

LIFEBALL

Birth of a New God

J. Andrew Ross

By the same author

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LIFEBALL

Birth of a New God

A Novel

J. Andrew Ross

ROSS

J. Andrew Ross

www.andyross.net

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2020 Vision

The angels have blessed us. We were in a tight spot seven years ago. But they came and saved us. And my dear Ann, so angelic herself in her human way, saved me. If not for her I'd have died August 16, 2013.

Now, at the ripe old age of 40, I can look back and sigh. It was the time of my life, that long, hot summer of 2013. Also the biggest and nastiest crisis for life on Earth since the asteroid hit that did in the dinosaurs. I don't wish to be immodest, but I saved the world. With the help of the angels, naturally. But if it weren't for me they wouldn't be here.

Hard to imagine now, but it was only seven years ago that the angels weren't here to guard us and guide us and groom us for a better future. It was a bad time. We were losing it. If God meant us to rule the Earth he would have made us angels.

But let's not forget there are still a few billion people out there who hate the alien abominations, the binary beelzebubs, the cybernetic cherubs, the digital demons, the electronic extraterrestrials (how would the ANN anchors have assuaged the atavistic anger of the benighted billions without the alphabetic assistance of alliteration?) and all they stand for. And what right have I to contradict them?

I have my reasons. I could bite the bullet, cut my carotids and die like a dog (sorry, the a-thing is addictive) rather than accept the rule of the angels. But I figure the best thing we can do is to learn to love them.

This is the story of how I brought the angels down to Earth.

Jon Christie

Earth, 2020

How to read this book

Take your time. An hour a day for sixteen days should do the trick. Each of the sixteen chapters tells the story of a day or two. Between them they cover the last three weeks of my former life. Read the book in three weeks to feel the rhythm.

It's a heavy tale in parts, I must admit. I've done all I can to lighten it up, but the nitty-gritty details – the scientific and philosophical brainbusters and the lovingly reconstructed hi-tech scenic props – are essential. You have to grapple with them all to get the full benefit. Take courage from the fact that my seven years of lusting after the muse to create this megabyte of text has resulted in a tale with a nice dramatic shape – boy meets girl, saves world, gets girl – as well as a hard philosophical thrust.

I've chosen to set the story in the third person. This emphasizes how much I've changed in the last seven years. But I couldn't resist some first-person editorializing with the benefit of 2020 hindsight. My know-all comments are set off above and/or below with a bullet:

•

In 1996, a fresh-faced teenager called Jon Christie dreamed of writing a book like this. In fond memory of his dream I've restricted the list of sources at the end of the story to works available back then.

J.

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Logic

The truth unfolds

The Global

Jonathan Christie was cut out to be a hero. As a kid in California he used to watch his father jetting over in a Phantom or a Falcon or an Eagle and pray he'd inherited some right stuff too.

His mother taught philosophy and her genes were for brains. Young Jon turned out to be a computer wizz, a software wonk. He was too good on the keyboard to jet away his days in the wide blue yonder. He flew in the headier realms of math and science. When he turned 21 on November 13, 2000 he found his mission – to boldly go and do his bit for machine life.

Our story starts some 400 megaseconds later.

•

Heidelberg, Germany, Friday, July 26, 2013. Now aged 33, our hero lived alone in a small apartment on the top floor of an eight-deck block on a quiet street in a prosperous suburb a short walk south of the city center. He worked as a software editor and freelance journalist, flying a heavy-duty workstation called Hal that dominated the apartment.

Bleeeep

“Good morning!” It was the regular American radio deejay. “Six o'clock on a bright new Friday!”

Jon opened his eyes to bright sunlight and squinted.

“The news headlines. A team of astronomers in Hawaii have discovered a mysterious microwave signal from the direction of Epsilon Eridani, one of our nearest stellar neighbors. Epsilon Eridani is very like our own Sun, and is only eleven light years away. The signal looks like a natural emission from a weak pulsar, which is a tiny, dense, collapsed star that spins very fast and emits a narrow searchlight beam like a lighthouse. But the astronomers say no-one has previously detected a pulsar near Epsilon Eridani and some say the signal may be – just may be – from an extraterrestrial civilization.

Astronomers around the globe are now working overtime examining the signal and checking their records.”

Jon opened his eyes wide and reached for the gun on the bedside cabinet. The gun was a 9-millimeter automatic, a Beretta M92, the standard handgun of the United States armed forces for over twenty years. He sat up, hefted it with both hands, and took careful aim at the lock on the two big metal-framed glass doors to the balcony.

“Slum riots in New York City claimed another ten lives yesterday as street fighting continued in the Bronx and Queens. President Tom Smith repeated that National Guard units would only be withdrawn when the rioters learned the rules of the new behavior-linked Federal welfare package.”

Jon squeezed the trigger and the doorlock sprang open with a metallic twang. The doors slid back smoothly to leave a gaping square interface between the room and the fresh morning air outside. The gun was customized with a solid-state laser in the barrel and a battery pack in the butt. Jon had laser sensors fitted to the electronic hardware in his apartment and it amused him to turn things on and off with his ray gun.

“Later today, at noon our time, a Quasar booster is scheduled to lift off from the Kennedy Space Center with the reactor module for the second Acropolis nuclear transporter. An Antinuclear Coalition spokesperson warned that activists would sabotage the launch but Space Center officials say they’ll go ahead anyway, as planned.”

Jon looked up at a plastic scale model of an Acropolis nuclear transporter suspended over the foot of his bed. The Acropolis lunar observatory mission had fired his imagination in a big way. He put down the gun, pushed back the duvet, stood up and stretched. He slept naked and liked the feel of fresh air on his skin in the morning.

His apartment was about fifty square meters, a seven-by-seven box with a balcony facing south. In the northwest corner was a kitchen and northeast a bathroom, with a passage between them to the front door. In the southern half of the box was a double bed at the west end, Hal in the middle, and a long couch flanked by bookcases at the east end.

He strode around Hal to the sunlit balcony and breathed the fresh air deeply as he gazed out over the bright green treescape.

“The weather today will be bright, sunny and hot, with temperatures rising as high as thirty degrees in southern Germany –”

Jon grabbed the gun, zapped the radio and fired a ray at the compact-disk stereo to fill the air with sweet soul music. Then he started a methodical workout routine that built up to a heart-thumping aerobic finale. Once a jock,

always a jock ...

A cold shower later, in white cotton bermudas and a loose gray short-sleeved shirt, as the coffee machine bubbled and gurgled, he mixed a bowl of muesli and yoghurt, poured a glass of orange juice, opened the latest issue of TIME magazine on the kitchen table and breakfasted.

An hour later, seated in front of Hal, he was studying a complex network diagram on Hal's flat hi-def screen. The screen was 45 centimeters high and 80 wide (36-inch diagonal), shaped like a movie frame. The phone beside him was a simple handset – a screen window popped up for the video.

Next to Hal was a Globall. This was an electronic globe, a big glass sphere 64 centimeters in diameter fixed like a lightbulb onto a black plastic collar 25 cm across that flared out to a wide round base. The glass sphere was lined with millions of color pixels to give a hi-def image.

Jon's Globall now showed an image of Planet Earth as seen from space, complete with a dark half and clouds. The land surfaces showed shaded patterns of green and brown and crinkled mountain ranges delicately laced with white snowfields. The sea surface was a deep and brilliant blue. The image was rolling slowly around a horizontal polar axis, just fast enough to show the swirling of the cloud formations.

Jon was reviewing the programs that let users zoom in on chosen areas of the Earth to view thematic maps on their flat screens. A trackball moved a flashpoint over the globe and a turning knob zoomed on it. He'd agreed to write a README diskette introducing a new set of optical datadisks for the maps on global trade and industry. It was slow, nitpicking work.

The Globocop

So far so bland. Opening credits and some radio news to set the scene. Next we glimpse the fateful thread that stitches up the story.

•

Percy the email postman popped up on the screen.

"Hi, Jon! Intelink mail from Langley! Wanna see it?"

He sighed. Langley, home of the CIA, had been his own home between stints at London and Oxford. "Okay, Percy, I wanna see it," he said carefully. Hal's voice recognition was uncertain at best, and Jon couldn't access his Intelink mail without a positive match.

A two-page memo with a CIA header floated into a side-by-side formation in front of a soothing blue skyscape. It was classified SECRET, as high as his Intelink memos went. In the spook world he was a low-grade techie wonk,

and he wanted it to stay that way. He was no cub Jack Ryan, no macho cog in the machine of the United States government – USG – U.S. Globocop – what a barfogenic dinosaur! He found the heart of the memo:

Continuing close cooperation with Japan is essential to the success of the Acropolis mission. Japanese telerobots maintain and operate Space Station Primrose and the lunar transporter rockets. Japanese robots will build and operate the Acropolis base infrastructure. Japanese telecom satellites and ground stations will play an important role in keeping the base online. If the Japanese government decided unilaterally to restrict its cooperation on the Acropolis mission, the entire USG investment in lunar astronomy would be jeopardized.

The present Japanese government is unstable. Right-wing political groupings are threatening to subvert the ruling coalition and initiate a get-tough policy in ongoing trade talks with USG and are also pushing for a tough line with Russia on the return of the Kuril Islands. In both areas USG has limited leverage. If events compel USG to redefine our posture toward Japan in order to reduce our national exposure, we stand to lose not only our investment in the Acropolis project but also our moderating influence on possible deployment of the Japanese AND in scenarios involving Russia or China.

In order to have the capability to assess the magnitude of the threat posed to USG interests by the activities of right-wing groups in Japan and in order to create the capability to implement any countermeasures the USG may consider in the prevailing circumstances to be necessary, the CIA must engage the services of a number of additional HUMINT assets inside Japan to perform ultralow-profile intelligence activities. We need more NOC agents in Japan.

Jon smiled as he read on. A human intelligence asset with no official cover – he was being invited to do his patriotic duty and insert his uncovered ass into Japan to monitor the finger on the button of their alleged nuclear deterrent. What a joke – he couldn't even speak Japanese!

He trashed the memo. Forget it – he'd cut his CIA cord long ago.

Hmm ... who said once a spook always a spook?

He turned back to the Globall. He thumbed the trackball to roll the image until Japan was facing him and gazed dreamily at the emerald green islands set like a splat of spinach in the deep blue Pacific Ocean.

Holiday romance

Jon was ready for a vacation. He hadn't been away from his box for more than three days in a row for two years now. During the previous summer he'd stayed in Heidelberg ... and enjoyed a magical week with a charming young Japanese lady called Yasuko who was visiting Heidelberg, alone, as a tourist. They met by chance in a streetside café and spent the next five days, eight hours a day, together. She couldn't speak German and didn't want to spend her week with all the other Japanese tourists in her hotel, so she was happy to hang out with Jon.

For a week Jon was out of his head, out of the loop of *me-myself-I*. Each day they walked and talked and saw the sights. Each evening they parted with a formal handshake before she retired to her hotel and he returned to his box. At the end of the week they exchanged promises to meet again some day and parted with a kiss. Since then they'd exchanged no more than a couple of cheerily vacuous letters.

He decided to call her now. He clicked screen icons to turn on his stereo speakers and open a videophone window, clicked on her listed number, and glanced up at the vidcam mounted in a ball hung from the ceiling to check it was on. After a few bleeps and buzzes her voice came over light and fast:

"Moshi moshi – Tanaka Yasuko desu."

"Yasuko! Jon Christie here, in Heidelberg." He watched as a delicately fuzzed image of a pretty young Japanese woman popped up in the window. Her portrait had a painted quality – he could almost see the brush strokes – but he knew it was just an artifact of the fractal image compression software. He posed for the camera. He had a military crewcut and his chin was smooth, just like when he saw her last.

Yasuko looked puzzled for a second, then her delicate features suddenly animated and she smiled for an instant before replying. "Jon-san! *Ohayo – Hai! So desu! Chotto ...*"

She moved out of the picture and there were a few scratching noises. The sound of a television show in the background disappeared, then came the sound of something dragging, and a big pillow loomed across the screen, and finally she reappeared, adjusted the girdle of her *yukata* – a short bathrobe in thin white cotton – and sat down on the pillow.

"So ... Jon. How are you? What is your news?"

Jon paused to adjust his tone to her evening mood. "I'm fine, thank you, very well indeed, and enjoying the summer here. I remembered our week together here last summer and decided to call you. How are you?"

Yasuko giggled and held up a delicate hand to cover her mouth, then replied, “I am very well too, thank you. I remembered you often since last summer and wanted to call you. I have yearning to see Heidelberg again. Is it beautiful like last summer?”

Jon had a sudden vivid recall of kissing her cute little mouth and smiled. “Yes, it’s just as beautiful as last summer. It would be nice to see you again. It’s nice to see you again now. You’re looking good.”

Yasuko giggled again and looked down, then up at him. “Thank you. You look ... *herusi*. Have you plan to visit Japan?”

“Why, yes. That’s why I’m calling, in fact. I thought it would be good to visit you for a few days. Perhaps I could stay with you and your family in Hamaoka.”

“Oh, yes, that would be ... wonderful.” Yasuko’s eyes lit up and her expression warmed. “You are very welcome to stay with us for a few days. When do you want to come?”

“I thought maybe in a week or so. Next weekend, perhaps.”

“In a week or so ... is soon. Today is Friday ... *Chotto matte, kudasai!*” She stood up, flashing a quick close-up of her lap, and moved off-screen.

Jon waited, dreaming vaguely of bliss, and she reappeared.

“So ... my mother says ... is okay. Where do you want to meet?”

“I haven’t planned the details yet. Can I call you next week to fix the exact time and place?”

“Yes, *puriisu*. Will you spend some time in Tokyo?”

“Maybe, yeah. I may look around a while. To be honest, I don’t know yet. I just thought it would be good to visit Japan and ... see you again.”

“Have you learned Japanese?”

“No, I haven’t had time.”

Yasuko suddenly glanced aside, then looked back anxiously at Jon. “Very sorry – have to go now ...”

“Okay, fine. I’ll call you next week.”

“Yes. Thank you for calling – *Bai-bai!*”

“Bye.” Jon keyed off and stood up. Such a sweet girl, such a peach!

Yes, it felt something like love.

A day in Oxford

About ten o’clock, Jon finished his Global work and quit the program. Time to go to work on his working weekend. There was a physics conference in Oxford he planned to cover for the online journal SCIENET.

He clicked the icons for speakers and window, hilit an Oxford number and waited a few seconds. He looked up at the vidcam: "Hi, Ann, it's Jon Christie in your old apartment. Do you remember me?"

"Jon ... yes, of course ... how long, two years?" A window portrait of a pleasant-looking woman, in her late twenties, with friendly brown eyes and an animated expression framed by neck-length brown hair, smudgily rendered in subdued color tones, appeared on his screen.

"Right," said Jon as he scrutinized her. She wore a plain white shirt and sat in front of a blank off-white wall. Her vidcam was fixed directly above her screen, so when she looked at Jon's image her image looked at Jon.

"Mmm, two years! I only lived there for two years before you. Have you changed everything?" Her voice was soft and level and she sounded more American than German. Jon remembered how pleased he'd been to meet her when he was looking for an apartment. She was looking for someone to take over her box while she went off to study in Oxford. Jon's German was weak and he was grateful for her English.

"Wait a minute. Take a look ..." Jon tapped a few keys, then rolled a trackball to pan the vidcam around the room. He zoomed in on the bookcases, the crazy quilt over the couch, and the stereo speakers. "There. It's more or less how you left it."

Ann smiled. "I see. It looks just the same, except for the workstation, of course. The big video panel is new too."

"Yup." Jon had a giant hi-def video panel facing the southern end of the couch. It was 160 centimeters wide and 90 high (6-foot diagonal), and could blow up anything Hal could download from the net.

"They must pay you well ... sorry, I forget what you do."

Jon tracked the vidcam back to his head. "Software editor, mostly under project contracts with Media International. They leased all this hardware to me at a discount. But it still dents my budget."

"Budgets – I know the problem."

Jon nodded. "I guess you're wondering why I called."

"Well, yes."

"Well, I plan to be in Oxford tomorrow for the big QTC conference."

She smiled. "Oh yes, I'll be there too ... By the way, I read your article in *Scientific American* on Steve Simpson. I was very impressed."

"Thank you. I was pleased by how it turned out." Jon had interviewed Steve for SCIENET and sold a two-page version to the revered monthly.

"He'll be at the conference tomorrow."

"Yes, that's why I'm going. Well, that's one reason. I mean it's a big deal

– Kaplan’s quantum theory of consciousness and all that.”

Ann nodded eagerly. “Absolutely. I’m in George Plummatt’s neuronet team. It’s all based on our work. We’re all really excited about it.”

“You’re with George Plummatt! Excellent! We have a lot to talk about.”

“Yes, we do – you said you’ll be here tomorrow.”

“Right. I plan to travel today, stay overnight. I just have to fix details, like a hotel and so on.”

“Good ... Can you get here in time for dinner at seven?”

“Dinner at seven – sounds like a fine idea. Seven in Oxford – eight in Heidelberg. Ten now, ten hours ... sure.”

“Don’t worry about accommodation. I can book you a room here.”

“Thanks, that’s very nice of you ... Oh, where are you?”

Ann smiled. “I’m in the main building – St. Joan’s College.”

“Okay. See you soon.”

Another nice girl

Jon grew up in England after the Gulf War. His father landed a desk job in London and Jon went to school in Ealing. He won a place at Imperial College and got a First in physics in 2001.

For the next three years he did his stint in the U.S. Air Force – as a code wonk with the CIA in Langley, Virginia. That was where he first got ensnared in the Globocop nightmare of national security, in his case at the sharp end of fine-tuning nuclear legacy system deployment scenarios. Happily, the work also fine-tuned his own hacking skills.

Then he spent four years back in England, at Oxford, where he wrote a thesis on a powerful new program for handling calculations in quantum field theory. It was heavy computer science, abstruse and academic. Sadly, the job prospects afterwards turned out to be zilcho.

After a depressing year of chasing leads that didn’t pan out, he got a job as a software editor with Media International, a publisher based in New York, with offices in London, Heidelberg and other European cities. After two years in London he moved to Heidelberg in 2011.

•

Ten-fifteen CEST. Jon called one of his former Media colleagues in London.

“Media International, Ruth Barclay.” The voice was smoothly professional, the tone neutral. The screen showed a blonde woman, aged about 30, smart and carefully groomed. Jon liked Ruth – she always cheered him up.

“Hi, Ruth, Jon here. How’s life in London?”

“Ah, Jon, it’s you. Nine-fifteen and you’re shaved already.”

Jon pulled a telegenic grin. “Yeah, have to stay smart for the vidcam.”

“So – what can I do for you, or is this just a social call?”

“No, this is work. I plan to go to a hot conference in Oxford tomorrow.”

“Good for you. So what?”

“The conference is a big one. It’s a televised do with big-name speakers. It’s on the new quantum theory of consciousness.”

“Ah, refresh my memory here, please.”

“I was just about to. There’s been a lot of excitement over Sol Kaplan’s new theory that shows how photonic wave functions can be used to model consciousness. He based it on Sir George Plummatt’s experiments showing that the Fröhlich fields support extended coherent states. Just recently, Steve Simpson simulated the Kaplan functions on a hypernet and got big enough coherence effects to match the experiments.”

“Sorry, didn’t understand a word. Try again.”

“Oh, really, I thought you had a brain.”

“I do, but I have trouble remembering all this science.”

“Okay, again. Sir George Plummatt showed that in the brain, between the neurons, there are microwave excitations that resonate like photons in a laser to form coherent patterns. Then Solomon Kaplan showed how these effects can be used to model the way that consciousness is always consciousness *of* something. Just a few weeks ago, Steve Simpson actually modeled the effects on a hypernet computer. I interviewed Steve on his earlier work in the March issue of *Scientific American*.”

“I read it – it was a good piece. But what’s all this to me?”

“What’s it to Media? There’s a multimedia project – book, disk, video – in this. After my article I’m well placed to get the ball rolling.”

“You want Media to pay for your weekend in Oxford, is that it?”

“No, that’s only part of it. I’d go anyway, but of course if Media can pay, that’s nice. I want to get some backing to research this up into a video series. But first I need to discuss how it dovetails into other Media plans.”

“Well, I can’t help you there. I’m only a business manager here. You need to talk to the bosses in New York.”

“I know. But I need to talk with you first to get oriented. If I can’t sell the idea to you then there’s no point trying it in New York.”

“Okay, that makes sense. How do you want to play this?”

“How about I visit you Sunday and we take it from there?”

“That’s possible. I’m at home in Putney on Sunday. But I fly to New York Monday morning. Is a quickie on Sunday afternoon enough for you?”

“Sure. Great. I knew I could count on you.”

“I have to go. I have an appointment.” She looked aside anxiously.

“I’m in a rush too. Seeya Sunday!”

“*Ciao.*” The window went blank.

Travel plan – take a taxi to the railway station, local train to Mannheim, Transeuropa Express from Mannheim to Brussels, Eurostar Express from Brussels to London, then hire a car and drive to Oxford. It was about a thousand kilometers – ten hours, just.

He tidied up the apartment and packed his case. Into it went a baggy gray bizz suit, bizz shoes, two traXuits, Nyke trainers, Hyperlite shorts and vest, swimwear, plastic flip-flops, shirts, shorts, boxers, sox, personal hygiene kit, digital zoom camera, compact laser printer, photo album, paperback, some papers – oh, and a few copies of his biomag, a desktop publication featuring his resumé, extracts from his thesis, a few of his articles, specs of his software projects, and some nice color layouts.

He also prepared Hal Junior, his portable computer, for the trip. He downloaded a briefcase file from Hal Senior and updated the desk files in Junior. He checked Junior’s broadband ISDN link, battery charge and R-alert dongle. He set Senior to caretaker mode.

He undressed and threw his clothes and towel into the Combo neurofuzzy wash-dry machine. He donned crazysexycools, cybergrunge shirt, cool black baggies, white sox and Powersole sneakers. He called a taxi and waited.

Minutes later he was at Heidelberg *Hauptbahnhof*.

Pandora’s box

On the Transeuropa Express Jon watched the ZDF news, which led with the mysterious microwave signal from Epsilon Eridani, then gazed out at the sunlit countryside flashing by at 200 kilometers per hour.

•

This lull in the story gives us a chance to dive deep into Jon’s thoughts and find out – if we can – what made him tick. A bit murky, maybe, but essential if we want to understand his actions later.

•

Was there or was there not an extraterrestrial civilization located eleven light years away from Planet Earth? A Pandora’s box of a question ... maybe like Schrödinger’s cat box ...

Erwin Schrödinger’s (fictional) cat was sealed in a heavy steel box with a flask of poison gas released by a radioactive trigger. The radioactive decay

of a single atom fired the trigger. When the probability was a half that the trigger had fired, was the cat dead or alive? Schrödinger said it was in a *superposition* of states – dead *and* alive. Maybe the aliens ...

Superposition was a puzzling idea. When a set of possible states of a system have a certain set of probabilities of coming into existence, this means we can't know more about what will happen than that those are the odds, because the different possible states – dead or alive, aliens or no aliens – *coexist* up to the moment we find out the truth.

That logical puzzle had obsessed Jon in Oxford from 2004 to 2008.

He'd learned that logic is the science of valid inference, of inference that never leads from true premises to false conclusions. A contradiction destroys a logical system. Thus logicians have to find ways to exclude paradoxes like 'This sentence is false.' The art of logic is to build systems that not only preserve consistency but can be seen to preserve it.

In physical reality, the different possible states of a system aren't all realized together so formal consistency is preserved. Yet their superposition still looks paradoxical.

Jon cut the knot of this paradox quite simply. The mutually contradictory alternatives coexist in a superposition because *reality is still symmetrical* with respect to all the possible outcomes. The symmetry is broken only when one of the alternatives becomes actual. At that point you need a different logical system to express the true state of affairs. New truths come into being as the evolution of reality breaks the symmetry.

Jon had written a program to generate a series of logical systems along a time-like dimension. Each system broke the symmetry of reality a bit further. Impending contradiction drove the advance through the systems. Logic was always a step behind the leading edge of reality.

...

Jon changed trains at Brussels. In the Eurostar Express he mused on.

The philosopher Hegel – the dialectical idealist who inspired Karl Marx – based his whole logical system on contradiction. Following Hegel's example, both Lenin and Mao Zedong saw history as the working out of contradictions. But consistency was stronger. Holding out for consistency in science caused a revolution even bigger than the communist revolutions of 1917 and 1949 – *computers*.

It started with Gottlob Frege, who in the late 19th century was obsessed by the need for rigor and consistency in mathematics. He built a logical system that reconstructed classical math as a part of logic. It was a magnificent, glorious achievement. Then disaster struck.

