 2008

CONTEXT 21 (Ohio conference focused on speculative fiction literature and genre games and films) at the Midwest Hotel & Conference Center, Columbus, OH. Guest of Honor: Tanya Huff; Editor Guest of Honor: Paula Guran; Horror Guest of Honor: Brian Keene; Science Guest of Honor: Jeannine Davis-Kimball. Membership: $35 until 15 August 2008; workshops extra. Info: www.contextsf.org/; contextsf@gmail.com; PO Box 163391, Columbus, OH 43216

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3-5 October 2008

ARCHON 32 (St. Louis, MO area SF conference) at Collinsville Gateway Center, Collinsville, IL. Guest of Honor: Laurell K. Hamilton; Artist Guest of Honor: John Kovalic; Fan Guests of Honor: Rich & Michelle Zellich; TM: Vic Milan. Registration: $55 until 15 September 2008; $60 thereafter and at the door. Info: archonstl.org/32/index.php; (636) 230-9481.

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3-5 October 2008

FENCON V (Dallas/Fort Worth area SF conference) at Crowne Plaza North Dallas, Addison, TX. Guest of Honor: Gregory Benford; Music Guest of Honor: Three Weird Sisters; Artist Guest of Honor: Real Musgrave; Fen Guest of Honor: Gerald Burton; Special Guest: Jay Lake; ORAC Special Guest: Doris Egan. Membership: $35 until 1 September 2008; $40 at the door. Info: www.fencon.org/; P.O. Box 701448, Dallas, TX 75370-1448.

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30 October-3 November 2008

WORLD FANTASY CONVENTION at Calgary, Alberta, Canada. Guests: David Morrell, Barbara Hambly, Tom Doherty, Todd Lockwood; TM: Tad Williams. Membership: Attending USD/CAD125

(GBP62/ AUD146) until 30 April 2008 (limit of 850), Supporting: USD/CAD35 (GBP17/AUD41); additional for Awards Banquet USD/ CAD50 (GBP25/AUD58). Info: www.worldfantasy2008.org/; info@worldfantasy2008.org; World Fantasy 2008, c/o The Story Box, 1835-10 Avenue SW, Calgary, Alberta T3C 0K2 Canada. n