Bertrand Russell, at that time a young don at Cambridge, spotted a flaw in Frege's logic. Frege's system allowed the user to form the set of all objects having any given property – an object (it may be a set too) was a member of the set if and only if it had that property. Russell chose self-membership – let the set of all sets that are not members of themselves be called R . Now, is R itself a member of R or not? It follows from the definition that R is a member of R if and only if R is not a member of R . This is a contradiction. It destroyed Frege's system and drove him to consternation and despair.

Russell then spent the best years of his life trying to repair the damage. In the decade before the First World War, he and Alfred North Whitehead wrote a big trilogy entitled *Principia Mathematica*. In it they reconstructed math in logic all over again. Their system was clumsy and hard to use, but it shone in glory for some decades.

This enormous mathematical effort to build contradiction-free systems was a paradigm for the whole enterprise of science. Mathematics shows in pure form what other sciences show more imperfectly – that a consistent and comprehensive account of reality is the goal.

Sadly, the idea soon turned sour. A young logician called Kurt Gödel studied Russell and Whitehead's system carefully and found a new paradox, a whole new class of paradoxes, a new and even more shocking logical abyss deep in the heart of math. Its consistency was now even harder to defend against hidden contradictions. Yet the effort to defend it created something new – mathematical logic. That in turn gave birth to computers.

Arrival at Waterloo Station, in the heart of London, stopped Jon's train of thought.

The nightmare

Jon hired a small Honda hatchback for the journey to Oxford. He mused on the question of extraterrestrial life as he motored along the M4 and M25. One day it had to happen – humanity had to find life somewhere *out there*. Or it had to find us. That deadly symmetry hid an infinity of nightmares ...

His mood was tranquil as he cruised up the M40 but turned gloomy as he drove into the familiar Oxford streets at about 6:30 PM British Summer Time. He'd lived here with Judy for almost four years.

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Time for another deep dive. We need to plumb the abyss of Jon's emotional life to understand the intellectual trivia that buzzed in his brain.

•

Judy was a fellow student. He met her at his first graduate seminar and they soon agreed to live together as they worked on their theses. They made an ideal couple, well matched both intellectually and sexually. And how they matched! Every day in every way, in bed and out. For four years Jon was fulfilled as never before. It was human love at its mortal best.

They'd been happy – until the morning of August 8, 2008. They were on vacation, thundering down a German *Autobahn* at 200 kph on his turbosupercharged Kawasaki motorbike when a car pulled out to overtake a truck, Jon braked hard and skidded, Judy flew off the bike, bounced off the car, rolled under the wheels of a following truck. Killed instantly.

That was five years ago. He'd been in mourning ever since. No more fun, no more sex, nothing but cold, dull survival.

Jon parked a block away from the college and swiped a parKard through the parking meter. He picked up his case and computer and started walking. He was back on a very familiar pavement.

This had been his route from Jericho to the Mathematics Institute. Jericho was an outlying part of town with rows of little terraced houses. He and Judy had rented half a house there. The Mathematics Institute, a short walk away, was where he'd been initiated into the secrets of formal logic and set theory. Once, on this very pavement, he'd been struck by a visionary insight – the null set and the universal class in the cumulative hierarchy of sets were the alpha and omega of subjectivity, the opposite poles of the logical bubble of the self – *I am the alpha and omega* of the universe of sets!

In a way, that was the conclusion of his logical studies. When he saw the ultimate pinnacle of subjectivity – the face of God – he knew that his quest for logical truth was over. It was just a case of wrapping up the formalities and bowing out.

But no, it needed a shock. A seeker after truth doesn't give up so easily. Judy's death had been that shock.

The main entrance to St. Joan's College was set in a concrete gatehouse. The porter's lodge opened onto the gateway. A fat old man with a bald head and a shiny pink face blinked out. Jon spoke out loud and clear.

"Can you page Dr. Ann Cross for me, please? My name's Christie, Dr. Jon Christie."

"Page? I can telephone her, if that's what you mean, sir." He had a thick bucolic accent. He called Ann. "Alright, sir, she's expecting you."

"Ah, where's her room?"

"Main building, first floor, room 101."

Jon walked in. This had been Judy's college.

Brains

The corridor to room 101 was long and gloomy. The door was a sheer face of dark wood with a spyhole in the middle. Jon pressed the buzzer and waited. He felt like he was in a prison or a mental hospital.

The door opened wide and Ann stood framed by light. She stood half a head shorter than Jon, who measured 180, and she looked lithe and athletic. She smiled warmly and her eyes were wide and animated.

“Hallo, Jon, good to meet you again.” She extended her hand in greeting.

“Hi, Ann.” Jon held her hand lightly for a moment. It was cooler than his own and slightly moist.

They stepped into the room. It was a traditional academic study, quite compact, with a table and a plain couch to the left and a bulky wooden desk to the right. Books filled a set of shelves behind the table and overflowed around the room. Ahead was a wide window overlooking a garden. The desk was loaded with neatly piled papers and an old computer with a CRT screen.

“Nice room,” Jon ventured, “very traditional, very cosy.”

“Yes, I think so too.”

He studied her more carefully. Her hair was tied back and her face was smooth and unadorned. She wore a plain white shirt and a loose black skirt over bare legs and feet. “You look different somehow.”

Ann shrugged. “A little bit older, a little bit sadder, that’s all.”

“Sadder? Aren’t you enjoying yourself here?”

She looked wistfully out the window at the trees and grass below. “The work is as always, just work, sometimes satisfying, sometimes frustrating. The social life here is pleasant but not very exciting.” She woke up out of her mood and looked harder at Jon. “But how’s life in Heidelberg?”

Jon shrugged, but less wistfully than Ann. “Fine. The apartment’s great, the town’s okay, the work’s chugging on ... *Alles ist in Ordnung*.”

Ann smirked. “*Ich kann mir leicht vorstellen* ... How’s your social life? Do you have a girlfriend?”

“No ... actually, I’m still getting over a girlfriend I lost five years ago.”

“I’m sorry ... Why don’t you sit down and relax?”

Jon sat on the couch. “Mind if I take off my shoes?”

“Please do.”

Jon took off his sneakers. He undid two shirt buttons and flapped his arms to send fresh air to his armpits. “It’s hot today.”

Ann moved to open a window. “Would you like to take a shower?”

“Not right now, thanks. You said you’d book a hotel.”

“Oh, yes, I’m sorry, but the decent hotels are all booked up. It’s the height of the tourist season. There should be a guest room free here in college. I’ll ask when we go to dinner.”

“Aha.” Jon gazed ahead abstractedly.

Ann settled on the chair by her desk and rotated it to face the window. She picked up a conference brochure. “There are six main talks on the program tomorrow. Do you know any of the speakers?”

“Sir George Plummett, Solomon Kaplan, Steve Simpson ... The others are new to me.”

“We’ll meet them all tomorrow anyway.”

“Tell me what you’ve been doing here for the last two years.”

Ann’s hands fluttered momentarily around her hair. “Well, just routine postdoctoral research in neurobiology. We’re developing automated techniques to culture neuronets *in vitro* and measure their surface excitations. We’re the team behind Sir George’s results.”

“Aha ... Do the nets behave like living brains?”

“No, actually, they don’t ... I was reading some old stuff recently about brains and logic but I didn’t understand it ... It was a discussion of whether it’s logically possible for computers to simulate brains.”

“Aha – go on.” Jon was back on familiar ground.

“There was something there about how Gödel’s theorem proves that computers can’t be like brains.”

Jon laughed. “Right, I know the argument. But it’s not convincing. In fact Gödel’s theorem sets no limit at all on how brainlike computers can be.”

“Okay, if you say so, but what’s Gödel’s theorem?”

Jon smiled. “Kurt Gödel was a student in Vienna who in 1933 proved an amazing theorem about the system of logic set up by Russell and Whitehead in *Principia Mathematica*. Have you heard of that?”

Ann frowned. “Russell and Whitehead ... I think so.”

“Okay, they built a logical system that incorporated all of mathematics. They wanted to prove that math was consistent and complete, so that all mathematical questions that could be asked in the language of the system could be answered in the system. They could all be either proved to be true or proved to be false.”

“So what was the theorem?”

“Gödel proved that there were sentences of the formal language of *Principia Mathematica* – or any other language big enough for arithmetic – that couldn’t be either proved or disproved in the system, so long as the system was consistent.”

“You mean the system would be contradictory if the sentences could be proved or disproved.”

“Exactly. The sentences were paradoxes. In fact he defined one sentence but the idea was general. The sentence said, in effect, ‘This sentence can’t be proved in the *Principia Mathematica* system.’ So it was true if it couldn’t be proved and false if it could. That was the paradox.”

Ann frowned for moment. “But how did the theorem show that computers can’t be like brains?”

“Well, it didn’t. The idea behind the theorem got taken a lot further by other people, such as Alan Turing, and the outcome of it all was that no computer system could be both consistent and complete. There would *always* be undecidable statements, however you tricked up a system.”

“What’s this got to do with brains?”

“Well, the idea was that brains can always *see* the truth of the Gödel sentence that any particular system can’t prove. Therefore *that* system, at least, can’t give a formal representation of the brain’s ability, and you can play the same trick for *every* formal system.”

“How does the brain see their truth?”

“Well, that’s the weakness of the argument. The sentences are true *if* the systems are consistent. But that’s a big *if* – it’s the whole problem. The idea that the brain is seeing anything special is really just an illusion.”

“I still don’t get it. Do logicians think the brain is like a computer?”

“Not exactly ... Look, let me get one thing straight here. In an abstract sense, the brain is *obviously* a computer, or rather a Turing machine.”

Ann looked despairing. “Now I’m *really* getting confused!”

“Do you know what a Turing machine is?”

“A Turing machine is a mathematical model of a computer. Any computer can be emulated by a Turing machine.”

“Right! You know!”

“Don’t be patronizing.”

“Sorry. The point is that anything the brain does can be simulated by a suitably programmed Turing machine. Only in principle, of course.”

“Of course. Surely no-one thinks we could do it in fact. Anyway, the brain works by natural selection, not logic. Our thoughts are in a sort of Darwinian struggle with each other. But what did you mean when you said the brain’s obviously a computer?”

“I mean it’s an input-output device that runs in a rule-governed way. You have patterns of information as input and patterns of information as output, and in between there’s a complicated tangle of rules that say what happens to

this or that piece of information.”

“But the brain has tens of billions of neurons in the cortex alone, with maybe a million billion connections between them –”

•

Cut there. As you see, Jon had found another soul-mate.

A big bang

Seven o’clock. Ann skipped off to the bathroom. Jon saw a television behind the door and turned it on. A plummy female BBC voice-over:

“– launch was sabotaged by Antinuclear Coalition activists.”

A view of a launch pad at the Kennedy Space Center, lit by morning sun, showed a giant Quasar booster, a fat tube 80 meters tall, a 2500-ton can of cryogenic hydrogen and oxygen fuel with a 100-ton payload perched on top, ready to go. Suddenly the booster sprouted a bouquet of flame at the side, halfway up, then broke in two and gushed boiling fuel in all directions. The fuel ignited and billowed into a bright cauliflower that obliterated the whole scene in a huge mushroom cloud of steam.

“The explosion released as much energy as a ten-kiloton nuclear bomb and completely destroyed the launch tower. Fortunately, no-one was hurt in the explosion and the booster payload, a nuclear reactor for an Acropolis transporter rocket, was thrown clear and remained intact. No radioactive material was released and the clean-up crew have already cleared the site.”

Jon feasted his eyes on the billion-dollar firework show. The Quasar was slightly bigger than the Space Shuttle launch stacks he saw as a kid. It made a big bang.

“No information has been released yet about how Antinuclear Coalition activists breached the security cordon around –”

Ann returned from the bathroom. Jon pressed OFF. They went to dinner.

Classified information

The college dining hall was a big utilitarian room in old-century style, with a wall-high window onto a grass quadrangle at the center of the college. Ann and Jon dined with the dons – the college faculty – at high table.

The catering was self-service. Ann and Jon collected salads and mineral water at the hatch and sat side by side facing out over the hall. It was the summer recess and the few students who remained were quiet, serious types. Most of the students at this college were female.

"I'm sorry there's no guest room free," Ann said as she tucked into her salad, "but you're welcome to camp out in my study on the couch if you prefer not to go hunting around town for a bed-and-breakfast room."

"Sounds fine by me," Jon replied, cutting into a slab of game pie, "so long as you can stand my company for two nights."

Ann glanced sharply at Jon. "If I can trust you not to disturb my sleep then I can stand your company."

Jon grinned. "You can trust me – I've been house-trained."

Ann raised her glass of mineral water. "Good. Let's drink to a fruitful weekend."

Jon raised his glass to hers and the glasses chimed musically together.

"You know, I hardly know anything about you," Ann said. "Tell me about yourself and your life and so on."

"Okay ..." Jon frowned with effort. "I was born in San Bernardino, California, in November 1979. We lived there until I was ten. My father was a fighter jock in the air force. His family were all Mormons from Salt Lake City. My mother was from an academic family in San Francisco. She looked like Madonna back then ... she had a Jewish grannie but apart from that they were all Wasps. My mother taught philosophy at California State University. In 1989 my father was posted to Ramstein in Germany and we moved to Kaiserslautern. His last real flying was in the Gulf War." He said all this in a flat monotone. Expressing his feelings was not his style.

Ann looked up. "He flew in the Gulf War?"

"Yeah. He flew top gun in an F-15 Eagle for F-16 mud movers. Really thrilled me as a kid. After that he got a desk job as a liaison officer with the Brits and we moved to London. I finished school there and read physics at Imperial College. Then I joined the U.S. Air Force too ... but I never got as far as flying jets."

"Would you have liked to?"

Jon shrugged. "It would have been fun, yeah. But I was a keyboard ace and they told me I'd be more useful on the ground."

Ann smiled. "So what did you do?"

"They posted me to the research station at Langley, Virginia, where I sat for three years in front of a row of computer terminals. I helped out with the database programming for the Global Nuclear Force."

"Langley – that's the CIA headquarters, isn't it?"

"Yeah, I did some work for them too ... classified work ... It was just boring stuff, anyway."

"Aha ... Do you have any brothers or sisters?"

“One kid sister, married five years ago, now has two kids, lives in San Francisco ... How about your, er, life and family?”

“My life is very simple. I grew up and studied in Heidelberg. My parents live in Berlin now. I have one brother, two years younger. He works as an engineer for Daimler Benz.”

“How come your English is so good?”

Ann smiled and turned to face Jon. “My father’s American. He worked at the U.S. Army headquarters in Heidelberg.”

“Oh, right!” Jon warmed up.

Crazy

After dinner they drove out to a country pub a few minutes northwest of the college. As Jon drove and Ann gazed at the scenery in the fading glory of a blue-sky July day, they talked.

Jon told her the difference between epistemology, the study of knowledge and how we can get it, and metaphysics, the study of stuff that goes beyond physics and the regular sciences.

“What about ontology?” asked Ann.

“Ontology is the study of what is, or what exists, without any particular regard to how we can know about ... whatever,” said Jon with a smile.

“Very eloquent ... How we can know about ... whatever ... is allocated to epistemology, I suppose.”

“Exactly. Every science has an ontology. Its ontology is the set of things it says exists. But ultimately all the sciences have the same ontology.”

“You mean quarks and so on?”

“Yes – but actually they all boil down to superstrings, which are really just mathematical constructions, which boil down in turn to sets.”

“Wait a minute. You’re trying to tell me that in the end only sets really exist. That’s crazy!”

Jon smiled. “Maybe. But that’s where logic leads you.”

“You’re really into all this, aren’t you?”

“Yeah.”

A divine addiction

The pub was a traditional stone farmhouse set in a cluster of buildings beside a stretch of river once celebrated for its trout fishing. Wooden tables and bench seats on the courtyard overlooked the river. Several colorful peacocks

strutted in the greenery on the opposite bank. There was a moderate crowd of drinkers.

Ann and Jon found seats at one end of a table occupied at the other end by a young couple who were very much involved with each other. Ann had a fruit juice and Jon a half-liter of alcohol-free beer. Ann kicked off her sandals and toed the wooden legs of the table.

"Tell me what you expected," Jon said, "when you first came to Oxford, how you expected it to feel and what you expected to achieve."

"Yah," Ann took a deep breath, "I basically expected to just keep on going with what I started in my *Doktorarbeit*, my thesis. All this new stuff with nonlocal quantum effects and computer simulation was still quite marginal. Now it's all up in the air. The field is taking off and I'm sitting in the middle. I'm not so hot at math and physics, so it makes me a bit dizzy."

"How about your colleagues here?"

"They're okay, quite nice, mostly experimentalists like me."

"I see ... When the field's exploding so fast I guess it's hard to keep up. You need to be a math-fizz wizz and a computer geek at the same time."

"Like you." Ann smiled. "Do you try to keep up with it?"

"Sort of, I guess ... Right now I'm fixated on probability. I think getting a clear concept of probability is the key to an awful lot."

"Like what?"

"Like entropy, the arrow of time, the evolution of the universe and of life, quantum events –"

"Enough! Tell me about probability."

"Okay ... When you have a set of possible outcomes of a situation, you can use common sense and a bit of science to assign numerical probabilities to the possibilities."

"For example?"

"Like when you toss a coin, it's common sense that the probability of heads is a half and the probability of tails is a half."

"Common sense – is that all?"

"Well, naive physics. It's just a symmetry argument, from the basic physics of the situation. Symmetry means 50-50 probabilities."

"I don't feel any wiser yet."

"Exotic probabilities in exotic situations just get built up from simple ones by logic and math and so on."

"What's all this got to do with entropy and the arrow of time?"

"Entropy increases when a system evolves in the most probable direction. The law that entropy increases is logically a tautology, but physically it just

means that the universe actually conforms to our naive expectations.”

“No, it doesn’t. If I naively expect to win a million in the state lottery, the tendency of the universe is not to conform.”

Jon smiled. “What I mean is that as scientists we naively expect reality to be how our latest pet theories say it should be and – lo and behold – it often *is* that way. That’s really quite a miracle, when you think about it.”

Ann frowned. “So what’s your great insight on probability?”

“Probability is a subjective thing. We assign probabilities relative to our own perspective, relative to our best theories about the situation.”

“Can you give me another example – a nontrivial one this time, please.”

“Think of the question of whether there’s an extraterrestrial civilization on a planet orbiting a nearby star. If we don’t have any facts it’s 50-50 again. But every fact we learn about nearby stars, formation of planets, evolution of life and so on raises the odds – or lowers them. Changes them, anyway.”

“So what?”

“So when something apparently improbable occurs, like we pick up a radio signal, we have to revise the odds.”

“But that just shows we didn’t know all the facts.”

“Yeah, sure. But that’s *always* how it is. We *never* know all the facts. Whenever we learn something new, all our old probabilities fly out the window. Even in quantum physics, with every new observation we revise all the probabilities. It’s all subjective. It depends on where we’re at.”

“Is that your big insight on probability?”

“In short, yes.”

“I want another drink.”

Jon bought more drinks. When he returned Ann was sitting on the flagstones with her feet dangling over the river. He sat down beside her.

Ann stared hard at him. “Tell me, what do you hope to do in the long term? What do you want to achieve?”

Jon gazed up at the sky. “I wanna see into the future. I wanna look ahead and see what’s coming, then do my bit to help the good things along.”

“So you don’t have any desire to do science yourself?”

Jon frowned. “What’s that, to do science yourself? I don’t have a burning desire to do experiments in a lab, if that’s what you mean. But that’s not all there is to science. Someone has to put the details together, see the big picture, or the lab work loses its meaning.”

Ann looked thoughtfully into the distance. “Well, I see what you mean. Sometimes lab work feels like working in a high-tech kitchen.”

Jon smiled ruefully. “And sometimes working in my box, pecking away at

the keyboard, reading files, writing them, sending them on, feels like being an anonymous bureaucrat in some Kafka nightmare.”

Ann looked down at the river flowing quietly past them in the twilight. “Do you see science as just dull routine?” She looked up suddenly at Jon. “Don’t you see it as an exciting quest, like waking up to the truth and seeing the awesome glory of creation?”

“Wow!” Jon raised his eyebrows. “I see it more often as a lot of guys trying to outsmart each other. The truth is a by-product – if we’re lucky.”

Ann wrinkled her nose and looked away. “That’s pretty damned dull!”

“Okay, okay!” Jon raised his hands defensively. “It’s a glorious quest, a heady elixir, a drug like no other, a divine addiction!”

Ann frowned again, but with a bright gleam in her eyes this time. “Hmm, that’s better.”

“Good.” Jon suddenly felt tired. “I vote we go soon.”

They drank up silently and Ann put her sandals back on. She lifted each foot in turn to buckle the strap, and as she did so her skirt fell back to her lap and exposed a pair of smooth tan thighs with a dark shadow between them. Jon watched, fascinated ... it was five years since he last laid hands on another person’s lower bod.

Epsilon Eridani

They drove back to college in the gathering darkness with the car stereo quietly playing romantic soul music. Then Ann turned the sound down.

“I feel like talking. Do you mind?”

“Not at all,” Jon said evenly, his eyes on the road.

“I’m still thinking about your thoughts on probability. Do you think our lives are governed by chance?”

Jon considered silently for a few seconds. “Chance plays a part, sure. It’s chance that we met two years ago, chance that I thought about calling you yesterday, chance that you were free.”

“But according to your theory of probability, that just shows we don’t know all the little factors that make things happen the way they do, so we put it all down to chance.”

“Well, sure, that’s right.”

“Isn’t that a contradiction? We believe it’s all determined somehow, yet we still say it’s chance.”

“Not at all. If I say the way we met two years ago and again today is truly and literally random, I don’t rule out that there might be a theory somewhere

that could have predicted it.”

“Uh?” Ann turned to Jon. “Explain.”

“We define randomness in terms of complexity. A series of numbers is random if the simplest way to predict the series is as complicated to spell out as just listing the series.”

“So chance may be an illusion ...”

...

Jon turned up the volume on the car radio. “Let’s hear the news.”

“– like our own Sun and is only eleven light years away. Although the signal looks like natural microwave radiation from a pulsar, no astronomical records of a pulsar near Epsilon Eridani have so far been found. A world-wide search through the astronomical databases is under way and speculation on possible explanations for the signal is running wild in the astronomical community. Some astronomers are even saying the signal could be from an extraterrestrial civilization. In Brazil –”

Jon turned down the volume. “Extraterrestrials – this could be the news of the century!”

Ann was silent for a while. “Yes ... Epsilon Eridani ... Do you know anything about it?”

“Yup ... It’s in the constellation of Eridanus, which is off to the southwest of Orion, if you know where that is.”

“Orion – yes – the Mighty Hunter.”

“Epsilon ... that means it’s the fifth brightest star in the constellation. And Eridanus is pretty unspectacular, so Epsilon must be fairly dim.”

“But they said it was only eleven light years away.”

“Yeah, but it’s a bit smaller than the Sun, which is not especially big.”

“Does that mean you’d need a telescope to see it?”

“Oh, no. It’s a naked-eye star.”

“How far away is eleven light years?”

“The nearest star to the Sun is about four light years away, so eleven is right next door by galactic standards.”

Ann shuddered. “So close ... that’s scary!”

Pizza

Back in Ann’s study, they pondered the sleeping arrangements. Adjoining the study was the bedroom, a narrow chamber containing a single bunk bed along the study-side wall and cupboards along the facing wall. A door in that wall opened into a narrow bathroom.

“As you see,” said Ann, “it’s all rather close for two, but you should be quite comfortable sleeping on the couch.” She pulled a sleeping bag from a closet. “Here – don’t worry about disturbing me going in and out of the bathroom. I’ll leave the bedroom door open.”

“Thanks. I think I’ll take a shower now.”

“Go ahead. I’ll find a sheet for you.”

Jon pulled towel and toothbrush from his case and went to the bathroom. *Tssst* – cold water on bod – *great!* He emerged towel-skirted, clothes in hand, to find Ann standing by the couch and gazing out the window, wearing just a short sandy-brown silk wrap. “Hi – your turn in the bathroom.”

Ann jumped slightly. “You startled me!”

Jon grinned. Time for the move. “I have a question. Since you and I have so much in common and since we’re both adult people, why don’t we make a bed on the floor here and sleep together?”

Ann’s eyes flashed and she smiled back. “Not so fast, airman! You have a girlfriend from five years back, remember?”

“Hmm.” Jon gazed out into the darkness beyond the window. “Let me tell you how it ended. We lived together here for four years, as I said. Then, just after I finished my thesis, we went on vacation to Germany. We were doing a double ton down the *Autobahn* on my motorbike when a damn fool car pulled out and I had to slam on the anchors. She flew off and fell under the wheels of an 80-ton truck-trailer combo. Squashed her out like a jumbo-sized tomato-enriched barf pizza.”

Ann blanched. “Oh, my God, I’m sorry.”

Jon exhaled wistfully. “Yeah, well, that’s ... goodnight.”

“Goodnight. Sleep well.” Ann walked off to the bathroom.

Jon settled on the couch and dreamed of pizza ...

•

As you see, my former self had a headful of problems. Quite a case.

Physics

Consciousness is photonic

A liberated woman

This chapter covers a day of heavy theoretical endeavor. Wade in and take it with a smile. You'll find the effort pays off later.

•

Oxford, Saturday, soon after dawn. Jon rose from the procrustean couch, donned Hyperlite shorts and vest, opened up Hal Junior, jacked into Ann's phone socket and checked Hal Senior's mailbox. No memos from Langley. Just junk, a large Tollgate bill and a small Media contract. He filed the mail and paid the bill ... what he needed was a big hit of funds.

"Morning. Sleep well?" Ann stood at the bedroom door in her silk wrap, holding the front loosely in place over her navel.

"Yes, thanks. Just doing my mail in Heidelberg."

"Nice machine ... I'm going to go for a run around the park. You're welcome to come too if you want."

"No thanks. I'd rather spend the time online just now."

"Okay." Ann dipped back and re-emerged in an outsize black teeshirt and running shoes. She hung a key on a ribbon around her neck. "I'll be about twenty minutes. Do make coffee or whatever."

"Thanks." Jon watched her exit, then logged onto his web home page at www.jonchristie.de. Hal's emoticon was smiling – it morphed to a frown if Hal was ailing. Jon logged off.

He stowed Hal Junior and took a long cold shower. Back in Hyperlites, he looked around for the coffee gear. He found a machine but no coffee. He saw a physics textbook and hefted it.

The paradoxes of quantum physics had driven Jon crazy. But Sol Kaplan was using them to build a bold and dazzling new theory of consciousness. Physics was plain sailing until the 19th century when James Clerk Maxwell invented electrodynamics and showed that light is electromagnetic radiation.

Then a puzzle over light spectra led Max Planck to invent the quantum in 1900 and a paradox over the speed of light led Albert Einstein to his theory of relativity in 1905, and soon it was all too much for Joe Blow. Superstrings in the 1990s had made it all even worse. Kaplan's ideas were like a new dawn over a shadowy landscape.

Ann burst back into the room breathing deeply, limbs and face glistening with sweat. "That was good!"

"Good ... where do you keep the coffee?"

"In the fridge in the bathroom. I'll fetch it for you." She skipped off and returned with a jar, then went back to shower.

Jon started the coffee machine and turned on the box for the news:

"— leisure boat was found abandoned at Daytona Beach just north of Cape Canaveral. On the boat was a launcher for a missile of the type that struck the Quasar booster yesterday."

View of the ten-kiloton firework again. Wotta bang! Those Antinuclear Coalition guys sure knew how to put on a show! Cut back to the studio where a po-faced Big Brother read the news:

"The first nuclear transporter rocket is now almost fully assembled in orbit beside Space Station Primrose and is on schedule to set off on its first trip to the Moon next Tuesday."

Jon smiled. *The Moon* — at last, forty years after Apollo, we were going back to build a proper base there — it gave him goosebumps!

Ann emerged again, her silk wrap now tied by a black sash. Her hair was slicked back and her face and limbs were creamed smooth and shiny. "Shall we have some music?"

"Okay." Jon zapped Big Brother and filled two mugs on the desk.

Ann turned on the radio, sat down in her swivel chair and picked up her mug. "We can go and breakfast in hall when we're ready."

Jon sat on the couch and gazed blankly at Ann's thighs. They were slightly apart. "I hope this is gonna be an exciting conference."

Ann pulled her legs together. "You probably know it all already, but I expect to be excited."

"No, I don't know it all. I seriously hope to be excited. But these events are always dull in a way. Just lots of words — know what I mean?"

"If you're going to start complaining I'd rather go without you. I intend to get all I can from it." She spoke in a brisk, no-nonsense tone, like a school-marm.

"You're right — positive thinking!" Jon drank his coffee. "Hey, did anyone ever tell you you have great legs?"

Ann glanced down at them. “Yes, several people. I didn’t get on with any of them, so don’t try and charm me that way.”

“Sorry ... When did you last have a boyfriend?”

“For sex, you mean?” Ann’s eyes sparkled for a second.

“Well, yeah, for sex.”

“Four years ago. A fellow student in Heidelberg called Horst. We lived together for three years.”

“Aha ... what happened?”

“He went to America. He got an assistant professorship at Ohio State.”

“Why didn’t you follow him?”

“And give up my own work? It means too much to me for that.” A hard look crossed her face as she spoke.

Jon saw it and sighed. It was a pitiless world for human love, no doubt about it. Still, another liberated woman ...

Ann went into her bedroom to get dressed. Jon selected a clean white shirt and the black baggies. *Sub fusc* – academic drab.

Disorder

Ann and Jon sat in the main hall at a sunlit table by the big window, breakfasting on muesli with milk and fruit salad and orange juice. Ann wore a plain white shirt with no bra and a loose black skirt that reached to her knees, just like the day before.

“What are you doing after the conference?” asked Ann.

“Tomorrow I’m off to London to see an old friend called Ruth.”

“Aha ...” Ann mused.

“She’s a business colleague from Media International. I thought I’d try to sell an outline for a multimedia project based on this conference.”

Ann looked up in surprise. “Really? Do you mean videos and so on?”

“Right – videos, hypertext disk, book – you know.”

“How will you do it?”

“Say hi to the speakers and the organizers, hand out my card, see if they’re interested. Just play it by ear.”

Ann looked puzzled. “Is this how you operate?”

“Sometimes, yeah. Maybe that’s why I haven’t hit the big time!”

“It seems a bit vague ... do you get more organized as you go along?”

Jon shook his head. “Nope. More disorganized – entropy increases.”

Ann smiled. “Yah, the second law of thermodynamics ...”

“It governs everything.”

“Does it? Living organisms are different. They’re open systems. They don’t just create disorder like heat engines.”

“Well, that’s debatable ...”

Dissolve there. The word-lovers were back in heat.

“... so living systems concentrate order by spreading disorder all around.”

Ann smiled again. “But why do they concentrate order?”

“Because the order they’ve already concentrated tells them to.”

“You mean they’re programmed to?”

“Yeah, sure. Our genes are little concentrations of order that program us to replicate them.”

“Life concentrates order ...” Ann mused for a few seconds. “Do you think that’s what life is?”

“Yes, near enough. If there were little green men orbiting Epsilon Eridani they’d concentrate order too.”

Ann smiled. “If ... I wonder if there’s any more news about that yet.”

Jon shook his head. “I’m sure it’ll be a pulsar that no-one noticed before.”

“Very strange ...”

A touch of the sun

Ann and Jon walked to the Congress Centre. It was a bright sunny morning and the walk took them through the university park, which boasted a fine collection of trees from dozens of different species. Ann wore Pronk sandals and Jon his Powersole sneakers so they strode along at a brisk pace.

Jon brought with him a ziparound document folder containing two copies of his biomag (in case he met any potential employers – be prepared!) and a notepad. Ann carried a nylon sports bag containing a notepad and piece of dense foam rubber about a foot (30 cm) square and an inch (25 mm) thick.

“Fine day!” opined Jon.

“This is where I go running.” Ann betrayed no sign of breathlessness at keeping up with what Jon thought of as his remorseless pace.

“Sunlight is great against depression!”

“Yes, it is,” she agreed.

“Nothing like an overdose of photons to the retina to wake you up!”

“Sunlight is as important as food, you know.”

“More so! It’s where all the energy and negentropy in food come from!”

“I think it does even more, but we don’t understand it yet,” said Ann.

“We understand light very well!”

“I don’t think so. Human reaction to light is still quite a mystery.”

“Photons hit the retina and trigger a surge of nerve impulses to the back of the brain. Is that a mystery?”

“Don’t be obtuse. I mean the way light affects mood. How can people say we understand light?”

“Because we do – QED!”

“Was that supposed to be a proof?”

“Quantum electrodynamics, ‘the strange theory of light and matter,’ as Dick Feynman once put it. The jewel in the crown of physics!”

“Best it may be,” Ann said calmly, “but it doesn’t explain everything.”

“Everything except small things and large things. Nuclear phenomena at the small end and gravitational phenomena at the large end are missing, but it covers the whole middle ground, including all of chemistry and biology!”

“That’s outrageous!” Ann was excited at last.

“Okay, what else is missing?”

“Life, the evolution of order and complexity in living organisms, the emergence of consciousness!”

“All covered in principle. Just very complicated!”

“I don’t believe you!” Ann was obviously quite shocked.

“Let’s have a ceasefire until after the conference, okay?”

“Okay. Maybe that’ll change your ideas!”

Hard seats

Jon and Ann took seats in the middle toward the back of the hall, which was angled so that the audience looked down on the lecturers. The hard bench seats had narrow writing shelves fixed in front of them.

The hall was crowded. Jon and Ann were soon pressed in on all sides by earnest participants. Jon gloomily remembered all the Oxford lectures he’d ever attended. So many hours of boredom – and so little to show for them all! Ann pulled out her rubber square and sat on it.

“You should have reminded me,” said Jon. “This bench is gonna gimme a mighty sore bum!”

“You’re an Oxford veteran. You should be hard enough to take it.”

“At least we have a good view.”

He took a long, slow look around the hall. At the front, on the podium, was a long table with an angled touch-screen lectern in the middle and a flatbed video scanner at either end. The wall behind the podium was a huge white projection screen served by a pair of powerful LaserScan video projectors set in a central emplacement overhanging the back of the hall like the

projection gallery in a cinema. Beside the projectors was a pair of television cameras emblazoned with the *Dominus illuminatio mea* logo of the Oxford University cable network. The balcony and its gear reminded Jon of a pom-pom turret on a 1940s battleship.

The murmur of voices hushed. The proceedings were about to commence.

The breakthrough

Here we go – a few pages of science reporting. Read them carefully to build a solid investment that pays interest later.

•

The chairperson walked from the front row of seats to the speaker stand. She was a tall, distinguished lady, in her fifties, dressed in a discreet gray trouser suit with a white shirt left open at the neck. She had a strong classical face and golden-brown hair in a stylized tangle of ringlets.

“Good morning, ladies and gentlemen. I’m Dame Angela Plowright. Welcome to the Extraordinary Oxford Conference on the Quantum Theory of Consciousness. No doubt you’ve all heard a great deal in the popular media about the recent events in the field and already have a general impression of what’s been achieved.”

A collective self-deprecating murmur arose from the company.

“Before we begin with the invited lectures, however, I trust you will permit me to present a brief overview of the field. I know that a great variety of backgrounds is represented in the audience here today, and no doubt many of you are still a little unclear about the significance of what is being hailed on all sides as a breakthrough.”

Another collective murmur. Jon smiled – he could feel his neural circuits revving up, getting ready for the fray.

“The breakthrough is really based on a conceptual revolution, a paradigm shift, if you will. Only following the conceptual revolution did the true significance of the experimental work on interneural resonant fields become evident. And the conceptual revolution is in large part due to the work of one man, Professor Solomon Kaplan from Columbia University in New York, whom we are privileged to have with us today and who is scheduled to deliver our third lecture this morning.”

Dame Angela waved an arm in the direction of Solomon Kaplan, who was sitting in the front row. He stood up to face the audience and a polite round of applause. He was a stocky guy with thick curly black hair and beard, and wore a red plaid shirt. He sat down again and Dame Angela continued.

“The conceptual revolution is in the way we understand the electromagnetic field that shimmers in the cerebral cortex. The various decahertz rhythms of the gigahertz Fröhlich fields have been studied by many workers for many decades. But exact spatial and temporal mappings of the coherent gigahertz fields were possible only this century, and the significance of their coherence was not at all apparent at first. Essentially, our new insight is that the high levels of coherence manifested by the Fröhlich fields imply that their quantum properties are of decisive importance ...

...

... the experimental work on mapping the interneural resonances and on elucidating their role in coordinating higher brain functions was the indispensable foundation for the emergence in recent months of a fully fledged and testable theory. The work over the last ten years of Sir George Plummett, Professor of Neurophysics at the University of Oxford, has been of inestimable value in this respect. Sir George is with us today and is scheduled to deliver the fourth lecture on our program.”

Dame Angela waved an arm at Sir George, who also sat in the front row. He stood up and faced a brief round of applause. He was a tall, hale chap in his fifties, with a strong profile and thinning gray hair.

“Sir George’s contribution to the new understanding of consciousness has been to make a series of extremely precise measurements of the astonishingly delicate excitation waves that serve to stimulate and to synchronize neural firings. It has emerged from Sir George’s experiments ...

...

... the shift from a purely subjective characterization of consciousness to an objective, physical definition is as huge a conceptual revolution, as huge a paradigm shift, as any in the history of science. It is no less momentous than the Copernican shift of the center of the solar system from the Earth to the Sun or the Darwinian shift of man’s place from the divine realm to the realm of the animals. The new understanding of consciousness is a watershed ...

...

... the depth and clarity of our physical insight into consciousness is increasing at an impressive rate, and it requires no great foresight to see that it will soon be possible to manipulate consciousness routinely at the medical level. That is to say, we shall soon be able to repair, enhance or extend a person’s consciousness as easily and reliably as we now repair broken limbs, remold facial features or replace defective organs. More speculatively, it may even become possible to transmit consciousness directly between brains via photonic transducers and optical fiber bundles. Naturally, this prospect

raises horrifying science-fiction possibilities ...”

Jon’s own thoughts had already mapped this terrain. The idea of plugging brains together to transmit mental stuff between them or to create multibrain mindfields had been a philosophical playground for decades. His mother had published papers on the subject.

“... since consciousness is now understood to be embodied in a photon field with a character analogous to that of a laser beam, and to have quantum properties that may also be manifested in nonbiological matrices, the prospect must be seriously entertained that we shall soon be capable of generating states analogous to human consciousness in artificial substrates, and indeed of creating artificial consciousness in intelligent devices incorporating those substrates. Thus we may soon find ourselves surrounded by conscious machines. The yet more horrifying possibilities that this prospect conjures up are too obvious to enumerate here ...”

Jon sighed. This was familiar stuff. Machines with minds had been staples of science fiction for many decades.

“There is, of course, another side to our understanding of consciousness, and that is a renewed appreciation of just how miraculous it is. When one contemplates the myriad harmonies between different excitation states within the brain at each and every moment, how these harmonies build up into a symphony of environmental awareness, and how all this arises from the resolution of quantum superpositions at a scarcely measurable energy scale, it surely seems the most stupendous miracle in the known universe. Far from reducing humanity to the level of quantum robots, the work in this field has shown humans to be in hard scientific fact what artists and philosophers have always maintained, namely the very paradigm of all that is impressive and mysterious in Nature’s works. This aspect of consciousness, its complexity and subtlety, is the main theme of our first speaker today, Professor Max von Hirn, from the Free University of Berlin.”

Dame Angela extended an arm toward Professor von Hirn, who rose from his front row seat and turned to bow at the audience. He was a dapper man in his forties, with graying hair slicked back to a small pigtail at the nape of the neck. He wore an immaculate gray suit and a white shirt with a Texan bootlace tie.

Dame Angela continued but Jon let the words flow over him. It was an elegant academic speech, charming and cultivated, but not the sort of thing to blow his mind. He glanced at Ann. The soporific effect of Dame Angela’s well-turned phrases hadn’t disturbed her zen-like concentration. Jon sat up. He had to show some *backbone* here!

“... The sufficiency of quantum physics as a background theory for an understanding of the phenomenon of consciousness was already an article of faith in the 20th century, of course, but it was not generally appreciated until this century that the characteristic features of quantum phenomena are essential to the story. It was widely thought as late as the 1990s that brains were too gross and ordinary, considered as physical objects, to involve quanta in any essential way, and that a sufficient account of brain function should be possible in terms of classical physics and chemistry. One consequence of that view is that most life scientists have only a sketchy understanding of quantum mechanics. To help us out here, our second invited speaker is an expert teacher of quantum mechanics to life scientists, Dr. Alastair Davies from the University of Cambridge.”

She waved at Alastair Davies, who dutifully stood up and faced the crowd. He was a thin man in his thirties, with wispy golden hair over a round head. He wore a Cambridge-blue shirt.

“Dr. Davies plans to give us a gentle introduction to the basics to enable us to follow what Sol Kaplan and Sir George have to say ...

...

... The structure of the photon field in the cortex is likely to be the subject of many studies in years to come, for its ceaseless shimmering over the neuronet is one of the wonders of nature. The structure does indeed appear to have stable properties that are amenable to study. Although the field is chaotic, which means it displays a nonlinear sensitivity to extremely tiny fluctuations, it regularly adopts a pronounced fractal structure in which the same pattern recurs again and again over a hierarchy of scales ranging from microns, corresponding to individual neurons, up to centimeters, embracing the whole neocortex, that is to say over four powers of ten.”

Jon nodded wisely. This was Steve’s turf.

“These fractal structures may be simulated in nonbiological substrates, and this suggests that consciousness may ultimately be generated artificially. This astonishing discovery is the latest step in the unfolding of the drama we are celebrating in our conference today. The discovery took place just a few weeks ago when 17-year-old Steve Simpson from Cleveland, Ohio, succeeded in modeling coherent interneural excitations in an artificial neuronet on a hypernet computer. I am delighted to say that Steve is here today and has agreed to address us this afternoon.”

Dame Angela waved an arm at the front row but no Steve stood up. Jon had never met him in the flesh – he’d conducted the SCIENET interview via email and videophone. He tuned back ...

“The last invited talk of the conference will be given by Madame Brigitte Colbert, Director of the Children of the Earth Institute in Nice, France. Madame Colbert will address the subject of nonhuman consciousness, which surely deserves a mention in the context of a new scientific foundation for psychology. Madame Colbert is an accomplished popularizer of science and a prize-winning television director, and I am delighted to announce that she has chosen to illustrate her presentation with her latest video.”

Jon smiled happily. He’d be pretty punch-drunk from so many words by then and a video would be sweet relief. These gigs always went on too long, and he’d have to stay to the bitter end.

At last the dame shut up and sat down.⁷

The music of the hemispheres

Professor Max von Hirn took the stand. With his slicked-back hair and smart gray suit he looked like a military officer, and the clipped precision of his bearing gave the same impression. But the little pigtail and the bootlace tie made him look like a cult artist or a movie star. He grasped the lectern firmly and stared straight out at the audience.

“Good morning, ladies and gentlemen. I am Max von Hirn from the Free University of Berlin, where I lecture on what we Germans call the *Geisteswissenschaften*. You may ask what the so-called ‘spiritual sciences’ have to do with the quantum theory of consciousness, so let me explain.”

He paused to glance at his notes on the lectern screen.

Jon turned to Ann beside him and whispered, “Do you know this guy?”

Ann frowned at him. “I saw him a few times on television.”

Professor *Doktor Doktor* Max von Hirn explained.

...

“... Human psychology is the psychology of consciousness, and consciousness is the crowning glory of the human animal. However, the phenomenon of consciousness is not a free-floating psychic state without behavioral consequences for the animal that manifests it. On the contrary, consciousness reflects a harmonious coordination of brain activity at a very high level. The neurophysics of consciousness is only half the story. The other half is its behavioral phenomenology ...”

Ah, how Jon loved such fine words – cut!

“When people dance, speak, paint, or build machines, the higher-order patterns formed by the Fröhlich fields in the cerebral cortex reflect those external phenomena. The patterns and their external manifestation are in a

certain sense identical. The inner ontology of photon field states is in a state of ongoing, ever-changing, dialectical identity with the external phenomenology that drives it, and through intentional action is driven by it.”

Jon smiled – this tide of polysyllables was high German academic style. Was this really suitable for family viewing? More philosophical padding followed before normal transmission resumed.

“... in Kaplan’s theory, consciousness appears when large numbers of photons in the cerebral cortex resonate with each other to form a coherent field state. Individual neurons produce electrical spikes lasting about a millisecond, with peak potentials of about a hundred millivolts, and are excited to fire when a sufficient number of their input synapses are stimulated. Large groups of neurons – millions or even billions together – can coordinate their firing to produce fluctuating rhythms that serve to modulate the Fröhlich excitations, which have frequencies of some billions of cycles per second. Elaborate fractal patterns in those rhythms correspond to the phenomena of consciousness. Thus consciousness is rather like music.”

Jon liked that. The music of consciousness!

“... humans have had big brains for well over a million years, but until recently their brains lacked the organization needed for consciousness. The hardware needed to create the music of consciousness is not only a large neocortex with several billions of neurons but also a highly re-entrant pattern of neural organization. We now believe that consciousness evolved only a few tens of kiloyears ago ...”

Jon saw Ann nodding quickly, almost impatiently, beside him. All this was pretty basic for her.

“Neural organization could evolve much faster than brain size, since the interconnections between neurons develop by natural selection within each growing individual. The variations needed for selection occur not by genetic mutations but by the influence of the environment on dendritic growth in individuals ...”

...

Jon and Ann shuffled out with the crowd for coffee in the lobby.

“That was bearably dull,” Jon said.

“I thought it was good – not too much hard physics!”

“Too many long words instead.”

“Well, you know German professors.”

“As if hard seats weren’t enough.”

“The seats are British!”

But Jon liked it hard. Glutton for punishment.

The classical volcano

Doctor Alastair Davies took the podium. He fed a disk into the lectern and fingered the screen. A bright white square as big as a billboard appeared on the wall behind him. His wispy golden hair intercepted the scanning laser beam and lit up like a brilliant flame. He stepped back to the lectern.

“Good morning. I’m Alastair Davies from the University of Cambridge, and my job today is to remind you briefly of what you probably already know about quantum mechanics ...”

This lecture was seriously heavy.

“The world according to classical mechanics was a fixed totality of facts which we passively discovered as we experienced successive moments of time. The world according to quantum mechanics is a chaotic flux of future possibilities that crystalizes into an orderly domain of facts as it funnels through a time-zone called ‘now’. Behind us, in our past, is a classical domain of facts. Ahead of us, in our future, is an infinite superposition of possible states that condense into a unique reality in the now-zone. Consciousness operates in the now-zone, which extends indefinitely far both spatially and temporally. The zone is open and gets fuzzier the further out you go until it dissolves in the timeless fuzz of all possible wave functions. Consciousness is part of how the flux condenses into a definite pattern of facts. This is the new quantum view of consciousness.”

He touched his screen. The bright billboard above him now showed a blue volcanic cone – FACTS – with a jagged red fanlike flame – NOW – emanating from it and a swarm of black dots – CHAOS – swirling around the flame. A time-reversed volcano, condensing clouds of CHAOS through the flame of NOW onto the ash-heap of FACTS. Jon smiled – *nice!*

“The concept you need to grasp to understand the now-zone is non-locality. Kaplan’s bold leap of the imagination here is to say that consciousness is nonlocal in exactly the same way that quantum events are nonlocal before they are determined to be in a definite place. For example, photons from a distant star exist as wave functions spread out over huge volumes of space before they’re finally recorded on human retinas or imaging chips. So long as the photons are still in the now-zone they’re not localized. Consciousness in Kaplan’s theory is similar, except that it *stays* in the now-zone ...”

Davies gestured at the CHAOS above the flaming cone on the wall:

“The quantum chaos here has to be seen as fuzzing out not only particles and objects generally but also space and time. Space–time geometry is

resolved into a unique and orderly structure at the classical level, but if you descend to the quantum scale it dissolves into a seething foam of fleeting and tangled forms with complex and bizarre topologies. These forms are virtual microgeometries that become real for an instant and then disappear again. Only when an object falls through the now-zone to crystalize into classical reality does it get a fixed space–time location ...”

It got worse. Davies obviously imagined his audience was a bunch of utter brillos. But Jon was tough enough to take it. He made notes faster and faster – just like the old days!

The mirrored ball

Professor Solomon Kaplan stood at the podium. His black hair and red shirt contrasted dramatically with the white wall behind him.

“Hi, good morning. I’m going to talk to you about my nonlocal coherent-state theory of consciousness. I’m not going to go deeply into the technicalities because I’m told that most of you are not specialists in physics and would much prefer a lite survey of the theory. Neither am I going to refer in detail to Sir George Plummatt’s experimental work, although I’d like to state here at the outset that it was extremely important for me. It’s also greatly reassuring that his results are so strongly consistent with the theory.”

He paused for a moment. He reached down below the podium and then raised his right arm. In his hand was a silver ball about the size of a tennis ball. It had a mirrored surface.

“This mirrored ball is my favorite model of consciousness. Let me tell you why. The ball reflects the universe around it. All the light rays that strike this ball are reflected in a geometrically predictable way. The result is that the image you see in the ball is a perfect image of the visual universe surrounding the ball. It’s all there, differing from the real thing only by a simple geometrical transformation.”

Jon liked the ball model.

“Consciousness is not so simple, of course. But neither is this ball. The photons are not just reflected without more ado. First they’re absorbed by free electrons in the surface. The electrons get excited and jiggle about with the same frequency as the photons, then re-radiate new photons. The new photons interfere with each other destructively and cancel out in most directions. But they interfere constructively in one direction, where we see a reflected ray.”

Jon recalled the reflection story from a classic Feynman lecture.

“In my model of consciousness, sensory input gives rise to electrical activity in the brain. That’s analogous to photons giving rise to electron excitations in the ball model. The electrical activity in the brain, in turn, generates specific output that causes the body to act in some particular way. That’s equivalent to photons being reflected in a specific direction. What’s special about my mirror model is how it describes what happens between those two events ...

... the coherent electromagnetic field in the brain reflects the external environment in some complicated way – that’s the key insight here. The unity of the ball is also important. Consciousness is a paradoxical thing without clear and obvious properties, but one thing it has is a certain unity. The field in the brain has a unity too – that’s where the quantum interaction of the field photons comes in. I don’t know a better phrase to capture that unity than the one used by the great philosopher Immanuel Kant back in the 18th century, who called it the ‘synthetic unity of apperception’ ...”

Jon smiled and nodded with pleasure. His mother had been fond of Kant’s philosophy of mind – his formal theory of the pure rational ego – and Jon knew enough to see the link.

“Consciousness has another remarkable property, namely that it’s always consciousness *of* something or some domain. This is the famous intentionality of consciousness. The photon field in the cortex isn’t a self-contained thing that can be separated from its environment, any more than the image in the mirrored ball can be separated from its environment. The photon field *is* what it reflects, so far as we, who use this field as our mirror of apperception, are concerned. When I look into a mirror – any mirror – I see *me*. Only if I want to make a lot of fuss about geometrical optics or electron excitations do I bother to make the distinction between me and my image. It’s just the same with the model of the environment formed in the photon field. So far as we’re concerned, it *is* what it represents ...

...

... The quantum properties of the electromagnetic field in the cortical neuro-net are essential not only to create the synthetic unity of apperception but also to allow superpositions of field states to grow, and then, when they’re ready, to pop, and leave behind a well-defined state of excitation of the neuronet. Remember that our sensory input does *not* come already cut up into neat concept-sized chunks, ready to be processed by a packaged program running on logical hardware. The brain often has to struggle to find any logic in its input. When that happens, and my guess is that it happens several times a second, the field goes into a superposition of states. They all

blur together until a clear winner emerges, which then dictates the logic of both the input and the output ...”

And so it went on. Classic stuff.

All politics

Jon and Ann enjoyed a stand-up buffet lunch in a reception room above the lecture hall, along with the other participants. Over a paper plateful of salad, Jon spoke.

“This idea that consciousness resolves superpositions is puzzling. After all, I don’t *see* any superpositions in my consciousness.”

“I agree, it’s puzzling,” said Ann after swallowing. “On the other hand, how *could* I see superpositions? If I’m reflected in the domain I recognize in consciousness, then it *has* to be resolved into facts already, because otherwise *I* wouldn’t be in focus either.”

“You’re right!” A beatific smile slowly dawned on Jon’s face. “Thanks – you’ve just helped me understand the meaning of life!”

Ann broke into a catlike smile. “You’re welcome.”

A tall chap pushed into view. “Hi, Jon!” he called loudly.

Jon groaned as he recognized the face from 2008. “Hi, Lou, what are you doing here?” Lou had been studying the Thatcher–Reagan years and the fall of communism. Consciousness for him was a political category.

“Got a last-minute invitation. How about you?” He looked like a football jock – as he had been back in Arkansas.

“Reporting for SCIENET,” Jon sighed. “Did you finish your thesis?”

“Yup, indeedy. Now I’m at All Souls – can you believe it?”

“All Souls?” That was a graduate college for brainiac mutants. “How did you manage to pull that?”

“Contacts, kiddo. It’s all politics here. Hey, how about Tom Smith? Did you vote for him?”

“Me? Never! He’s a caveman on Japan.”

Lou’s eyes lit up. “Japs! Threaten to nuke ’em, I say!”

Jon saw Steve Simpson a few steps away. “Hey, Lou, I gotta go. I’m here on business.” He held up a hand.

“Okay, take care!” Lou was already moving on.

Jon stepped up to Steve. “Hi, Steve, good to meet you at last. I’m Jon Christie.” He extended his hand.

Steve blinked nervously. He was a thin kid, not very tall, with a shock of tangled blonde hair and plastic glasses, in a white sweatshirt and blue jeans.

He shook Jon's hand limply. "Ah, yeah, Jon Christie. I, ah, liked the piece in *Scientific American* ... Made me sound kinda ... crazy, though!"

Jon grinned widely. "Good for your image. Geniuses should be a bit crazy. How's the work going? Any new breakthroughs?"

Steve gazed into space for a few seconds. "Not yet ..."

"Hey, Steve, I have an idea for a multimedia project on all this –"

He made his pitch as best he could, but Steve didn't really get it.

Squid helmets

At 2:30 PM precisely, Sir George Plummett strode onto the podium. His tall, distinguished figure and sober suit gave the impression that he was a head of state holding a press briefing.

"Good afternoon, ladies and gentlemen. The topic on which I shall be speaking is the experimental basis for the quantum theory of consciousness. Over the last ten years, my laboratory team and I at the Crick–Dawkins Institute for Molecular Biology here in Oxford have made an extensive series of measurements of the interneural excitation fields which are hypothesized to support consciousness. Our overall conclusion is that there is an extremely close and finely structured connection between the interneural excitation fields and states of consciousness ...

...

... Layer upon layer of electromagnetic excitations were found to be highly coherent and to give rise to extensive macroscopic superpositions of virtual field states. The fields form coherent ensembles and propagate over large parts of the neocortex and over both cerebral hemispheres. As the fields propagate, further neural groups become locked into phase with them, which causes them to grow yet further. They may continue to hover in a superposition of states as they grow, and this way they can amplify quantum uncertainties up to a macroscopic scale. At a certain threshold size, the superpositional fields pop, so to speak, and leave behind them a well-defined distribution of interneural surface potentials ...

...

... The quantum events that are presumed to resolve the superpositions – to pop the cerebral bubbles – are utterly beyond the reach of experimental investigation using our 3D-CIMEG techniques based on analyzing output from megachannel helmet arrays of microprobe squids."

Jon nodded knowingly. Three-dimensional computerized interferometric magnetoencephalography he knew about – sort of – and about Sir George's

artfully constructed megachannel helmet arrays. The microprobe squids – superconducting quantum interference devices – were just tens of microns in size and were made in Japan for nanochip diagnostics. They could measure quantized magnetic flux with a spatial precision far beyond that of previous brainwave readers. Sir George’s team was first to assemble the squids into helmets. The plummy voice continued:

“To appreciate the depth of the impossibility here, one should remember that the photons recorded by the squids have frequencies of just a few billion hertz, corresponding to photon energies measured in microelectronvolts and localization uncertainties measured in centimeters ...”

Sir George keyed up a set of equations on the LaserScan wall screen and explained them. The audience reacted with a flutter of surprise, but not Jon. He quietly checked the math in his head.

“... Our squids are indeed sensitive to individual photon energies in this range, but not against the background noise of a living brain, which dashes any hope of using our squid techniques, or any other noninvasive techniques, to measure the quantum events that pop the field superpositions, and dashes with it any hope of predicting the evolution of the field. The best we can do in terms of modeling consciousness is to simulate the cerebral field in a large hypernet computer and collapse its superpositions randomly. Thus we may simulate consciousness generically with great realism, although we have no hope at all of emulating an individual human consciousness ...”

Fade.

The nerd genius!

Steve Simpson was next. He stepped up quickly to the podium and blinked nervously at the crowd through his plastic specs. This was the *Wunderkind* – the miracle kid, the nerd genius! He’d managed to program a hypernet to do something no-one else dreamed possible. The media legend was that he was practically a space alien – more brilliant than Einstein, more freakish than Hawking, more driven than Bill Gates! He got a warm round of applause before he started, which only made him more nervous as he fumble-fingered the lectern touch-screen.

“Er, hi. I’m Steve Simpson from Cleveland, Ohio ... I, ah, have a few video animations here to show you, made on my hypernet ... First, er, I oughta say how they were made and what they show about the brain and about Sol Kaplan’s theory.”

Everyone in the hall felt his pain, but it was okay – he was a genius!

“Basically, what I wanted to do was model a field of virtual photon states with the same parameters as Sol Kaplan’s theory and Sir George Plummer’s experiments. When I ran the model on the hypernet I got these amazing pictures! When you model a semi-coherent quantum field in a non-uniform matrix with electric potentials everywhere you get some very nonlinear effects. When you remember that all this is happening in a complex space with an imaginary dimension branching off from each real dimension you can imagine it gets quite hot! I had to do the fields in two dimensions on my workscreen, obviously, but with a bit of imagination you can sorta see how it might go in six or eight dimensions. Anyway, what I discovered was that the coherent states could stay in place in the matrix for up to like seconds at a time. And they come in cascades at different energy levels, so I guess these states are the moments of experienced time, like each coherent state is a now, and these nows meld seamlessly into each other.”

Jon smiled suddenly. That was good – *now-now-now!*

“Then I looked at the nonlocal links between the cascades of photons and the things in the outside world they represent. If you wanna picture of these nonlocal links, you can see them as like snags or crumples in space–time. A nonlocal state is where bits of virtual space–time touch together, and when the virtual state pops into reality the crumple sorta pulls free and space–time straightens out ...”

(We veil another hairy bit.)

Steve fiddled with his specs. “I guess it’s time for the videos ...”

The hall lights dimmed and a giant white rectangle appeared above him. The silhouette of his unruly hair danced along the bottom edge as he walked to the side of the podium.

“This first video shows the evolution of coherent states induced by a cascade of gigahertz frequencies in a multifractal potential landscape with dimensions corresponding to excitations in a tangled neuronet with typical connectivity for the cerebral cortex. The parameter values are a bit arbitrary but you get the general idea ...”

The image looked like a slow zoom into the Mandelbrot set, with colored swirls and curlicues forming fantastic, kaleidoscopic, psychedelic patterns, slowly growing and revealing shapes within shapes.

More videos followed, visions of the eternal wonderland that lay barely veiled in the cloud of virtual futures, waiting for the leading edge of consciousness to condense them onto the classical ash-heap. *Paradise ...*

Star children

The next speaker was Madame Brigitte Colbert. She was a large, imperious woman in her forties, with long blonde hair falling free and a face that hinted at considerable beauty. She was draped in a tentlike dress printed with what looked like jungle camouflage that left a fleshy white shoulder exposed. She sat on a high stool behind the table on the podium and waited as the audience settled on their hard benches.

“Bonjour, mesdames et messieurs! I am honored to give the last lecture of this conference. The topic I have chosen is nonhuman consciousness. We know that consciousness is a physical state – that is the message of all the lectures we have heard today. It is a state that could be manifested in other zoological creatures ...”

Some fine rhetoric followed, but let it go.

“... human consciousness is not the ultimate state of consciousness. The human view of the cosmos is extremely limited. As scientists, we now see a realm of cosmic order that transcends the animal view as completely as the animal view transcends the vegetable view. The simple human animal is like a tree in the world of science, a natural body with an undeniable dignity, yes, even a glory and a majesty, but with a very limited field of awareness. The human faculty of consciousness is now seen to be the limited ability of the cerebral neuronet to create and respond to electromagnetic fields, as if our cerebral hemispheres were a pair of walkie-talkie radios.”

Jon liked that – *walkie-talkie radios!*

“Only with our technology can we rise above the solipsistic prison of Cartesian inner awareness, so similar in its privacy to the natural solipsism of the other animals. Only with our new knowledge can we see that our own awareness is no longer a mark of supernatural distinction and no longer enough to distinguish us as divine beings surrounded by a profane creation. Now we know that our innermost spark is simply a better tool to adapt us to our environment than the soft feelers at the tips of a growing tree.”

Jon glanced at Ann. She was writing copious notes, deadly earnest.

“... human consciousness is a murky state, like the transparency in the depths of a muddy pond. By practising the art of meditation and the ancient science of spiritual discipline, a human can greatly improve the clarity of his or her consciousness. By studying the modern sciences, a human can become aware of domains of clarity which utterly transcend the human condition. Not only can we imagine constructing machines with analogues of consciousness but also we can imagine titanic seas of photons with fantastic

fields of coherent states dancing in vast patterns that dwarf Steve Simpson's fractal images. We can imagine *superconsciousness!*"

Madame Colbert spread her arms in an operatic gesture. Jon glanced at Ann, who glanced at Jon. A sparkle flashed between their eyes – *good* – she had a sense of humor.

"*Mesdames et messieurs*, we are privileged to stand on the threshold of a new age as we look toward the horizons of Kaplan's new view of the mind. *The stars themselves* may be superconscious – and we may be their children!"

Yessiree! Jon liked that!

Madame Colbert raised an imperious arm and cast her gaze up at the video emplacement. The hall lights dimmed and a cinematic rectangle glowed on the wall above her.

"I have prepared for you a vision of what the future may hold. Relax and let it work its magic, but do not attempt to understand it. The images will live in your dreams until the time is ripe for them to be understood."

The vision began. It was a collage of images, some familiar, some surreal, cut and mixed in a fast, frantic style, like an MTV video. The images were of ultramodern research labs, giant hyper-hi-tech manufacturing plants, busy urban street scenes and so on, as well as views of the Earth and of orbiting space structures and some clips from science-fiction movies. Rainbow-hued psychedelic multifractal structures like those in Steve Simpson's videos swirled between the images. Staccato words and phrases sounded over a synthesized fusion composition of some musical merit. The experience continued for about thirty minutes.

The vision ended. The music stopped. The hall lights came up. Madame Colbert gathered her jungle drape and spoke.

"That is a vision shared by others. The message is very simple. The story of life around our Sun will go on far beyond our present human activities. The level of consciousness manifested by the superorganism growing on Planet Earth will transcend our present consciousness by at least the same factor that our consciousness transcends that of the first protean cell in the primordial ocean. The individuality of our personal consciousness will be subsumed within the collective identity of the superorganism, just as the individualities of the cells in our bodies are sacrificed to the human identity of the whole body. Consciousness as we know it is just a beginning."

Madame Colbert had finished. She sat on her perch like a Buddha, hands clasped in her lap, gazing into space.

Jon says his bit

The next item on the program was the panel discussion with all six invited speakers. They sat in a row on the stage, three on either side of Dame Angela. A pair of white-coated technicians stood ready to pass a radio microphone to anyone with a question.

A hand was raised near the front and Dame Angela waved a gracious arm at it. A young woman stood up, radio mike in hand, and spoke.

“Madame Colbert, you said that the integration of consciousness on this planet would continue far beyond human consciousness. Can you tell us how and when you think this might occur?”

“*Mais oui* ... It is already proceeding apace. The development in recent decades of global *télécommunications*, especially the internet, creates a field of activity that forms the basis for consciousness. People are linked into a global machine and their lives and their work are synchronized. When we act in a single rhythm, we may be part of a unified consciousness. That is similar to how the integration of different neural groups led to consciousness in the evolution of humanity. I would say we are already much closer to a global consciousness than many people think.”

The young woman remained standing. “How do you see this global consciousness in relation to Gaia?”

“Gaia is not yet conscious. We are close to making Gaia conscious with our activities. I have a feeling that Gaia is still a young organism and has not yet learned to focus her mind. When we construct machines with bionic consciousness which are so intimate with us that the barriers between us are no longer important, then we can say she has woken up.”

“Thank you.” The young woman sat down.

There were a few other questions. Then Jon raised his hand. Dame Angela waved at him and a mike was passed along. He stood up.

“My question is for Steve Simpson. Steve, what intrigues me about your new work is the difference between simulation and reality. You’ve simulated consciousness in your hypernet at a level of fidelity that’s as deep as we think it goes, which means you’ve *emulated* consciousness, in the same sense that you can emulate one computer on another to create a virtual machine, a fully functional copy. So in that sense you’ve created virtual consciousness. My question is – haven’t you already given a machine consciousness in the full and literal sense?”

Steve blinked anxiously. “Er ... yeah, sure, something like that did cross my mind. I have a whole lotta scaled parameters in my model that kinda

spoil the real-time interaction you need for real consciousness, and I don't see how you could change the scaling by a big enough factor – we're talking billions here – but apart from that, sure. It's virtual consciousness, just like a virtual Macintosh on a Fujitsu. It's functionally isomorphic."

Jon nodded slowly. "Do you think people will look back and say you were the one who made machines conscious?"

"Well, as I said, there's a few factors of a billion to worry about. But it's there in principle, sure. I'd say, ah ... within our lifetime, certainly." He grinned suddenly.

Jon handed back the mike and sat down.

Soon enough, Dame Angela declared the conference closed. Applause. People stood up to go. Jon elbowed his way to the front and buttonholed Dame Angela for a quick businesslike chat. She was politely noncommittal and he didn't press too hard. It was enough to make contact. On the way out he ordered a copy of the proceedings, to be emailed to Hal in Heidelberg.

A better feel

Ann and Jon walked back westward through the University Park to St. Joan's College. It was late afternoon and the sun was still high in the clear blue sky. Groups of people sat and lay on the warm grass.

Ann and Jon sat down in the shade of a tree beside the river and watched people floating past them in punts – those flat, square-ended boats that give Oxford and Cambridge such an exotic ambience in summer.

Ann sat on her mat. She folded her legs to one side and fingered an ankle. Jon stretched out beside her on the grass and touched her arm.

"I'm very glad I called you," he said.

"I'm glad too," she replied, and moved her hand to touch his. They were silent for a few seconds as their hands twined gently together.

"What shall we do this evening?" Jon's voice was mellow.

Ann gently pulled back her hand. "Let's eat out somewhere."

"Okay. You choose where." He stroked her ankle lightly.

"Let's go soon. I want to sort out my notes before we go."

"Okay, me too, I guess." His fingers moved up her calf to her knee.

Ann pulled up her legs and hugged her shins. She gazed out over the river and sighed.

Jon's eyes focused on the fold of skirt between her legs. It hung tent-like to shade a tuft – no panties! – of fuzzy hair. He reached out his fingers toward the fuzz.

Ann twitched suddenly as the fingertips touched. She grabbed his arm and moved her legs. “Jon, please.”

Jon pulled his hand back. “Sorry, I didn’t mean to startle you.” He stood up. “I vote we go.”

“Yes.” Ann moved onto her knees and put away her mat. “What about the conference? Did you get what you wanted?”

“Definitely, yeah. I now have a much better feel for where all this work is going. We have a big new technology on the way here. It’s like computers were seventy years ago. Conscious machines will change everything.”

“I’m afraid they will,” said Ann with a sigh as they left.

Quark soup

They dined that evening in a small Oxford restaurant specializing in French cuisine. Over a very good meal – Ann chose it – with mineral water they talked mostly about personal things. Ann described her childhood and how she got interested in biology, and Jon explained how his parents never really understood each other.

“It was really a problem,” he said. “Dad had a Mormon background. He rebelled against it but he kept the conservative bias. Mom’s family was very liberal and free-thinking. So they couldn’t really relate too well. But they did agree on science, so that was where they pitched camp and made their peace with each other.”

“Now I see why you want to relate physics and psychology,” mused Ann. She’d changed her white shirt for a camisole top made of see-thru black lace. Her bosom was modest but, thus veiled, quite sexy.

“I want to relate them because they’re ultimately the same science.”

“No, I don’t see that at all. It’s only electrodynamics – QED, as you said – that’s relevant for Kaplan’s theory, which is only a part of physics relating to a tiny corner of psychology.”

Jon considered this for a moment. “So far, maybe ... but we’ve only just started. Already we’re deep into quantum theory, the geometry of space–time, and the whole psychological rat’s nest of intentionality, which I suspect will end up dragging in all the rest of psychology. My guess is we’ll also be mining physics as far as superstrings before we’re finished.”

“Superstrings ... I don’t understand them at all.”

“Me neither ... or intentionality, for that matter.”

“It’s all just theories ...” said Ann in a vague tone. Her hands and wrists flexed elegantly as she toyed absently with a bread roll.

“As the first step beyond QED,” Jon mused, “you have to remember that what goes for QED also goes for QCD.”

Ann raised her eyebrows. “Sorry – what’s that?”

“Quantum chromodynamics – the theory of quarks and gluons.”

Ann smiled gently. “Another theory – do explain.”

“It’s the theory of the strong interaction that holds atomic nuclei together. The interaction is mediated by gluons. They glue quarks together in nucleons – that’s protons and neutrons.”

“Oh, yes, I remember – three quarks in each proton or neutron. Why is it called quantum chromodynamics?”

“The force mediated by the gluons is called the color force and the quarks have colors. But they balance out to make the nucleons colorless.”

“I thought color wavelengths were much bigger than atoms.”

“Not literally color. It’s just a word.”

Ann shrugged. “Okay, so why’s it interesting?”

“Well, I have a new idea here.”

She smiled wearily. “I thought so – tell me.”

“We now explain consciousness as a property of photon fields. As I see it, an exactly analogous property could exist in gluon fields.”

“You’ll have to explain.”

“Gluon fields are much more complicated than photon fields, so they should give rise to more complicated phenomena, such as some new kind of consciousness.”

“Inside atomic nuclei?” She shook her head in disbelief.

“No, not in nuclei. In quark soup!”

Ann laughed out loud. “Quark soup?”

“Quark soup is what you get when you compress matter so hard that the nucleons are squeezed together.”

“Can we do that in accelerators?”

“Yes, but not on a big enough scale. The universe was that dense for the first few seconds after the big bang, but nowadays the only place we know of where it happens is at the core of neutron stars.”

Ann’s eyes widened. “Neutron stars – pulsars.”

“Yes, while they’re still hot at least.”

“What do you mean?”

“Quark soup is up around a trillion kelvins. The pulsar that seems to be orbiting Epsilon Eridani must be quite cool if we can’t see it.”

Ann shrugged. “So it can’t be conscious.”

“Well ... now you mention it ... the gluons in superfluid neutronium

could also sustain some kind of ... hyperconsciousness.”

She shook her head. “I won’t ask!”

“Cool neutron stars may have superfluid neutronium inside, which would support extended coherent states. But it’s all theory anyway.”

“What if the Epsilon Eridani signal is from a genuine E.T.?”

Jon smiled and sat back. “Improbable, I’d say.”

They finished eating and walked back to college under a starry sky. Jon burred on about superstrings while Ann looked up at the stars.

A good move

Ann unlocked the door and they walked in. She threw her jacket onto a chair and turned on the spotlight over the desk. Jon drew a deep breath – the smell of body lotion or deodorant, or whatever, was good. He put his hands in his pockets and looked through the window into the outer darkness.

Ann sat heavily on the couch and took off her sandals. “Well, believe it or not, I’m suddenly tired and have a headache.”

Jon sighed. “I’m quite tired too. I vote we just go straight to bed.”

“I agree. I need a good night’s sleep so that my brain can file all this new information.”

Jon sighed again, more heavily. “That’s very sensible.”

Ann smiled. “Yes ... you first in the bathroom.”

“Okay.” Jon took off all but his trousers and went off to the bathroom. A cold shower later he reappeared, cool and naked, trousers over his arm.

Ann was sitting on her bed, draped in her silk robe. When she saw Jon she smiled. “Goodnight – sleep well.”

“Thanks – you too.” Jon spread the sheet and the sleeping bag over the couch. He turned off the spotlight and sat in the faint light from outside the window. He breathed slow and deep and let his thoughts drift.

Superstrings ... a theory that postulated ten or more dimensions, and explained that six or more of them were forever invisible because they were compactified into submicroscopic hyperballs, was hard to handle. The math was too much for his poor brain ...

The math of information networks and robot systems was hard enough ... *Robots* ... Japan ... the CIA ... Was that why they mailed him? Was he the only robot guy they could find? *Lou* ... how did he get into All Souls? ... wasn’t he involved with the Company somehow?

Why was he so eager to take a vacation in Japan? Whatever possessed him to do it ... after he’d read the memo? *Spooky*.

Fifteen minutes passed before he heard Ann coming out of the bathroom. She turned off the light. He heard her getting into bed.

Maybe he should go and ravish her ... *no* ... she had a headache. Bad manners, anyway.

Looking up Ann had been a good move ... He'd sat through an entire Oxford conference, as pompous and ponderous as any he'd ever punished his bum for, and not once thought about Judy.

•

There. You've climbed the (first) mountain.

Psychology

All minds are mortal

Sexual repression

Saturday was a slog, I know, but Sunday turned out to be a whole lot of fun. We're still sorting out the scenery here, so enjoy the easy ride while you can.

•

Oxford, Sunday morning, about six. Jon rose again and turned on Hal Junior. Moments later he was online – another Intelink memo! It was short:

> Jon, we know you're there. Please tell us you read the Friday memo and say if you can help. We need your robonet smarts to chase a lead. We need inside poop on the industry infonets to check out the JAND. Write me soon! Best, Bob

Jon frowned. Bob had been his Company boss back in 2004. Nice guy but never knew when to back off. Jon typed a quick reply:

> Bob, I read the memo. I'm not interested. Leave me alone! Jon

He mailed it and quit Intelink, then passed time surfing a web mall.

Ann appeared at the bedroom door. "Morning, Jon."

Jon glanced up. "Morning – looks like another sunny day."

"Yah." Ann strode over to the window to open it. Her silk wrap flared out behind her like a flame.

Jon watched the silk settle slowly over her bod. She had state-of-the-art wetware there, no doubt about it. "How's your head?"

"Fine, thanks. I slept well." She turned and smiled warmly. The front view, right down to that little tuft of fuzz, was even better.

"Me too ... you're looking good ... Do you plan to go running again?"

She stretched out her arms. "Mmm ... yes. Do you want to come too?"

Jon stood up. A bulge was growing in his Hyperlites. "I wanna come too – but let's wake up here awhile first."

She saw it and closed her wrap. “No, not here. I want sun and fresh air. Let’s go now, before it’s too late.”

Jon raised his open hands. “Your call.”

She skipped off. Jon closed down Hal and put on sox and Nykes.

She was sexy! He hadn’t gotten such a quick stiffy for yonks. A nude bod was one thing – he’d eyeballed plenty of hot babes in sunny locales – but she was something else. Was it time to let rip?

What about his scruples? What about five years of celibacy? Groan ... the thoughts were still churning ...

Freud was right – civilization was built on sexual repression. Let that go and you might as well do it in the street.

Ann appeared in her big black teeshirt and Nykes. They departed.

Black satin

They ran around the park. They jogged at a brisk pace in a big circle that Jon guessed they took about a kilosecond to circumnavigate (a kilosecond, for those unused to the new metric time, is 16 minutes and 40 seconds, about equal to the mean diameter of the Earth’s orbit around the Sun in speed-of-light units). Then, since they were still full of energy, they went halfway round again, to the river, and sat down on the dewy grass.

“Well,” Ann began, “it was very nice to meet you again and a great pleasure to spend yesterday with you.”

“My pleasure entirely ... I have an idea. Why don’t you come along with me to London and meet Ruth. She’s real nice – I’m sure you’ll like her.”

“Ruth – your colleague at Media International.”

“Yeah. She works in London, at the office where I was before moving to Heidelberg. We go back four years.”

“I get it. Hey, aren’t you going to Japan next week?”

“Yeah, right. I’m going to visit a charming young Japanese lady I met in Heidelberg last summer.”

“Aha, good for you!”

“Seriously – come with me to London. You’ll like Ruth.”

“Maybe ... I need to be here in Oxford tomorrow morning.”

“Come back here tonight on the train.”

“On the train ... Yes, I can.” She raised her legs and hugged her knees. “One thing – are you just going to talk business?”

“Well, not all the time. We’ll chat a bit too, I’m sure.” He gazed at her crotch. A token adornment of black satin ribbon arched airborne above the

fuzz and plunged deep between the buns.

She let his eyes dwell on the silent drama. "What's Ruth like?"

"She's about your age, blonde, good-looking, fun, always cheerful."

"Sounds too good to be true."

"Almost. She doesn't take me seriously at all. That's why I like her."

Ann stared at him sharply, suddenly alert. "There's something I wanted to ask you, something philosophical."

"Go ahead."

"Do you remember what you said last night about consciousness in stars?"

"Consciousness in stars? Oh, quark soup, yes!"

"Madame Colbert had the same idea, with the superconscious Sun."

"Well, not quite. I was thinking about gluon fields. She's still thinking about photons."

"I told you we didn't understand light very well, and you just said QED!"

Jon grinned. "Yup ... there's a lot of detail to explore. Sunlight gives us energy and negentropy, sure, but if there's more it's not in QED."

"*Quod erat demonstrandum!*" Ann's eyes twinkled.

They sprinted back to college.

Camouflage

Back in Ann's room they were sweating and breathing hard. Jon opened the window wide and Ann fetched a bottle of water from the fridge. They drank from the bottle as their pulses slowed to merely fast. Ann went to shower and Jon fell to musing.

That was almost as good as sex! After five arid years he'd rationalized his abstinence so thoroughly he now saw sexual indulgence as a weakness. The Nietzschean superman wouldn't waste time on sex games – no way! Fucking was fun, sure, but it was for kids, in both senses. His father had drummed the warrior code into him – sex without love was dirty and dishonorable, and sex with love was so rare it was worth dying for. All sex weakens you and you have to pay the price. His mother thought the code was a lot of fascist nonsense ... well, yeah, right!

Ann came out of the bathroom like Venus, a towel around her hips.

Jon showered and came out betoweled too. Now was as good a time as any to put his arid years behind him. He sat on the couch facing Ann, who was prodding her toenails.

"Well, we're clean and undressed – what next?" he said as he reached out and stroked her knee. His loins were stirring again.

Ann took his hand gently in both hers and looked into his eyes. “I don’t want to have sex, not here, not now.”

Jon gazed back and joined his other hand to hers. “I know it’s a bit sudden and all that, but what better time than now?”

She glanced aside. “Oh, time for the news.” She turned on the radio.

“– still not found any record of an earlier pulsar signal along the line of sight of Epsilon Eridani. The mysterious signal has now been analyzed in more detail and is almost certainly from just a few light years away, which is very near to us by galactic standards. Astronomers are now assuming that the source of the signal is a transmitter in the neighborhood of the star Epsilon Eridani itself, and speculation is mounting that the source may be some kind of artificial transmitter.”

Jon stopped breathing and froze in an abstracted posture, reflecting.

“In Tokyo, Prime Minister Shintaro Kawasaki made an urgent call for a relaxation of European and North American import restrictions on Japanese robots to forestall a possible trade war. He warned that his ruling coalition was under heavy pressure from a right-wing grouping headed by Shusako Mishima and the National Heritage party. In Moscow –”

Ann turned the volume right down and looked at Jon expectantly, waiting for him to take a breath. Three of their hands were still entwined.

“Wow,” he breathed, “just a few light years away.”

Ann looked blank. “Is that very near?”

“Yeah. Most pulsars are hundreds or thousands of light years away.”

“Oh ...” said Ann, deflated. “Does that mean it can’t be a pulsar?”

“It’s absurdly unlikely that a pulsar should pop up right next to Epsilon Eridani. Perhaps it *is* an E.T. transmitter, after all.” Jon gazed out at the sky. His erection was gone.

Ann pulled her forgotten hand from his and stood up suddenly. “I’m going to put on some clothes.”

Jon nodded silently as Ann went off to the bedroom. Why would an E.T. civilization code its microwave transmissions to look like a pulsar? He stood up and put on his black baggies. It had to be *camouflage*, surely ...

Ann returned in her standard black skirt and a little white vest.

“Are you hungry?” she asked.

“You bet.” Jon picked up the cybergrunge shirt from Friday, sniffed the armpits, decided they were fragrant enough and put it on.

Ann smiled indulgently. “Let’s go to breakfast.”

A catastrophic event

They sat at a table by the window and enjoyed the college approximation to a continental breakfast.

"It's not a problem that the waveform looks random," opined Jon.

"Surely it should have patterns in it to carry the message, assuming there is one," insisted Ann.

"An efficiently coded message looks random. The more information you code in, the more complex its description becomes and the more random the signal becomes."

"Ah, yes, I remember that ... but if there is a message in the signal it should be easy to see."

"Why? Whatever it is these guys are broadcasting so loudly, it's very unlikely to be intended for us."

"Who, then? And why should they make it look like a pulsar?"

"Right – my questions too. Maybe it's hostile. Maybe they're broadcasting battle plans to their fleet of space cruisers."

"You're being flippant."

"I wish I was. We have to be very cautious about something like this."

"Why not start by acting as if they're friendly?"

"Because whether they're friendly or not doesn't change the fact that if a fleet of space cruisers flies into our solar system it'll be the biggest and most catastrophic event in all of human history."

Ann blinked unhappily. "Yes, I see that ... but an advanced civilization would have nothing to fear from us. They'd be friendly."

"Try telling that to the Native Americans! Remember what happened five hundred years ago when the Europeans moved in."

"Does that mean we can't try to talk with them and be friendly?"

"We can try all we want, but it won't change much."

"You're not being very comforting. Why would a civilization based in a system eleven light years away want to conquer us?"

"Why should they be based eleven light years away? They might be the shock troops for an empire based in another galaxy, for all we know."

"Now you're really worrying me!" Ann looked distinctly anxious.

"Sorry," Jon said flatly, and looked out at the sunlit quad.

"I don't like your militaristic approach. I think we should welcome any visitors as warmly as we can and try to establish good relations with them."

"Right, of course. But if they want to colonize us and plunder all our natural resources, I don't see what good it'll do."

“If they’re an advanced civilization they should have evolved beyond the need for colonization and plunder. Any civilization that’s learned how to build interstellar starships will know how to treat organisms like us with sensitivity and respect.”

Jon smiled ironically. “I wish it were that simple. If they need anything we’ve got, they’ll take it.”

“You’re projecting your own arrogance onto them. You can’t hope to understand how it’s possible to approach nature respectfully unless you learn to do so yourself. Your attitude makes me suspect that your whole lifestyle is self-centered and exploitative, in which case nothing you say about how to react to visiting extraterrestrials can have any validity.”

Jon studied her mouth as she said this. The lips were tight and unnaturally curled, as if she were angry. He relaxed his own expression. “I hope you’re right. Anyway, we have no reason yet to think the signal is artificial. When pulsar signals were first discovered, back in 1967, some people thought they were messages from extraterrestrials, but they soon found they were wrong. Something like that will probably happen this time too.”

Ann nodded slowly. “I hope so ...”

They returned to Ann’s room. With remarkable self-discipline, they sat down at their computers and worked on their conference notes for an hour. Then Jon changed into his pop-art traXuit and Powersoles, Ann put on an old black leather jacket and scuffed loafers, and they set off for the day.

Dead trousers?

They drove along the M40 in Jon’s hired Honda. Jon wore a snappy pair of shades and drove like an ace jock, wasting no time.

“You should have stayed in the air force,” said Ann.

“Why? I can do better software on civvy street.”

“As a flyer, I mean. You’re obviously a speed freak.”

“Well, yeah, but flyers don’t have a very balanced life. Years of boredom and just a few hours now and then of thrills and terror.”

“Don’t you like flying?”

“Oh, sure. I logged fifty hours on light planes. Loved it.”

“So it wasn’t all coding for the Global Nuclear Force.”

“Nope ... I also learned to kill people with my bare hands – *judo, karate, taekwondo*.”

Ann seemed to shudder. “Let’s hope you never have to.”

“Absolutely. There’s a philosophy with all those martial arts. You learn

self-discipline. Never use it unless you have to. Never show off.”

“Did you finish your SCIENET report this morning?”

“Almost, yeah. I’ll finish it today ...I really enjoyed the conference ... but I must say brain research doesn’t really grab me. Whenever we can model a brain function on a computer it turns out the machine does it better. Now we have consciousness grokked there’ll be no stopping us ... Pull over, *Homo sapiens*, your time’s up!” He overtook a slow car with a macho swerve.

Ann was unruffled. “Do you think it’ll be that easy?”

“What, bionic consciousness?”

“Yes, implementing it on a machine. It’s a very complex phenomenon.”

“Mmm ... maybe you’re right. When you look at the fuss last century in artificial intelligence over what seemed like simple brain functions in vision and speech ... It could be decades.”

“You don’t even know that. You’re guessing – we’re all guessing. We haven’t even begun to see the problems yet.”

“But consider how fast we’re moving already. Remember what Steve Simpson said. In our lifetimes, probably.”

Ann sighed. “He doesn’t know any more than you do.”

“Maybe ... but remember how it was with ANNs – artificial neural nets. Really dead trousers at first, then they took off with genetic algorithms and evolution programs.”

“Artificial neuronets work like the brain.”

“Right. Once we can make them efficiently, with consciousness, that’s it. Machines will do everything better.”

They drove on. Jon turned south onto the M25, then east onto the M4. At Hammersmith he headed south over the river to Putney. It was now shortly after noon, British Summer Time.

Beer and water

Ruth’s house in Putney was a small terraced two-up/two-down set behind a low hedgerow on a quiet back street. The ground-floor window was two meters wide and had a mirror finish to reflect passing viewers. Jon pressed the door buzzer as Ann admired the hedgerow.

The intercom crackled. “Hallo?”

“Jon here, all the way from Oxford.”

“Oh gosh, come in.”

The doorlock buzzed, and Jon and Ann went in. The hallway was rather narrow, with a staircase on the right side and a short passage to a door on the

left. The floor was a parquet tiling of polished darkwood blocks and the stairs were covered in fluffy white carpet. On the left wall was a mounted Hockney swimming-pool print.

Ruth appeared at the top of the stairs. She wore an outsize black teeshirt with a right-rambunctious horny Rambo rhino (Bombay's latest challenge to Hollywood) on the front. Her long blonde hair was in disarray and her legs and feet were bare. She saw Ann and started down the stairs.

"You're a bit earlier than I expected ..."

Jon waved an arm at Ann. "Ruth, this is Ann. Ann, Ruth."

Ruth wiped her palms on her teeshirt and extended a hand to Ann. "Pleased to meet you, Ann. Sorry to be so disorganized."

Ann took the hand and smiled. "Hallo. Jon invited me along at the last moment. I hope you don't mind."

Ruth managed a gracious smile. "Not at all – we didn't have anything in particular planned." She turned to Jon. "You could have called me –"

Jon grinned, took Ruth's hand and kissed it lightly. "Sorry, but I knew you're so well organized you wouldn't need reminding."

"You said this afternoon."

Jon shrugged. "It's after twelve. That's afternoon."

"Two at the earliest for me." Ruth moved toward the door at the end of the hallway. "Set yourselves down in here for a few minutes while I get myself together upstairs ... Could you leave your shoes in the hall?"

"Oh, sure," said Jon. He was used to Ruth's care of her floors and carpets. He and Ann shed footwear and followed Ruth.

The living room extended from the front of the house to the back, about eight meters, and was about half as wide. An arch in the middle suggested a division into two square rooms. Wide glass doors at the back opened onto a small courtyard surrounded by a high wall covered in shrubbery. The front half of the room contained a large sofa, two armchairs, a smart multimedia system and another big Hockney print, and was carpeted with a fluffy white rug. The back half of the room contained a bookcase and a dining suite, and was bounded on the hallway side by a second arch opening onto a kitchen alcove. The dining room and kitchen were parqueted like the hallway.

Ruth opened the refrigerator. "If you'd like to help yourself to beer or fruit juice or whatever, feel free." She waved at a good stock of bottles.

Jon glanced at them. "Okay, I know my way around, thanks."

"Good, then I'll just leave you to it." She skipped off upstairs.

Ann went and opened the doors to the back courtyard and stepped out to admire the shrubbery.

Jon found a bottle of his favorite alcohol-free beer. "Fancy a drink, Ann?"

"A glass of water, thanks."

Jon poured beer and water and joined Ann in the courtyard.

•

Please don't yawn. All this establishes Jon as a human being.

The Mekon Corporation

A kilosecond later Ruth reappeared, hair tied back in a pony tail, wearing a red-and-white candy-striped traXuit with the front unzipped far enough to show off her ample alabaster bosom.

"Hi, guys! Thought I'd be supercool and flash my new traXuit!"

"Very sexy," Jon remarked judiciously.

"Morning, folks!" said a loud new voice. Jon saw a tall dark stranger at the hallway door.

Ruth turned suddenly. "Let me introduce you. Jon, this is Phil, my boyfriend. Phil, this is Jon, the guy I told you about on Friday, and ... Ann, was it? Sorry, I wasn't quite with it when Jon introduced you."

Phil shook hands with Jon and then with Ann, treating them both to a wide conspiratorial grin. "Hallo, Jon and Ann. Pleased to meet you. You're a bit earlier than we expected." His accent was East Coast.

Jon nodded. "Hallo Phil. It's afternoon – Ruth knows how punctual I am."

Jon took a more careful look at Phil. He was tall, thin and angular, and wore a white shirt covered in red polka dots, and baggy white trousers in a trad cricketing style. His face was long, smooth-shaven and pale brown, and his forearms were covered with fine black hair.

Ruth was busying herself in the kitchen area. "We thought we'd have lunch here, if that's okay with you. I can't remember if I warned you, but I have to stay in and get some work done this afternoon."

"We can amuse ourselves," Jon said casually.

"Good," said Ruth, taking a box out of the fridge. "Phil, why don't you take our guests into the lounge and entertain them while I nuke the lasagne. I take it lasagne's okay for you chaps?"

"Sure," said Jon. "How about you, Ann?"

"Oh, yes, fine." Ann returned her attention to the bookcase.

Phil turned on the stereo. "How about an old Bon Jovi?"

"Sure," said Jon as he moved over to Ruth. "Ruth, is it okay if I stay here tonight? Ann has to go back to Oxford but I want to move on."

Ruth closed the oven door on the lasagne. "Yes, of course. Phil's staying

too, but he won't mind. I think I told you I'm off to New York very early tomorrow."

Jon nodded. "Thanks – right, you did."

Phil returned. "Drinks, everybody! Ann, let me refill your glass."

"Thanks – it's just water."

"One just water, yes, ma'am." Phil took her glass and refilled it. "Jon?"

"Thanks – alcohol-free beer."

"One righteous beer!" He refilled Jon's glass.

"Thanks." Jon drank a gulp. "Do you work in London?"

"Nope. Right now I work in Tokyo, much to Ruth's displeasure." He glanced at Ruth, who was assembling a salad.

"Pour me a beer too," she said.

"Tokyo!" Jon was suddenly interested. "Who for?"

"I work for the Mekon Corporation. You may have heard of them."

"Mekon! I surely have. They're massive in robotics and networks. Their robots are everywhere on the Acropolis mission. But their main field is still robots for nuclear work, isn't it?"

"Yeah, that's right. That's our basic business. But we also sell a lot of assembly robots for electronics and photonics. And we're moving into biotechnology robots for lab work."

"I didn't know that ..." Jon mused. This was a big break. Bob at Langley could hardly have planned it better. "Are you a robogeek?"

"No, not at all. I handle English-language documentation. I also help with public relations and promotion. I'm not a techie."

"That's really interesting. I do a lot of software documentation for Media International – Ruth may have told you – and the Mekon Corporation is a major user of the network software."

"No, she didn't tell me." Phil gave Ruth a glass of beer.

"In fact," Jon continued, "I plan to go to Japan next week to visit an old friend. I'd quite like to stop by at the Mekon Corporation in Tokyo and, you know, make a few contacts."

"Hey!" Phil brightened up. "That's great! You can be my guest. I can introduce you to the R&D guys. They'll be really tickled to meet you. They love that kind of thing in Mekon. Do you have a lot of industry contacts in Germany?"

"In software, yeah. They go with the job."

"Alright! When do you plan to be in Tokyo?"

"Not quite sure yet, but maybe Wednesday."

"Great! I fly back tomorrow. Why don't you just call me at my office

when you're in town and we can take it from there."

"It's a date." Jon frowned. *No way* would he tell Bob – sod the Company!

Ruth caught Jon's eye. "Jon, tell me about this Japan trip. I didn't know you had an old friend in Japan."

Jon smiled. "I do now. She's a girl I met last summer in Heidelberg. Beautiful girl called Yasuko. We spent a delightful week together seeing the sights and now I plan to see her again."

"I can imagine!" Ruth smiled back knowingly.

"No, don't misunderstand. We didn't do anything gross. It was a Platonic harmony, a resonance of souls."

"Oh, really, Jon!" Ruth exclaimed.

"No, I mean it. You're so, ah, sensually fulfilled that it probably sounds wacky, but it is possible to make something close to love with words alone."

"How dare you," Ruth said mockingly, "sensually fulfilled, indeed! If you mean shagged out then why not just say it and insult me properly?"

Jon grinned. "No, that's not what I meant. I mean you seem to have your love life running smoothly enough for my lifestyle to seem rather dull."

"I'm not as judgmental as you are," she said quietly.

A better idea

The foursome sat around the dining table over lasagne, a big bowl of salad, French bread, beer and mineral water. Jon told Ruth all about the Oxford conference and his plans for a multimedia project.

Ruth reflected. "How many other people have the same idea? If it's that hot, and it looks like it is from the news last night, there'll be ten projects under way already. What do you have that they don't?"

"Aha. You're quite right, of course. I'm as well placed as anyone to get it together, but no better placed."

"Worse than that, you're not a neurobiologist. Your thing is networks and robotics."

"Well, you have to juggle quantum electrodynamics, fractal geometry and hypernet programming to do this, and I know more about the three areas together than almost any neurobiologist."

"Maybe, but you're not exactly famous in the field, and there are plenty of glamorous professors eager to go pop. Why should we sign you up when we can wait for a star professor to come along?"

"Because I know more about multimedia, that's why."

"That's not the point. Media would need a big name to anchor the series,

and the big name would dominate the whole thing. You'd be just a two-bit researcher somewhere backstage. I don't think you'd want that."

"You're right, I wouldn't."

"So maybe you should just keep thinking."

"I have a better idea. I want to talk with the people in New York."

"When?"

"Soon." Jon drank a swig of beer. This was an idea he hadn't thought out at all, but it was certainly better than sitting on it like an unshat turd.

"There's a big editorial meeting tomorrow, if you can get your proposal ready in time for that."

"Tomorrow, wow. Maybe I could at that ... Yes, I like it. You're going to New York tomorrow, right?"

"Right. I'm at the meeting."

"Great. I'll come with you, present my proposal at the meeting, stay overnight in New York, then go right on to Tokyo."

"Sounds like fun!"

"I'll have to start on it this evening."

Ruth poured herself some more beer. "You can work on the flight. I always do. Five hours straight is quite a lot."

"Will there be free seats on your flight?"

"You'll be lucky!"

"When is it? I should book a seat right away."

"Eight o'clock. British Airways."

Jon went and called British Airways. He returned with a smile.

"One seat and I got it. So that's tomorrow taken care of. Meanwhile, what about this afternoon?"

"As I said, I have to work," said Ruth.

Jon considered the options. "Ann and I could go get lost in London for a few hours."

Ann nodded discreetly. "I'd like to go to the Science Museum."

"Great idea!" Jon clapped his hands. "My favorite haunt in London!"

They finished lunch. Ann and Ruth swapped numbers, then Jon and Ann went off to the Science Museum.

The DNA molecule

The first exhibit Jon and Ann paused for in the Science Museum was the Foucault pendulum. But Ann wasn't interested. They moved on to a row of old steam engines. Ann wasn't interested. They moved on to a collection of

old cars. Not interested. They moved on to the biotechnology exhibits and paused in front of a giant model of a DNA molecule.

“Does this remind you of work?” asked Jon.

“Yes. I have to make a lot of DNA. We use some of the genes to activate the neurotransmitters in our *in vitro* neuronets. But it’s mostly machine minding. Anyway, real molecules don’t look a bit like this.”

“Of course. What sort of machines do you use?”

“Mostly things like PCR copiers – polymerase chain reaction – to make DNA. A lot of the work at the Seedy Institute is automated. In fact we’re just about to buy a set of Mekon robots for biomanipulation.”

“Interesting ... Would you say your work at the Crick–Dawkins Institute is ahead of the rest of the world?”

“Well, actually, yes. We and the emboloids are at the frontier.”

“The emboloids?”

“The European Molecular Biology Laboratory in Heidelberg.”

“Right, right ... Ahead of labs in the United States and in Japan?”

“I’d say so, but it’s completely international research. We don’t see it in terms of who’s ahead. We trade data freely on a global basis.”

“But what about the trade politics of buying Japanese robots?”

“That’s nothing to do with us. We’re scientists, not politicians.”

“So how do you feel about the European restrictions on robot imports?”

“As you said – trade politics. So far as we’re concerned, Mekon robots are the best for what we want, and that’s that.”

“Good.” He had to snap out of this political mindset! “There’s something else I’ve been thinking about, something more theoretical.”

“Go on – tell me.” Ann sensed his bemused state.

“It’s about how DNA evolved. Don’t you think it’s amazing that DNA just evolved randomly in a primordial soup a few billion years ago?”

“No ... Well, no more amazing than that eyeballs or neuronets evolved. If you stir macromolecules around for long enough a lot can happen.”

“I read an idea some years ago – that the first DNA came from space – as seeds from another star system, perhaps.”

Ann shrugged. “That just pushes back the question. How did the seeds first evolve?”

“What if they were manufactured by an advanced civilization?”

“Are you kidding? How did the advanced civilization evolve?”

“Okay – these are all my thoughts too. I just want to check that we’re on the same wavelength. I’m happy to agree that DNA evolved randomly in the Earth’s primordial seas. But a random process is just extremely complex.

The evolution of DNA-based life is a complex process that's very sensitive to tiny perturbations in the boundary conditions."

"You mean tiny changes right at the start could have made everything turn out differently."

"Yes. A different sequence of events in a warm puddle somewhere could have left us all with completely different macromolecules."

"That's why we call evolution a random process."

"Well, okay, that's right. But strictly it's a chaotic process, which is quite consistent with there being a quite definite pattern behind it."

"No. The idea that there's a purpose to evolution is an illusion. It can't be that there was a plan somewhere that life just followed. The evolution of life on Earth has been far too untidy and opportunistic for that."

"Agreed, no problem. What I wanted to say ..."

Let's cut a long story short here.

"What's this got to do with seeds from space?" asked Ann.

"Well, maybe the extraterrestrials would send us a spaceship with some kind of macromolecular stuff in it that could grow and reproduce on Earth."

Ann frowned "Maybe ... you mean rather than send big shiploads of aliens, they send small shiploads of seeds."

"Exactly. Interstellar travel isn't really feasible for big ships, but for small throwaway samples of designer molecules it would actually be quite easy."

"Does this have anything to do with the Epsilon Eridani signal?"

"I hope not! It just popped into my head, that's all. I thought I'd tell you in case it helps you focus your *angst* about the signal."

"Thanks, but I think you've just made my *angst* worse, not better."

"Well, I didn't want you thinking a fleet of space cruisers might land at any moment. A molecule or two, perhaps ..."

"Let's move on. I don't want to look at DNA all day."

Radioactive waste

They moved on to the nuclear physics hall. They paused in front of a life-size model of a breeder reactor core. It was a solid metal cylinder as big as a jacuzzi and had a pattern of holes drilled from top to bottom.

Jon was impressed. "Just imagine – a gigawatt of power from such a small volume. That's quite an achievement."

"It's absolutely terrifying," said Ann coldly. "What does it burn?"

"Enriched uranium or plutonium. It produces more new plutonium than it burns. That's why it's called a breeder."

“Aha. How does it work?”

“The core runs hot. If you surround it with a layer of unenriched uranium, then the intense neutron radiation from the core transmutes it into plutonium, which you can also use as fuel ...”

...

Ann looked unhappy. “It sounds incredibly dangerous!”

“Yeah, it certainly could be, in the wrong hands. But with Mekon robots running the systems it’s safe enough.”

“Do you really trust Mekon robots that much?”

“Sure. I’ve studied them in some detail. Believe me, they’re as safe as they need to be. That was how Mekon got so big. His robots were safer and more reliable than anyone else’s.”

“But breeder reactors have to be more dangerous than regular reactors.”

“They have more elaborate safety systems. Modern breeders, like this one, which is Japanese, are about as safe as ordinary reactors.”

Ann shook her head. “Okay, but what about the radioactive waste? Just think of it, poisoning the Earth for thousands of years!”

“It’s a big problem, sure. But the quantities of waste are tiny compared to what you get from most industrial processes. Environmentally speaking, nuclear power is actually cleaner than power from fossil fuels like oil and coal. If you seal the waste up in glass blocks and put it in a deep hole, the problem is solved.”

Ann looked charged up for a fight. “What about the plutonium?”

“It’s a valuable fuel. Anyway, the world stock of plutonium is only a few hundred tons.”

“That’s enough for a lot of bombs!”

“It is.” Jon smiled sadly, recalling the Japanese AND.

Reactors in space

They moved on to a picture display of the nuclear-powered transporter ships for the Acropolis mission and for a projected future Mars mission. A giant photo of the first Acropolis transporter docked beside Space Station Primrose dominated the display. It was an ungainly ship, about a hundred meters long, with an open lattice frame between a ball in the middle and a knob at either end. The ball was the cryogenic tank for the hydrogen propellant. The big knob at the front was the C5 module for the crew, command center, control systems, communication systems, and cargo bay. The small knob at the back was for the nuclear reactor and the rocket engines.

“Reactors in space,” said Ann. “I suppose you approve of that too.”

“Sure do,” said Jon firmly. “How else can we get to Mars?”

“What about the Quasar explosion on Friday?”

“An expensive act of vandalism.”

“Doesn’t that make you dubious about the whole idea of nukes in space?”

“Not at all. The reactor survived the explosion.”

Ann frowned for a while. “I don’t understand how this spaceship works.”

“Let me explain,” said Jon warmly. “The reactor burns uranium. It’s a pretty standard unit. All it has to do is heat hydrogen. The hydrogen is stored cold in the cryogenic tank and pumped back to the reactor, which heats it up to 3000 kelvin and squirts it out the back. Simple as that.”

“Isn’t it dangerous for the crew?”

“The ship itself is as safe as any spacecraft. The crew are in far more danger from solar radiation, far more. If a solar flare lights up and they’re not ready they can be fried very quickly. For the Moon flights it’s a tolerable risk but for the Mars mission it’s a huge problem.”

Ann considered this for a moment. “I thought the Moon flight next week was a robot mission.”

“It is. The first five or six flights will be. When the robots have put up the main Acropolis dome it’ll be worth sending people, but not before.”

The thermonuclear reactor

They moved on a few steps, to a glass case as big as a small room containing a one-tenth scale model of a heavy-duty steel-frame structure surrounding a fat, donut-shaped metal ring.

“What is it?” asked Ann.

“It’s the International Thermonuclear Experimental Reactor. The biggest tokamak yet constructed. It hit a steady-state hundred megawatts this year.”

Ann eyed the colorful model suspiciously. “A fusion reactor ... It looks even more terrifying than the fast breeder.”

“You can’t complain at this one. No uranium, no plutonium, no bizarre isotopes that fizz for thousands of years. Just clean power in abundance, for as long as the oceans last.”

“I don’t follow you,” Ann frowned.

“It burns hydrogen. Well, okay, it burns heavy isotopes of hydrogen. It fuses deuterium and tritium to make helium.”

“I didn’t know you got tritium from sea water.”

“You don’t. You get it by bombarding lithium with neutrons. But lithium

is a common enough element in the Earth's crust."

"What about the neutrons?"

"They come from the tokamak. Deuterium-tritium fusion makes helium and fast neutrons. The tritium is made when the neutrons bombard a lithium blanket lining the inside of the tokamak."

Ann nodded. "Aren't fast neutrons very dangerous?"

"Yes, very – they're the active ingredient in neutron bombs."

She was silent for a while. "How much deuterium do you need?"

"It's like fission power. You need something like a million times less fuel than you'd need coal or oil to generate the same amount of power. With the same environmental payoff – no greenhouse gases, no acid rain, no ozone killers, no slag heaps, no oil spills ..."

Ann smiled ironically. "Cure for all problems – just build thermonuclear devices next to every big city!"

"No, you're joking. They're inherently safe."

"Oh, yeah!" ejaculated Ann with a contemptuous jerk of the head.

"No, listen, it's true! Any leak or malfunction and the plasma just stops burning. If the magnetic containment fails, the plasma instantly expands and cools to below criticality."

Ann's eyes burned with anger. "You listen! How hot does this thing run?"

"About 400 million kelvin."

"It's only 15 million kelvin at the heart of the Sun! You call that safe?"

Jon replied in a quiet voice. "Well, actually, there's only a tiny mass of plasma at that temperature and it would cool right down instantly if you turned off the magnets. The plasma inside fluorescent lamps glows at around ten thousand kelvin, which is hotter than the surface of the Sun, and they're completely safe –"

"You know what?" Ann was righteously indignant now, furious with rage at the whole technosphere that was eating away at her beloved biosphere. "You're dangerous! Your Global Nuclear Force programming has completely corrupted you! Nuclear lunatics like you should be locked up before they do any more damage to the Earth!"

Jon bowed his head submissively and said nothing.

They looked at harmless displays of old ship models until they were back in a placid mood again.

•

You may think Jon was an environmental fascist. You may be right.

Louisa

They moved on to the astronomy section, where they admired a full-scale mock-up of the 1969 Apollo lunar lander and looked into a real Apollo capsule. Jon was caught by a big model of a lunar landscape built up with a complex of domes, telescopes and radio dishes.

“Hey, Ann, look – the Acropolis base.”

“Ah, so that’s what it looks like!” Ann moved up to study it.

“Yeah, the Lunar Astronomical Facility. The first construction crew sets off from Primrose on Tuesday. They should be stirring up moondust on ... Saturday, if all goes well.”

“That’s what they said on the news.” Ann’s eyes were on the model.

“The crew’s a gang of Mekon robots ... pretty good advertising.”

Ann looked up. “I think the whole thing’s a waste of money.”

“You kidding? The payoff could be enormous. Planets around nearby stars, brown dwarfs, dark matter, the black hole at the heart of the galaxy, nucleosynthesis in supernovas, even the origin of the universe. Really, knowledge like that is worth billions.”

Ann looked more closely at the model. There was a big central dome with a total of 42 telescopes arranged in three concentric rings around it. The outer ring was ten kilometers in diameter. She read the label – “Louisa?”

“Louisa is the name of the main rings of telescopes.”

Ann was puzzled. “Why?”

“Lunar optical-ultraviolet-infrared synthesis array. The telescopes are all linked by a photonic datanet to a big hypernet image processor in the central dome. They work together like one monster scope. They’ll have a hundred thousand times the resolution of a big Earth scope.”

“Sounds a lot ...”

“Right. With this rig we should be able to take pictures of planets orbiting nearby stars like Epsilon Eridani – if they have any, at least. Seriously, we need Louisa as much as we need anything in science.”

Ann frowned disconsolately. “Okay, maybe we do need big telescopes, but what’s wrong with putting them in Earth orbit, like Hubble?”

“Too much junk up there already. Your rig is bombarded by bits of hyper-velocity scrap metal all the time. It’s a problem for Hubble. Not to mention radio interference from Earth stations and geosatellites.”

“Is it so bad up there? That’s depressing. So now we start littering the Moon as well ...”

...

Ann looked intently at Jon. “What do you really think about the Epsilon Eridani signal? Do you think it’s deliberate?”

“Well, no, I’m skeptical. Just stop and think of the probabilities.”

“Yes, I have done. They’re quite high, as I see it.”

“Okay, explain.”

“Just think of the trillions of stars out there. Hundreds of billions in our galaxy alone, and countless billions of galaxies. Our Sun is a completely average star, and planetary systems are quite common. So how can there *not* be life out there?”

“I don’t deny it!” Jon shook his head innocently.

“Well, it has to make its presence known to us *sometime*. Why not now?”

“Right, why not? On the other hand, why? Think how many thousands of people have claimed to see UFOs and suchlike and how many people would like to see such things. You have to be very skeptical.”

“How would you rather it happened?”

“How would I rather what happened?”

“We make contact. We discover another inhabited planet.”

“How about we send a spaceship to another star system and land on it?”

“Well, okay. They could do that to us.”

“I’d rather we got there first.”

Ann smiled. “A typical male reaction. But the probability is 50-50. It’s a symmetrical situation.”

“No, it’s not. The first planet to launch starships will land on all the surrounding planets first. There’s a low chance of being first and a high chance of being an also-ran.”

“Sorry – you’re right.” Ann frowned. “I don’t know any more. It would be a terrible shock to have a starship land.”

“It would be far and away the biggest event in human history.”

“God, yes ...” Ann stared vacantly ahead, trying to imagine it.

“It would have technology beyond our wildest dreams. It would be worse than Christians wiping out prehistoric cultures.”

“Let’s move on – there’s something I want to show you!”

The Weatherdome

Ann insisted that Jon see her surprise: “There’s a new exhibit in this hall that you won’t have seen yet.”

They walked around a corner into the darkened hall and there it was. The Weatherdome! This wasn’t just a little Global, but a hemispherical monster,

like a colossal luminous blue fried egg as high as a two-storey house. Around the dome was a walkway, with a flight of black stairs leading up to a raised viewing balcony. Above the balcony was a second one, closer in, to allow the dome to be viewed from above.

The dome was an exact visual replica of the daylit half of Planet Earth, with all the shades of blue, green, and brown finely reproduced, complete with a brightly glowing pattern of swirling clouds.

“Waaaaaw!” Jon exclaimed. “That is *awesome!*”

They walked slowly around the dome, then climbed up to the first balcony and stood and studied the image. The weather features were beautifully sharp and looked exactly as they did in photos from orbit.

“How come I didn’t know about this?” Jon asked.

“I don’t know. It’s an exact replica of the Weatherdome in the Hypernet Weather Center in Boulder, Colorado. It uses the same satellite data – this is a real-time image of the Earth’s weather. You know about the Weatherdome, don’t you?”

“Yes, of course. The hypernet weather service was a big Media circus last year ... Exact 1:1 000 000 scale, it says here.” Jon pointed to a small notice on the balcony.

“Yes. Each millimeter represent one kilometer ... What I like is the way it looks so *natural*. There’s nothing in this image that shows the existence of civilization at all.”

“Is that right?” Jon mused for a moment. “Airport runways would look like hairlines a few millimeters long, some straight bits of coastline about as long ... Right, nothing much at all. Puts us in perspective, doesn’t it?”

Ann nodded silently for a while. “So maybe any advanced civilizations out there just haven’t noticed us.”

Jon shook his head. “No, it’s the *radio* transmissions that give us away. We radiate a far larger amount of radio energy – in television broadcasts and microwave beams to telecom satellites and so on – than can be explained by any natural process. We’ve been doing so for at least fifty years and the signals are strong enough to be seen from fifty or a hundred light years away. So the fact that we’re here is obvious to anyone who cares to look.”

“Oh, yes, right,” Ann said quietly. “That’s scary.”

They admired the image silently for a while, then walked up to the top balcony, about level with the top of the dome. They looked down and spotted the British Isles, unobscured by cloud.

“Look, there we are, down there!” Jon pointed. “Bright and sunny. If we stand here long enough we’ll see Britain roll down to the floor.”

"If ... actually, I'd like to be back in Oxford in time for dinner, if that's okay with you. Otherwise I'll be all out of rhythm tomorrow."

"Okay – fine by me. Let's go."

The kiss

They strolled back to the car and set off for Paddington Station.

Ann kicked off her shoes and sighed with relief. "A lot of walking!"

"Worth it, though. I feel I know you better now."

"Lucky you – is that where you take all your lady friends?"

"The Science Museum? No, not at all. You're the first. Anyway, I don't think of you as a 'lady friend' yet."

"Yet?" Ann looked quizzically at Jon. "What does that mean?"

"Well ... I'd like to get to know you better ... maybe we could, er, do things together."

"There's not much more to know about me – except my work, of course."

"Me neither, really. But still ..."

...

They arrived at Paddington Station in time for the 5:30 fast train back to Oxford. Jon stopped by the main entrance and Ann opened the car door.

"Well, thanks for a great weekend. Have fun in New York and Japan!" She turned to face him.

He reached out an arm to her neck and cupped his hand around it gently. The skin was soft and warm. He pulled her toward him and she moved forward without resistance. They kissed, with a warmth and tenderness that made Jon dizzy. After about ten seconds, he let his arm fall and Ann turned and climbed out of the car.

"So long – take care – bye!" Jon watched as she walked off.

He drove back to Putney and parked beside the river. He got out Hal and pecked out his SCIENET report. The light was fading as he finished it.

Bees in his bonnet

Back at Ruth's house, he pressed the bell, the lock buzzed and he went in. Ruth and Phil lay sprawled on the sofa watching television. Ruth turned down the sound on the remote.

"Ann thanks you very much for the pleasant lunch," said Jon as he flopped into an armchair.

"She was very welcome," said Ruth. "How do you know her?"

"From Heidelberg. I took over her apartment two years ago when I was moving into Heidelberg and she was moving out. This weekend is the first time we've met since then."

"Really. But you seem to know each other quite well."

"Yeah. We have a lot in common. And we've talked a lot this weekend."

"Just talk?"

"We were too busy for more. Anyway, I'm still leading a celibate life."

"You mean you can't find anyone to put up with your misery."

Jon smiled. Ruth's brand of sympathy was the best. "Right."

Phil spoke up. "Your celibacy won't last long in Japan."

"Oh, really?" Jon raised an eyebrow.

"You're a smart *gaijin*. Just walk into a disco and you'll get a girl. You'll have to fight 'em off!"

"A *gaijin* – what's that?"

"A foreigner – the Japs are real chauvinists so far as foreigners are concerned. But it makes you instantly fascinating to all the women."

"Here speaks the expert," added Ruth. She turned to Phil and grabbed a bunch of his hair. "How many Japanese girlfriends do you have waiting for you in Tokyo?"

Phil tried to look as if his innocence were being wrongly impugned. "I don't have any girlfriends waiting for me in Tokyo."

"Aha?" Ruth tweaked his ear. "What about Miko then?"

Phil shrugged unconvincingly. "Miko lives in Shizuoka, not Tokyo, and anyway she's an ex. I haven't seen her for ages."

"Hah!" Ruth poked him in the ribs and forced him to retaliate. When calm returned she adopted a more serious tone. "I think it's time for me to drag my butt off to bed. I have to be up at 5:30 tomorrow. So do you, Jon, if you want to come too."

"Oh, right." Jon sighed. "Actually, I'm quite tired. It's been a long day."

"That settles it." Ruth disentangled herself from Phil and stood up. "Come on, Phil, you have to get up tomorrow too."

"Not at 5:30, no way. My flight's later." Phil stayed sitting.

"Have it your own way ... Jon, you need some bedding for the sofa."

"Yeah," Jon stood up too.

"I'll go and fetch it." Ruth plodded off upstairs.

Phil stood up too. "Okay, Jon, I probably won't see you tomorrow, so have a good trip to New York. Let me give you my card so you can call me when you get to Tokyo."

"Good idea."

Phil shuffled a pile of papers on a shelf and pulled out a business card. "Here, my work number. It's all in Japanese on the back."

"Thanks – Philip Ellis," Jon read. "That's a very American name."

Phil smiled. "Yeah, my great-grandfather adopted it after clearing immigration at Ellis Island."

"Nice ... Look, I'll call you Wednesday ... or Thursday."

"Okay, see you then." They shook hands and Phil went off upstairs.

Jon reflected for a moment on his plans. Suddenly he'd fixed up a day or two in New York. What was he going to do there? Pitch an editorial meeting with a half-baked plan for a television series on consciousness, then what? Keep clear of the CIA, have fun, get laid?

He remembered he had a friend there he wanted to visit. And here was a chance – just at the right time, too, when he had a few bees in his bonnet.

Ruth returned with a sheet and a duvet. "There you go. Sweet dreams."

"Thanks," Jon paused uncertainly. "Er, one more thing. I think I might visit an old friend in New York. Have you heard of Marvin Klotzberger?"

"Marvin Klotzberger – he's the author of *Megablob – The Future of Life on Planet Earth*, isn't he?"

"That's him. Have you read it?"

"Well, I started. I did see a television show based on it."

"Then you know the basic idea. I interviewed Marvin about two years ago for SCIENET and we had a really good philosophical conversation. He invited me to visit him whenever I was in New York."

Ruth gazed at Jon with a big smile. "Well, ain't you the lucky one!"

"Do you mind if I use your videophone to call him up?"

"Marvin Klotzberger – not at all!"

"Thanks."

"I'll wake you at six tomorrow morning. Oh, what about your car?"

"It's a hire car. I'll drop it at Heathrow."

"Good, we don't need a taxi ... Well, goodnight."

Calling Marvin

Jon fetched Hal and his case from the car. He flopped down in an armchair, jacked Hal into Ruth's ISDN socket and mailed his report to the SCIENET server. Job done. He could expect payment by BillNet in a few days. He freed Hal and rejailed the videophone.

Next, he found Marvin's number in Hal. He put the videophone on his lap so his head was right for the camera and keyed the number. The screen was a

standard postcard-sized color LCD panel.

“Marvin Klotzberger.” His voice was gravely and flat.

“Hi, Marvin. Jon Christie here, your sparring partner from SCIENET.”

The video image dawned on the screen and Marvin’s chiseled features came into flickering view – the compression algorithms used by the U.S. phone companies for long-distance calls caused the image to freeze in patches and change discontinuously. Marvin had thick black curly hair, now going gray, and haunted eyes that made him look as if he were seeing ghosts.

“Jon Christie? Oh, right, Jon. Good to see you. Hey, I liked your piece in *Scientific American* back in – what was it? – February or March.”

“Right, March. Hey, Marvin, I’m flying to New York tomorrow for a business meeting. I was at the Oxford conference on quantum consciousness yesterday and gotta whole lotta new ideas I wanna try out on you. I thought it might be good to get together and swap some philosophical bullshit.”

Marvin’s face lit up in a lopsided grin. “Swap some bullshit, huh? They mentioned the conference on the network news – I guess that means something. Tomorrow ... how long are you in town?”

“Two days maybe. Then I’m off to Tokyo.”

“You gotta busy week, huh? Wait a minute while I check with Miriam.” Marvin moved offscreen and Jon waited a while, then the craggy face reappeared. “Okay. Miriam’s in a good mood. You’re welcome to stay with us Monday and Tuesday night. I’ll be here after six tomorrow.”

“That’s fantastic. Please thank Miriam warmly for me. I’ve got a few wild ideas here I’m really looking forward to testing on you.”

Marvin pulled down the corners of his mouth. “Sounds ominous. Perhaps I should warn you that it just so happens I have a few dingbats I wouldn’t mind hitting you with. Two can play at that game.”

“I’m glad. Your ideas are bound to be better than mine.”

Marvin shook his head. “Flattery, young man, will get you nowhere. If I thought my ideas were better than yours I wouldn’t waste the time.”

“Okay, point taken. Farewell until tomorrow.”

“Yeah. Till then.”

The screen went blank. Jon stood up and stretched. He ran up to the bathroom and cleaned his teeth zestfully.

Bed. He pulled out the sofa and made it up. He laid out his bizz suit on an armchair ready for the morning. He climbed under the duvet.

Heidelberg – London – New York – Tokyo – he was in the jet set!

Biology

Life is more than human

Megablob

Biology – two busy days in New York. Life in all its superhuman fecundity. Some of what Jon did there I skip as irrelevant for our purposes.

•

Monday. Jon and Ruth were already driving to Heathrow at 6:30 AM. They were toggled up in gray bizz suits, the baggy unisex outfits that were about as common planetwide as Mao suits in 1960s China. Jon wore a soft gray shirt without a necktie. Ruth wore a gauzy white blouse secured by a knot below her bosom and had her hair tied back in a pony tail. As they drove through suburban streets, Jon mused.

We share over 99% of our active genes with chimpanzees. Considered as animals, humans are neotenous chimps (neoteny is the trait of retaining fetal or infant characteristics into adulthood). The last common ancestors of chimps and humans lived six or seven million years ago, so humans and chimps are much more closely related to each other than, say, gorillas are to orang-utans. To zoologists we're just brainy apes.

But that was ancient history for Jon. Coping with big cities and hi-tech gadgets put a new twist on human evolution. Biology, the science of life, had to be updated to face the new facts. Human apes weren't the end of the tale of life on Earth by a long way. Life was more than the self-expression of DNA molecules. The information carried by books, datadisks and netways was at least as important for life on Earth as that coded on DNA.

Marvin Klotzberger had made himself a millionaire on the strength of his big, popular account of Megablob, the global superorganism that bound humans together even more tightly than bees in a beehive. Megablob was the ultimate superorganism, big as a planet and greedier than any lifeform that ever walked the Earth before. Megatons of coal, oil, iron ore, bauxite and so on went in one end and megatons of greenhouse gases, slag heaps, waste

tips, and consumer goods of all kinds came out the other. Megablob had a nervous system wired up with megameters of optical fibers in data super-highways spanning the planet in all directions, and had a brain containing not only some eight billion self-propelled neurons (humans) but also countless million computers and other smart gadgets that together put Megablob's IQ up in the higher zillions.

When Jon first read Marvin's book two years earlier he was thunder-struck. It was the *truth* about life on Earth! Humans weren't the end of evolution any more than primordial bacteria had been two billion years ago. Together in Megablob, humans had a bold new future, a dream to lead them on to new millennia. Isolated in the shrinking wastelands between the organs of Megablob, the remaining pre-blob apes on Planet Earth faced a bleak choice – quick defeat or slow decline. That was Marvin's message.

At Heathrow Airport Jon dropped the car. They bused to the terminal and checked in their cases. They had time for coffee and croissants.

Keyboard zombies

The plane was a Boeing Double Whopper, a double-decker jumbo with room for some 800 passengers, powered by four giant turbofans with a total thrust at full throttle of almost two meganewton. Jon was a plane buff and delighted in his luck – a whopper!

Jon swapped his seat with Ruth's neighbor so that he could sit next to her. They were flying business class and the seats were wide, but they were far from the windows so he had to forget the view. Ruth looked harassed as she tugged at her jacket to stop it being crumpled by the seatbelt and sighed as she opened her briefcase and extracted her laptop. Jon balanced Hal Junior on his knees and sighed too as he opened his SCIENET report and set to work.

Oh, Monday morning!

An hour in, the proposal started looking coherent. Three hours later, the draft had evolved into eight pages of notes and he thought it made some kind of sense. He added four pages for title, credits, footnotes and references. He read it through quickly as he belted up for landing.

Meanwhile, beside him, Ruth had been writing too. The pair of them had pecked at their keyboards for the entire five hours of the flight, as totally absorbed in their own compulsions as any *pachinko* zombie in a Japanese pinball palace. The cabin staff were very British about it.

Genes on disk

Jon and Ruth took a yellow cab from John F. Kennedy Airport. It was old and battered and had sagging seats. The driver was of mixed ethnicity and looked as if he'd survived a life of ugly scenes with some serious scum. He drove hard, oblivious to the spine-jarring potholes and indifferent to the dented cars and dirty trucks that cut in close.

As they drove toward Manhattan through burned-out lots and scarred tenements in Queens, past rows of derelict cars with flat tires and smashed windows, past a grim convoy of National Guard armored cars, past wailing ambulances and a burning discount store, past a mountain of garbage dotted with scavenging scarecrow people, Jon turned to Ruth.

"I didn't realize it was this bad."

Ruth frowned. "Haven't you been watching the news?"

"Sure, but the riots are in the ghettos. I thought all this would be okay."

"Well, it's a national emergency. Tom Smith said he'd rather see New York burn than give in to the rioters. My guess is we'll see it burn before the rioters back down."

Jon considered this. Like all speculation, it could be cut through by an appeal to the facts. He leaned forward. "Hey, driver!"

The driver angled his stubbled brown head back, which made a row of folds appear in his heavily muscled neck. "What?"

"Do you think the city's about to collapse, with the riots and all?"

The stubbled head jerked. "No way! We bin goin' on like this for years. Few broken heads here and there don't make no difference!"

"What would make a difference?"

"Whole lotta dough, that's what! Fat cats in this city don't wanna throw away good money on scum. Rather hire more guards, put up more steel and concrete round their towers, give the cops more choppers. Anything but help the scumbags who keep the city going."

"What about Tom Smith's ultimatum?"

"Tom Smith – *pooaggh!* We oughta send him and his whole buncha smug Saints back to Utah where they belong. We don't want any of their racist holier-than-thou bullshit around here."

Jon could see that President Tom Smith and his Mormon backers might look pretty awful to a New Yorker of color. Smith's God was a white man, after all. "You think he's a racist?"

"It's war, buddy!" He turned and grimaced at Jon. "They think they've got us all by the balls! It ain't no big secret they'd murder all the misfits if

they thought they could get away with it.”

“The misfits?” Jon was out of touch here.

“Yeah – blacks, liberals, gays, Jews – anyone who doesn’t fit in with their so-called Kingdom of God. They’re worse than the Iranians – at least they’re honest about who their enemies are!”

Jon was surprised. “Does Smith really bother you that much?”

“He’s an asshole! He oughta be thrown outa Washington.”

“I see ... but what about New York?”

“We’re not backing down, no way! Let ’em nuke New York if they have to. That’s better’n kissing Smith’s ass.”

“If you had the power, what would you do to fix up New York?”

“Fix it up? What wouldn’t I do ... Get Smith out of our face first, then get rid of all the choppers, all the guards ... Blow the balls off all the pigs in City Hall! There ain’t no telling ...”

Jon saw no answer to that, so he sat back and daydreamed as they bounced and lurched onward. Racism ... genes ... DNA molecules ...

The genetic code was simple in principle. It was carried by base pairs linking the twin braided strands of the DNA molecule. Each base pair is either A–T or C–G (A is adenine, T is thymine, C is cytosine, G is guanine), with one base on each of the two strands. A word is a triple of bases on one strand and codes for a single amino acid. Each of the three letters in a word can be any one of the four bases, giving 64 possible words. Each word conveys just six bits of information (there are 64 six-digit binary numbers). Each human DNA strand has going on for two billion words, to give a total of some ten gigabits of genetic information.

The packing density was many orders of magnitude better than a state-of-the-art nanochip ROM. Fully uncoiled, each human DNA strand is about two meters long, so each word is about a nanometer long. The whole coiled and supercoiled DNA molecule fits easily inside a sphere of diameter ten microns and weighs about seven picograms – a miracle of nanotechnology.

But much of the information in a human DNA molecule seemed to be junk. Jon guessed it held only one or two gigabits – a few hundred megabytes – of vital code (one byte is 8 bits). A person’s entire genetic inheritance would fit easily on a single compact disk.

The Human Genome Project had mapped the entire ten gigabits of raw data, but reading the map was something else. Yet the main consequence was plain as day – it was technically possible to engineer the genome and make better people ...

Over the bridge – towering skyscrapers – Manhattan!

The slaughterhouse

Jon and Ruth got out of the cab at the Media building. The building was an aging hulk on downtown Broadway, at low-to-moderate risk from street riots and joyriding car bombers. The ground-floor frontage was surfaced with solid concrete, with just a pair of armor-steel doors opening onto the street. Media International occupied the top ten floors.

A pair of security guards in gray paramilitary uniforms and black kevlar helmets stood on either side of the steel doors. They were armed with sub-machine guns and gas grenades. Jon and Ruth approached them warily.

Ruth stood before one of them and set down her cases on the sidewalk. "Media International employees," she said.

The guard's face was a blank mask. "Identification, ma'am." Ruth flashed her Media card and he checked the photo. "Okay, ma'am."

Jon showed his card to the second guard.

"Okay, sir," the guard said, then looked at his buddy, nodded and pressed a quick sequence of buttons on a steel panel to open the steel doors.

Jon and Ruth walked along a bare white tunnel to another pair of guards with a lot of electronic equipment standing in front of the elevator doors. The guards frisked the pair and looked into their cases.

In the elevator, a plain steel box as bleakly utilitarian as a freezer in a slaughterhouse, Jon mused again.

His Media card left a lot unsaid, yet to someone with the right background information it defined him quite well. The diskful of data coded onto each human DNA molecule left a lot unsaid too, but to a bunch of the right macromolecules ...

Jon was a DNA robot. Pass on the genes, then wait for the slaughter.

Figures

Jon and Ruth checked in at the Media International reception desk. Beyond the desk was a wide open-plan office screened into little cubicles. The receptionist was a tall, slim African-American girl with a frizzy Afro hairdo and a simulated-buckskin dress that left her broad ebony shoulders bare.

"Good morning sir, good morning madam, may I be of assistance?" Her manner was light and neutral.

Ruth led. "Good morning. I'm Ruth Barclay, head of science marketing, Media London. This is my colleague Jon Christie from Media Heidelberg. We're here for the editorial meeting this morning."

“May I see your identification, please?”

Ruth pulled out her Media smartcard and the girl fed it into her computer. A picture and data popped onto the screen and the girl returned the card. Jon went through the same little rite.

The girl flashed a white-toothed smile. “Thank you for your cooperation. Have a successful meeting.”

Ruth caught her eyes. “May we leave our suitcases here with you?”

“Okay. Put them there.” She pointed to the far end of her desk. Jon picked up the cases manfully and parked them.

They walked boldly into the maze of cubicles until they came to a modest workstation fenced in on three sides.

Ruth plonked her briefcase on the blotter and pulled out her laptop. “The only topic on this morning’s agenda is next year’s plan for science editorial.” She sat down and plugged her portable into the workstation. The Windows 2010 intro played out, then she called up a chart. “Sit down.” Jon grabbed a chair. “Here, look at these figures.”

Jon looked at them. “What are they saying?”

“Science budget for next year. We have 800 000 dollars reserved for new multimedia projects in Europe.”

“That’s not a lot.”

“No. You’d need outside funding in addition. Can’t you do the project in collaboration with someone, like the University of Oxford, or Heidelberg?”

“Maybe, yeah. But I need a green light from Media before I can ask them. The exact sums we can do later.”

“Okay, but I thought I’d show you the figures. Don’t expect too much.”

“Thanks. It’s good to be warned ... I need to print my proposal.”

“Right. Make about twenty copies for the meeting.”

A gravy train

The meeting was in the penthouse-floor conference room. It was paneled in dark wood and an end wall was a screen for a LaserScan projector. The table was covered in green baize, and carafes of water and glasses on silver trays were set along it. At each place there was a pile of papers.

Twenty conference participants filed into the room and took their places. About two-thirds were men and one-third women, and all wore baggy gray or blue suits. Jon distributed his handouts quickly and sat down.

At the head of the table sat Dan Power, head of science at Media, a cheery silver-haired man with rimless glasses. He called the meeting to order.

“Alright, let’s get down to business. We have a draft proposal for the science budget for next year. We need to discuss where we invest our discretionary resources next year. We need to decide which new projects to take on board and how far to fund them. We have some projects on the table and we have market research reports on them. But, as you all know, the life sciences are in big flux right now, and it’s my gut feel that we need to review our shopping list here and check we’re still in the right ball park.”

The assembled employees looked at their copies of the draft budget.

“Our project palette here includes what we decided earlier this year was an appropriate balance between physics, chemistry, Earth science, life science, medical science, cognitive science, computer science, engineering science, space science and economics. Since then there’s been a lot of ballyhoo about the big breakthrough in cognitive science – the new theory of consciousness and all that – and Congress has voted a massive increase in funding for research in the area. I suggest we follow suit. I say we double our cognitive science budget. It’s gonna be a gravy train, and I wanna be on it!”

...

Jon raised his hand. Dan waved at him.

“Sir, I’m Jon Christie from Media Heidelberg. I was at the Oxford conference that was featured on the Saturday news. It convinced me that the new theory will have a lot of applications and lead to new industrial technologies. It could even lead to a new order of life on this planet and the eventual replacement of *Homo sapiens*. I mean this is a *big* breakthrough. I have here a proposal I’ve just written for a Media project based on the Oxford conference. I’d like to organize a multimedia series on the theory and its implications and applications.”

Jon picked up his copy of the proposal. There was a pause as everyone picked up their copy and fanned through it.

Dan replied. “Well, you’ve certainly moved fast here. This will need to be read carefully, of course. You’re talking a couple hundred grand here. Any quick reactions from the rest of the team?”

...

A hand with mahogany skin was raised unhurriedly. It belonged to a tall man with a thick black mustache sitting near Dan.

Dan glanced at him. “Ben, you wanna say something.”

“Yoh. This proposal is built around the Oxford conference, with the same concept, namely the new theory of consciousness, its experimental support and its likely impact on the medical sciences, robotics and so on. That’s not prime-time material.” His voice was deep and confident. “If we want to

reach a global audience we need a fresh angle.”

Dan nodded. “Right, Ben. What sort of fresh angle do you have in mind?”

Ben fingered the end of his mustache thoughtfully. “Well, Dr. Christie has just told us this breakthrough could lead to the replacement of *Homo sapiens*. That’s interesting. That could boost the ratings.”

...

Dan raised his hands at last as if to push away the topic. “Right. thank you, Dr. Christie. Your proposal has been noted.”

Weird stuff

After the meeting Jon and Ruth snacked in the Media canteen. It was rather warm – a notice by the cash register said this was a contribution to reducing greenhouse gases.

Jon and Ruth selected ice cream and cold drinks. They found a table and took off their jackets. Ruth’s gossamer blouse showed off her otherwise bare bosom to good effect. Ruth raised her glass.

“Well, you got your proposal on the table. Congratulations!”

“Only just. It’s a half-baked idea with no fresh angle and I’m not a big name. It could just get politely forgotten.”

“You can’t win ’em all. How original is the idea anyway?”

“That’s just it. It’s not. I’m just offering to report on what’s happening. Someone has to do it, so why not me?”

“Look, if it’s not such a big deal, why not just let it go? Let some other joe do it. Find something more exciting to do!”

“What could be more exciting than this? The biggest breakthrough in science for decades, visions of the planet overrun with conscious machines, people with hi-power brain implants, cars and aircraft with their own minds, houses that think for themselves – a whole new order of life on the planet – what more could I want? What more could Media want?”

“Well, sure, but everyone else will be there too. It’s a big market with big players. You’re just a punk from the boondocks who wants a slice of the action. You have to be realistic. Sorry, but that’s how it is.”

Jon stabbed his ice cream stubbornly. “I know it’s a long shot, but I have to take it and push it as hard as I can.”

“Right, go for it!”

“Okay.” Jon mused ... “I like your blouse.”

Ruth frowned. “Not you too! Everyone I meet makes lewd comments about my blouse. Can’t a lady keep cool without getting everyone horny?”

Jon raised his hands. "Hey, not me! I just said I like it, that's all."

"Well, you've got no reason to like it, so just forget it."

"Sorry," said Jon quietly, and sat in silence for a while as he contemplated the reaction to his plan. Actually, for a quick draft put together on the plane it had flown quite well. But he was already getting new ideas.

Ruth spoke again. "You're not sore, are you?"

"No," Jon mused aloud. "I'm thinking. That guy Ben, ah ..."

"Ben Bocker, the marketing director."

"Right. He was right about a new angle. I ought to lead with some wild idea to wake everyone up, then let the detail follow on behind."

Ruth raised her eyebrows. "Yeah, I think he's right too. You think it's all exciting because you're really into it, but to us dimwits who aren't, it's just superstrings all over again, weird stuff that no-one understands."

"Hmm, right ... But everyone wanted to understand superstrings. A lot of hacks made their fortunes explaining it. I mean the market has to be there for consciousness too."

"Sure, we all see that. That's why you weren't blown away already."

Jon was suddenly eager to get back to work. "Is there a quiet corner here where I can work in peace for a few hours?"

"Sure. You can use my desk. I have another meeting this afternoon."

...

Jon sat at Ruth's workstation with Hal Junior. The key to the rewrite was drama. He had to hit the vegetating viewer – the *sofa spud* – hard with a real zinger, then pump in the vital gen fast while he or she was too stunned to zap away. No time for leisurely presentations of academic research.

He worked for several hours and plowed in a reeking load of ripe bullshit. Whether the new histrionics added value to the package was anyone's guess, but at least they made the whole thing more fun.

...

Time to go. He packed up Hal Junior and strolled over to the reception desk. The girl with the Afro hair was still there.

"Hi! Still at work, huh?"

The girl looked at him and smiled. "Yeah, still at work."

"I'm going now. Ruth Barclay may ask about me. Tell her I'll call her tomorrow." He fetched his suitcase from behind the desk and admired a fine pair of long brown legs. He gave her a big smile. "Have a nice evening!"

"Thank you – you too."

He stepped into the slaughterhouse elevator and descended.

Humpty-Dumpty

Shortly after six, Jon penetrated the security screen at the base of the Media tower for the second time. A cab stopped. Jon jumped in.

“Turtle Tower, Fifth Avenue!”

The driver lurched off into the Broadway traffic. Jon daydreamed.

The higher life of Megablob – car culture, computers, television and telecom, air and space travel, rock and soul music, hamburgers and popsicles – had been dominated by America for seventy years. After the Nazi terror in Europe the United States imported a lot of Jews and the mantle of leadership from the Old World, which was left for dead.

Now American culture too was dying. The new popularity of Mormonism, an offshoot of Christianity from the early 19th century when America’s glory days were still a century away, was a groping attempt to recapture the virgin mood of those pioneer days and to cut a new ball gown from the threadbare rags of a lifestyle that had so single-mindedly centered on the here and now. Yet the rising tide of entropy in the star-spangled Union was irreversible. No new puritan revival, no mere religion could put Humpty-Dumpty together again ...

Turtle Tower wasn’t as swell as it had been at the turn of the century. Now the flashy ground-floor shops were screened by thick armor glass and the pink marble atrium was closed to the public. A pair of armed guards stood on either side of the Fifth Avenue entrance.

Jon walked up to one of the guards. In a clipped voice he announced, “Visitor for Marvin Klotzberger. The name is Jon Christie.”

The guard stared straight ahead. “Identification, sir!”

Jon showed him his U.S. passport – he was still a Yank.

The guard gazed at it inscrutably, then pulled a phone from his pocket. “Dr. Jonathan Christie here to visit Marvin Klotzberger.” He waited thirty seconds, then said, “Roger.” He looked back at Jon. “Okay.”

Jon picked up his cases and walked in. In front of the elevators were two more guards with electronic equipment, just like in the Media tower. They checked Jon and his cases thoroughly.

He looked at his reflection in the mirror as he ascended. Humpty-Dumpty!

Coffee for two

Marvin greeted Jon at the door of his apartment with a warm handshake. “Jon, dear boy, great to see you again. Come in and loosen up. The guards

probably had a party with your cases, huh?”

Jon schlepped the cases over the threshold and straightened up. “They sure did. Even got me to turn the computer on to prove it was real.”

“Well, they’re paid to do a good job.” Marvin led Jon into the living room. This was a palatial spread with a wall of windows facing north and a partial view over Central Park. The carpet was the color of lionskin and the well-spaced furnishings were low, sleek and heavy.

Jon nodded with admiration. “You’ve landed rather comfortably here.”

Marvin fingered a brown leather cushion on a long low settee. “A lot can happen in two years. I struck lucky with the book.”

“You surely did. How many languages is it in now?”

“I dunno. Ten, maybe ... Say, didn’t you have a book in the works?”

“I did, yeah. The plan mutated. I didn’t find superstrings as exciting as Hawking, Kaku, Witten and the others said they were. In fact, I was getting confused by them ... so I kept on dreaming. Now I’m excited by the new theory of consciousness. But I’m still at the planning stage.”

“Well, don’t dream too long or you’ll lose it. How about some refreshment? Have you eaten already?”

Jon turned from the view and looked at Marvin. His face was more lined and his hair grayer than two years earlier. He was dressed in a rumpled and homey gray bizz suit and his feet were shod in Native American moccasins. “No,” Jon said, “I haven’t, but coffee and cakes would do fine.”

“Okey dokey doo, coffee for two.” Marvin shuffled toward the kitchen end of the room, which was separated from the rest by a bar.

Jon remembered the proposal sitting in Hal. “Say, Marvin, do you have a printer here? I’ve got something I want to show you.”

Marvin looked around. “You wanna print something?”

“If I may. I have it in the portable here.”

“In the study over there.” Marvin waved vaguely at a door.

Jon went and looked over the printer. He plugged in Hal and printed out his revised proposal double-sided onto three big A3 sheets. While he waited he looked around the study. It was lined with books from floor to ceiling and the desk overflowed with more, with titles of all kinds. He’d read Marvin’s book as soon as it appeared some two years earlier and had discussed it briefly with him. Now he hoped to tap some of Marvin’s hard-won wisdom. There was also a Sun workstation and a Global in the study.

Jon returned to the living room. “Hey, Marvin, I see you have a Global.”

Marvin turned around. “Yeah, great toy, huh?”

“Yeah, I have one in Heidelberg. I’m writing an introduction to the trade

and industry disks for it.”

“Uhuh. I like the astronomy disks. Now I can recognize some of the stars I can’t see out the window here.” He came over with a laden tray.

“Right – who needs a night sky anyway? Can I help you with that tray?”

“No, ’sokay.” Marvin placed the tray on the low glass table between the two long settees in the center of the room. On the tray were a jug of coffee, two mugs and a plate of biscuits. He sat down on one settee and motioned wordlessly for Jon to sit on the other.

Jon put his proposal on the table. “That’s what I wanted to show you.”

Marvin poured two mugs of coffee with elaborate slowness, picked up the proposal wordlessly, sat back and started reading.

...

Finally, Marvin looked up.

“Okay, tell me if I got this right. You think the new theory of consciousness will lead to artificial consciousness within about a decade, then to machines that use it to think like humans. You think these machines will start to run things and cut humans out of the loop just as soon as they can, on the grounds that they can do everything better than we can. You think the machines will get on so well with each other they’ll create a seamless web of consciousness in Megablob. You think all this will happen so fast once it gets started that nothing we humans can do about it will make any difference. The technical stuff about quantum consciousness is your excuse to make all these dire prophecies. The medical stuff about immortality and so on is what’ll motivate people to go ahead and do it all despite the long-term consequences. So far as it goes, is that a fair summary?”

Jon was surprised at how well Marvin saw through to the heart of the message. His proposal, despite the new top layer, was still a cautious plod through the basics. “Yes, that’s exactly it, in a nutshell.”

Marvin waved his head a little, like a boxer. “Okay. You could try being a little more up front with that. It isn’t such a big deal that you have to be cagey or squeamish or shy about it. I’d say open with the big picture, be fair and square with the viewer, or the reader, and declare your perspective and your intentions clearly. No-one’s gonna thank you for giving them a blow-by-blow account of the history and the breakthroughs and the methods and the technologies and all to wade through before they get to the real message. They’ll have to wade through all that anyway if they want to understand it, but a big juicy carrot dangled right from the start ain’t such a bad idea.”

“You’re right. I didn’t see it that clearly. The global superorganism is a bit tricky when you’re still at the level of abstract theory. I wanted the reader –

the viewer – to feel they were seeing the outlook for themselves, like it was their own idea.”

“If they think that, they’re gonna think you’re pretty dumb for not seeing it first. Your job is to report the story, and the story here is that the Earth is about to get taken over by a bioengineered monster that eats ’em alive. Tell ’em anything less and you’re falling down on the job.”

“But it’s important to stress that this monster is a good monster, potentially anyway. It’s like a culmination of all our scientific and religious hopes and fears since civilization began.”

Marvin smirked. “I’d let the viewers work out that for themselves. Not all of us are overjoyed at the prospect, even if this monster pets every last one of us like a cuddly toy. No, my advice is to stick to the clearest possible presentation of the facts. Leave the fine detail for the academics to pick over and hand over the good-or-bad question to the great viewing public.”

Jon considered this for a moment. “That’s very good. Now I can see why your own book was such a success.”

“Well, I had to have my crass ideas knocked outa me too. Your big theme ain’t so very different from mine in *Megablob*.”

“Really?”

“Sure. My big idea in *Megablob* is that computers, the internet, telecommunications, robotics and so on have created an integrated global organism that’s very nearly conscious already. Since consciousness in Sol Kaplan’s theory is achieved when neural activity is synchronized and coupled over the whole surface of the cerebral cortex, what we have now – *already* – is a state very much like consciousness where information processing goes in lockstep over the whole surface of the planet. Megablob has a mind of its own and we’re inside it. I was ahead of you in one way – in my book we’ve already been swallowed alive and we haven’t even noticed it!”

Jon nodded ruefully like a chess player who’d just been checkmated. “You’re right. I’d forgotten how far your message went. I was so eager to spell out the consciousness story I forgot we’re already halfway there. I need to rethink the whole thing.”

Marvin let the feeling sink in before replying. “Don’t take it too hard. The consciousness story is a big deal, but its impact has to be seen in terms of who’s gonna make it happen. Like, what if the guys who make robots pipe human minds into them and start selling immortality? You know – ‘Buy a beautiful mechatronic android and have your own mind piped in at no extra cost! Get rid of that old bag of flesh and get yourself a new bionic bod!’ They’ll clean up on the biggest market the world’s ever known!”

Jon frowned. "You think it'll happen like that?"

Marvin grinned. "Think about it for a moment. Take a nice state-of-the-art photonic robot with designer bodywork, superhuman mechanical skills, high-grade vision and so on and pipe in your own mind. You'd have the best bod that money could buy, repairable at any good garage, with as many optional extras as you could afford, that you could plug into any power point or net terminal. That's how I see androids – the sexiest product ever invented. You wouldn't need human bodies ever again. They'd be as *passé* as horses were a hundred years ago."

Jon frowned. "I said here that something like that might happen."

Marvin shook his head. "You left it vague. In your picture the transition to machine consciousness looks like some kinda smooth metaphysical process. But you know as well as I do that it's gonna be big business, like cars and computers, with a benefit that's *so sexy* – I mean who doesn't wanna *live forever*? – that people will *kill* to get their own android bod. *That's* the sort of thing you have to emphasize – *how it happens*."

"But isn't that speculating rather wildly?"

"No, it's obvious!" Marvin was excited now. "The first thing everyone – and I mean *everyone* – will wanna do with the new technology of consciousness will be to immortalize their own minds!"

"Really?"

"Sure! Everybody will go bionic! Anyone who gets left behind will be deader'n the dodos! Once the smart set goes bionic there won't be any future in flesh and blood at all. The whole medical profession will move over to bionic systems and that'll be the end of *Homo sapiens*."

"You're assuming that human minds can be piped into a robot."

"Sure ... I take it that's a fairly easy consequence of developing Kaplan's theory into a technology."

Jon sighed heavily. "You're right, of course."

Marvin smiled. "What say we take a break and watch the network news?"

Fundamentalists

The news ended and Marvin turned off the set.

"Well, what are the odds on a megablob orbiting Epsilon Eridani?"

Jon frowned. "If it's an intelligent signal, then pretty high, I'd say."

"Could be a great opportunity for us to see how a megablob shapes up a few thousand years down the line."

"Could be a million years ahead."

“Nah – if it were that far advanced it woulda contacted us already.”

“Maybe it has and we just haven’t noticed.”

“Well, okay,” Marvin waved a hand dismissively. “Maybe it’s had a spy satellite orbiting in the Asteroid Belt for the last few million years. But if it could do that it could certainly come along and stomp all over us.”

Jon blinked. “You think an advanced planetary organism would want to stomp all over us?”

“You think it wouldn’t? If an advanced blob found a sweet virgin planet just eleven light years away, you think it wouldn’t shoot off a gob of, ah, genetic material and put us in the blob way, so to speak?”

“That’s not stomping all over us.”

“What’s the difference? Rape or plunder – either way we get our sweet little planet messed up for good.”

“No, come on, Marvin, be serious. If it’s a superadvanced blob it’s not going to go around raping and plundering. Imagine the situation reversed. If we discovered a planet orbiting Epsilon Eridani where life had evolved up to, say, the dinosaur level, do you think we’d go and stomp all over it?”

“You bet we would! Remember twenty years back when *Jurassic Park* was released? You wouldn’t believe the hoopla! Within a year we’d have more starship projects under way than you could count. Within a century we’d have regular package tours, double whopper starships – the works.”

“Yeah, too true ... Still, an advanced blob should have better things to do than mess around with a small planet eleven light years away.”

Marvin nodded seriously for a few seconds. “Right ... should have. We’re just guessing. On the other hand, every precedent in human history says it would check us out very carefully at the very least.”

“If it knows we’re here.”

“We’ve been pumping out radio noise for quite a few decades. That’s time enough for them to get their act together and stage some kinda response.”

“This signal could be it – the response.”

“Right – so why’s it been gimmicked up to look like a pulsar signal?”

Jon smiled. “My thought exactly ... Maybe it’s a test. If we’re too dumb to notice it then we’re not worthy of the message, whatever it is.”

“Maybe ... Or maybe this blob knows something we don’t. Like there’s a great big predatory monster just sitting out there waiting for an unsuspecting virgin blob to advertise its sweet little ass with a lotta radio noise –”

“Hey, lighten up!” Jon had heard enough of this stuff!

Marvin shook himself alert. “Right, right ... How’s about a cool beer?”

...

A lite beer later, Marvin was more relaxed.

“Okay, young man, tell me what you think about Tom Smith and his Mormon friends.”

“I’m shocked. I thought Tom Smith was a caveman, sure, but otherwise just another pol. And I thought the Mormons were good guys.”

“Tom Smith is a man driven by a powerful organization. What he does now he’s in the White House doesn’t have a lot to do with his poses last year. As for the Mormons ... how much do you know about ’em?”

“My father’s family was Mormon, so I know the basics.”

Marvin raised his eyebrows. “Okay. Forget the stories about angels and golden plates and prophets and all – that’s just fairy tales. What we have is a big organization with a locked-in membership who have a vested interest in kicking shit over the rest of us.”

“Well, you could say that about all religious organizations. What about what makes them different – their patriarchal concept of God?”

“That’s quite interesting. Joseph Smith – the founder – had the idea that God was once a man like himself and that a man could grow up to be God, which is like a throwback to the Book of J.”

Jon nodded thoughtfully. “Right, but it was his feeling for the human urge to be fruitful and multiply that got Mormonism going, with polygamy and so on. That’s what made it sexy.”

“Maybe, but since those days Mormonism has become a big – a *very* big – organization with extensive business interests. The big chief in Salt Lake City – the Prophet, Seer and Revelator – is the head of a multibillion business empire, and President Tom Smith is his paid man in Washington.”

“Paid man?”

“Tom Smith got elected with Mormon money. The Salt Lake City bankers call the shots within the party. Don’t forget too that a lot of key government employees in the FBI, the CIA, the Pentagon and so on are Mormons. They have quite a grip on this country.”

“I found that out ten years ago in the air force.”

“When a group of fundamentalists take over, that spells trouble.”

Jon shook his head. “You sound paranoid.”

“Don’t get me wrong. The Mormons are a big force in American history, but whether for good or ill we don’t know yet.”

“Hmm, you’re right ...”

Marvin smiled. “You game for another beer?”

Some good advice

At about 8:00 PM Eastern Standard (daylight saving) time, Marvin's wife Miriam burst briskly through the door. She was a wiry woman with short bristly black hair, and wore a long, heavy, military-style coat and dull black army boots. She upended the plastic bag in her hand and a pair of airObix shoes tumbled onto the carpet.

"Wow, the streets are getting worse. I swear I use more adrenaline walking the three blocks back at night than I burn in the aerobics class!" She noticed Jon. "Hey, Jon, you made it! Great to see you again! How are you?"

Jon stood up and stepped forward. "Miriam, hallo! Great to see you too!"

Miriam shrugged off her coat and knelt down to attend to her boots. "Wait a minute while I get these damn boots off!" Under the coat she wore a stretch black aerobics leotard that ended just above her knees. Her figure was lithe and trim for a woman in her forties with two kids. She kicked off the boots and hugged Jon. "Alright! That's nice!" Over his shoulder she said, "Marvin, have you been taking care of the boy? Have you eaten already?"

Marvin stood up and picked up the tray of coffee things. "We just had coffee, Tootsie. We were waiting for you."

Miriam disengaged from Jon, walked over to Marvin, pecked him on the cheek and took the coffee tray from him. "Waiting for me to clear up, too. How's about you dial up a pizza while I go take a shower?" She took the tray into the kitchen and unloaded it.

Marvin turned to Jon. "How does pizza grab you? You got an appetite?"

Jon frowned. "Uh, not for pizza. Monsterburger'd do fine."

"Aha," mused Marvin, "Monsterburger ... I'll go phone the order." He shuffled off to the phone.

Miriam came out from behind the bar. "Jon, are you married yet?"

Jon shook his head wistfully. "Not yet. I thought I oughta try and get rich first. That's taking longer than I expected."

"It usually does ... I say get married and *then* get rich. Find a girl who can help you get rich. Do you have a girlfriend?"

"Not really. Just a few, ah, prospects."

"Prospects?" Miriam said in a disbelieving tone. "My advice to you is – get a girl. You look like you need cheering up."

"I guess you're right. Marvin just told me I ought to rethink my book plan, so I don't quite feel like celebrating right now."

"Aw, he would say that. Don't take it too seriously. He just wants to head off the competition a little longer."

“No, he’s right. There are gaps I need to fill out to make my plan work.”

“Well, okay,” Miriam’s tone was still brisk, “but don’t let it get to your sex life. A young guy like you needs a little fucking from time to time. It’ll put the color back in your cheeks.”

Jon stared at the slowly gathering gloom outside the window. “You’re right, of course, but my work has to come first. There’s no merit in fooling around when there’s work to be done.”

Miriam came and stood right beside him. “Jon, don’t overdo it. You know as well as I do that your health must come first. You live alone, right?”

“Right.”

“In a small town where you don’t know many people, right?”

“Right.”

“You think you have to stay in control of yourself, right?”

“Hey, what is this?”

She shook her head. “Recipe for disaster. You need some fun. Marvin said you’re going on to Japan after you’re through here, is that right?”

“Yeah, I’m going to visit a Japanese girlfriend from last summer.”

“Alright!” Miriam clapped her hands lightly. “You *are* gonna have some fun! Just don’t marry her, that’s all.”

“What? Why not?” Jon looked at Miriam.

Miriam looked right back. “Where would you live? In Japan? Germany? Or drag her back to what’s left of America? No, my advice to you is – find yourself a nice German girl. But you don’t need my advice.”

Jon felt confused. “What about the Japanese girl? What if she likes me?”

“Hey, stupid!” Miriam nudged his ribs. “Lighten up! Just have fun!”

Marvin reappeared. “Pizza’s on the way ... Hey, Tootsie, I thought you were gonna put some clothes on.”

“Right. I was. But this boy was in urgent need of some good advice. Hey, you’re the man around here. Tell him he needs to get laid to get happy. Then maybe he can get his book together.”

Marvin shrugged. “You said it already. Who am I to tell him what to do with his dong?”

“Men!” Miriam put away her street gear and headed off.

Sacking out

The remains of a take-out dinner littered the dining table. The trio reposed on the leather settees with glasses of whisky. Marvin sprawled out on one and Miriam and Jon sat on the other. Miriam snuggled in a long white bath-

robe. Jon, tired and jetlagged, was reviewing the Oxford conference.

“... so you see the excitement is justified. The possibilities are enormous. It’s just that explaining them so they don’t sound too wild is rather hard.”

Marvin replied lazily. “But it’s what you have to get right. All the scientific stuff is just so much gobbledygook to most people. Their question, the one you have to answer, is – what’s in it for me?”

Miriam was still alert. “If they can put my mind in a new body when this one gets too old and gray that’ll be good enough for me.”

Jon managed to raise an eyebrow. “You’re right. For you it’s easy – you just have to relate it to yourself.”

Miriam looked surprised. “Who else? Who do you relate it to?”

“Well, I kinda like to get outside the thing, rise above the personal view.”

“Well, don’t rise too far or you’ll shoot right off the planet!”

Jon smiled weakly. “I don’t plan to. But what about our kids? What about *your* kids? What sort of world are your girls gonna have to live in?”

Miriam gazed into space for a second. “Good question. Ask them – they know better than me.”

Jon frowned. “Where are they? Will I get to see them while I’m here?”

“Maybe, maybe not,” Miriam replied. “Tonight they’re staying over with their boyfriends a couple blocks away.”

“Boyfriends already?”

Marvin raised himself on one elbow. “They’re teenagers now. They say they have to get smart on sex to survive in high school, and that apparently means overnight stays with the Steinberg boys –”

Miriam interrupted. “Don’t listen to Marvin. He’s just playing the Freudian father.”

“I’m playing the patsy, more like.” Marvin replied grumpily.

Miriam frowned at him. “Rebecca and Sarah have a lot more common sense than you think. They study better when they compare notes with the Steinberg boys.”

“Compare sex organs, more likely!”

“Marvin!” Miriam almost laughed.

Jon pulled himself groggily to a half-upright slouch. “I’m getting sleepy.”

Miriam asked, “You wanna sack out?”

“Yeah.”

“Right. Let me show you to your room.”

He followed Miriam to the guest room. It was just like a good hotel room, with a king-size bed and neutral furnishing, all spotless.

Bathroom – leak – clean teeth – bedroom – undress – bed – light out.

A true believer

New York, Tuesday. Jon woke early, feeling dull and heavy. He jogged in place and shadow-boxed for a while, then braved a cold shower. He put on a traXuit, sat back on the bed and turned on the television for a news bulletin – nothing special. He reached for Hal Junior, plugged into an ISDN socket and checked Hal Senior. Another Intelink memo:

> Jon, don't abandon your country! You can help us while you goof off in Tokyo. We need your robonet smarts to vet the Mekon Corporation. Remember the Clancy scenario! Best, Bob

In Tokyo? How did he know that? The Clancy scenario was the favorite nightmare at Langley while Jon was there. In it, an economically weakened United States was impotent to stop a nuclear-armed Japan from imposing a *Pax Japonica* in East Asia and the Western Pacific. Jon wrote a quick reply:

> Bob, get outa my face! I don't care about the Clancy scenario. Jon

He sent it and logged off, then went back to watching morning television. He hadn't left many traces since Friday ... *Lou* ... maybe Lou invited Ann to a Monday lunch at All Souls to discuss the conference ... *damn!*

At about eight the phone bleeped. Miriam: "Hi! Are you up already?"

"Up and running."

"Come join us for breakfast. We're in the kitchen."

...

Marvin sat on a barside stool with a coffee mug in his hands, swathed in an ankle-length, wine-red bathrobe. Miriam stood next to him, already dressed for the workday in a smart gray bizz suit and a crisp white blouse.

"Hi, Jon," Miriam chirped, "pour yourself a coffee."

"Thanks. Do you have a headache pill I could take?"

"Bad as that, huh?" said Marvin, who didn't look very dynamic himself.

"Pills we have," Miriam said brightly, "just name your poison."

"An aspirin would do fine. It's only jetlag and the recycled air at Media yesterday."

"That's enough," Miriam observed, fresh as her sharp white blouse. "I'll get you some." She strode off for a bottle of aspirin.

Jon poured a coffee and sat down. "So, what are your plans for the day?"

Marvin stood up with a decisiveness that surprised Jon. "I have dates from twelve to six with television people. They're making a ten-part *Megablob* series and if I'm not there to bawl 'em out from time to time they'll end up

making a pig's ear of the whole damn thing."

"Hey! I didn't know. That's great!"

"Great? That they're busy making a pig's ear out of my pride and joy?"

"No, a big series. That must be worth a lot."

"Yeah, yeah, yeah. It's paying the rent. But when a television company gets its hands on your book one day you'll realize it's not the money. You'll be screaming blue murder that they're screwing up the whole thing. They'll dream up stupid gimmicks to fake up some drama, they'll rephrase all your great passages to try to make 'em intelligible to morons, they'll invent all sorts of crazy location scenes to have an excuse to fly all over the planet, and they'll expect you to be grateful for the whole circus. Take my advice – if they wanna televise your book, let 'em do it without your involvement, then disown the series when it comes out tricked up like a hooker's underwear."

Jon was already feeling better. "Thanks for the advice. I hope I'll get the chance to use it some day."

Miriam returned with a bottle of aspirin. "Here you go – don't take 'em all at once!"

Jon grinned ironically. "Marvin's just charmed the headache away. I think I'm cured."

"Hey!" Miriam looked enthused at Marvin. "Why didn't you ever do that trick for me?"

"You gotta have faith, Toots," Marvin said, smiling. "Jon here's a true believer. You, my dear, are too cynical."

"Being cynical is what they pay me for at *Muzz* magazine. I gotta be going. Jon, don't believe everything the old charmer here tells you. He's just out to pick your brains and use your ideas in his new television series."

"Thanks for the warning," Jon replied.

"Toots, you're gonna be late," Marvin said in a flat tone.

"Yeah, I'm going. Have a nice day, y'all!" Miriam grabbed her purse and made a hurried exit.

Marvin was still standing. "Okay, I'm gonna go get dressed. Then we can have breakfast and get down to work."

Positive thinking

Half an hour later Marvin returned, wearing the same rumpled gray suit as the previous day. Jon put down his (third) mug of coffee.

"Okay, breakfast," said Marvin decisively.

...

Marvin munched his last spoonful of muesli placidly, like a horse chomping through the contents of its nosebag. “Humans are going the way of the dinosaurs, and nothing you’ve said about bionic consciousness leads me to think otherwise.”

Jon took his dishes to the sink. “Think how much time we spend eating and drinking and cooking and washing up and so on. Think how much easier it’d be to just plug into a power socket overnight.”

“And pray there’s no power cut.” Marvin washed, Jon dried.

...

The philosophical sparring partners moved to the settees.

“The big question,” Jon said, “is what practical benefit you get from adding consciousness to an intelligent machine. After all, most intelligent functions run pretty well without it.”

Marvin made an impatient gesture with his hand. “Okay, you said it. What’s the point? Why go to all that fuss when there’s no practical benefit?”

“Well, think about the car industry back at the end of the last century, when car manufacturers saw no point integrating smart systems in cars into one central caretaker. Yet now we see it’s obviously better and leads in turn to a whole lot of further possibilities that weren’t even on the horizon until the caretakers were in place and operating.”

“Yeah, I remember all that.”

“Well, it’s just the same with conscious machines ...”

...

The phone bleeped.

Marvin picked it up. “Marvin Klotzberger.” He frowned for a few seconds and passed it to Jon. “For you – Ruth Barclay.”

“Hi, Ruth, Jon here.”

“Morning, Jon. How are things with Marvin?”

“Fine. Fine.”

“Look, Jon, I’ve got good news. Are you free for lunch today?”

“Yeah. Matter of fact I am.”

“Dan Power just called me and said he’d like to talk with you about your proposal. He suggested lunch today.”

“Yup, okay, will do.”

“Hallo? Jon? Can you be here at one o’clock?”

“One o’clock. Sure.”

“Don’t get *too* excited! Till one then. Bye.”

Jon put down the phone and took a deep breath. “Right ... yeah ... The main point about conscious machines is that when they’re developed enough

they'll seem like people. You'll be able to hold conversations with them. From the standpoint of user psychology that's a huge benefit."

"I dunno ... who wants to argue with a robot?"

"Okay, but think of it – a living creature at your beck and call."

"Living creature ... I kinda feel that a living creature should be able to reproduce. That's been the key part of the definition of life ever since the beginning of artificial life ... since John von Neumann, in fact."

"Yeah, okay, but what's the unit of reproduction? I can't reproduce alone, for example. I need the cooperation of a woman. And if we all reproduced via test tubes we'd still be living creatures. Robot reproduction can be a separate function. The factories that produce robots can be robotized."

Marvin shook his head. "A robotized factory is a fragile thing. You need human repair crews whenever the slightest thing goes wrong."

"That's just where bionic consciousness comes in. A conscious machine is robust in face of complex perturbations of its environment or its operations. So a factory for conscious machines would be robust if it were conscious too, and then the circle would be closed and you'd have a living system."

Marvin contemplated this. "That's plausible."

...

Ten o'clock: Marvin jumped up and turned on the television.

"– nuclear transporter carrying the first robot construction crew for the Acropolis observatory powered up from Earth orbit to a fast lunar trajectory earlier this morning. The transporter is scheduled to go into a lunar orbit in three days and the crew module is scheduled to land on the far side of the Moon on Saturday."

The picture showed the long, clumsy-looking nuclear transporter boosting out of Earth orbit, seen from Space Station Primrose. It looked a bit like the long ship in the sci-fi classic *2001 – A Space Odyssey*.

Jon studied the scene closely. He loved to feast his eyes on the transporter's chunky, complicated, functional profile. Cut back to the studio.

"Japanese Prime Minister Shintaro Kawasaki complained again today about European import restrictions on Japanese robots. He warned that his Liberal Democrat government was under strong pressure from the right-wing National Heritage group headed by populist demagogue Shusako Mishima. Meanwhile, Mishima declared in a television interview that if he were prime minister he would launch a military invasion into the Northern Territories – the four southern Kuril Islands occupied by Soviet Russia in 1945 and held by Russian forces ever since."

Jon's eyes widened. Japan – maybe he should cut a deal with Bob.

“Rioting is continuing in New York for the tenth consecutive day. Six people were killed this morning in an exchange of gunfire in the Bronx, and National Guard helicopter gunships were called in to restore order.”

The view cut to a pair of Black Hawk gunships. When it cut back to the studio Marvin switched off the set.

“Well, whaddya think of all this rioting?”

Jon sighed heavily. “I dunno ... I asked the cab driver on the way from the airport. He was very gung-ho. Said it was better than giving in to Smith and the Mormons.”

“Tragedy for the city ... New York gets worse every day. It won’t be long before they send in the tanks and occupy the whole city.”

“What about the Moon trip? Doesn’t that cheer you up?”

Marvin sat in stolid contemplation for a few seconds. “Yeah ... at least with Acropolis there’s a chance we’ll see the battle fleet from Epsilon Eridani a few seconds before it zaps us.”

“Great! How’s about we put a few nuclear missiles up there while we’re at it? Then maybe we can bag a few before they get us!”

“Right ... that’s what I call positive thinking.”

...

Their discussion ranged far and wide for a few hours. Then Jon excused himself to go deal with his email. He sat on the bed with Hal Junior on his lap and logged onto a Langley Intelink server. He wrote a memo to Bob:

> Bob, I’ve thought about it and maybe I can help out. I’m off to Tokyo – as you so rightly sussed – to spend a few days seeing the sights and all. What sort of info are you looking for? Jon

To his surprise, a reply came within seconds.

> Jon, there you are! What a relief! Look, hang on a mo. Best, Bob

Jon frowned. He didn’t want to be hustled into a dirty deal here.

> Bob, I don’t want to ruin my vacation. I just plan to hang out with a girlfriend. Keep it clean, okay? Jon

He waited. He knew Bob too well – an affable, aw-shucks guy who could hang an albatross around your neck before you saw it coming.

> Jon, one word – networks. No-one knows them like you do. We can’t hack into the Mekon net and we suspect Mekon is hiding a big nukular warhead program. Only you can check it out. Best, Bob

Jon smiled – ‘nukular’ was Bob’s pet joke. Mekon!

> Bob, let me think about it. Over and out for now, Jon

He logged off and sighed. What was he getting into here? He checked his watch – time to go.

Bizz wizz – not!

In the Media canteen, Jon and Ruth stood in line for the lunch of the day. Ruth wore a decently opaque red blouse under her gray suit. Behind them in the queue were short, fat, pale Dan Power and tall, thin, dark Ben Bocker.

The foursome loaded their trays and headed for a secluded table. They made small talk until Dan opened the business end of the conversation.

“Jon, I read, or I should say Ben and I read, your proposal with great interest. The concept is certainly exciting, and we believe we could use a package like it in our scheduling for next year.”

“That’s gratifying to hear,” Jon replied cautiously.

Ben joined in with his mahogany voice. “I particularly like the way you brought in Sol Kaplan’s silver ball model. That would make a very effective promotional handle for the series.”

“But, Jon,” Dan went on, “we can’t go along with the suggestion that we’re about to create a global bionic monster that swallows us all alive. Our sponsors would never go for that. We see the show as reporting science, not trying to prophesy the apocalypse.”

“Yah,” Jon answered, “I see that. But the viewer has a right to know where all this is leading. The viewer is gonna be thinking all these pretty videos are great, but what’s in it for me?”

Ben nodded sagely. “Yeah, right. But we’d be looking for help from the big biotechnology companies to get this project rolling, and they’re not likely to smile on a series that paints them as pandering to rich old farts who just want their minds immortalized ...”

...

Dan sighed. “Jon, you don’t know the system here. You’d be an innocent in a sea of sharks. We have the talent here already to do a credible job, so there’d be no point hauling you over here. You see what I’m saying, Jon?”

“I see quite clearly. You wanna take over and cut me out.”

Ben cut in, *basso profundo*. “We’re not cutting anyone out here. You’d be our European point man. But control of the project has to be where the planning and production are centered, and that’s here in New York.”

“Forgive me, but did I hear you right there?” Jon asked rhetorically. “Did you just say creative control has to rest with the bureaucrats and the camera crew, and not with the guy who had the idea in the first place?”

Ben smiled. “Don’t misunderstand us. You made a business proposal and we’re taking you up on it. We’ll pay you a fee for the idea, we’ll even put your name in the credits, but you really don’t wanna get tangled up in all the sordid details. You can live without that.”

Dan nodded encouragingly. “Think about it, Jon. You’ll get credit for an idea you don’t even need to worry about after today. You can go back home with a handsome cheque and the satisfaction of knowing that you’ve started the ball rolling on a historic project. It’s a fair offer, Jon.”

Ruth looked at Jon and twitched her head as if to say go on, take it.

Jon frowned. “What sort of fee are we looking at here?”

“For all rights to your proposal,” Dan declared in a legal style, “and all names, formulas, plots, ideas and suggestions contained therein and flowing therefrom, without prejudice in regard to any changes or alterations we may at our own discretion make thereto, and in consideration of services rendered in the form of consultancy and European sponsor liaison during the period of implementation of the said proposal, the said period to extend up to one year, we are prepared to offer you the sum of forty thousand dollars.”

“Forty thousand dollars?” Jon repeated, aggrieved. “That won’t even pay my expenses for a year!”

“Forty grand for a few months’ part-time work,” Dan said, “looks pretty good to me.”

“I’m sorry,” Jon said emphatically, “but I can’t sign away all rights to an idea like this for forty grand.”

Dan looked at Ben. “What do we do, Ben? Do we throw it away?”

Ben frowned as he picked at his French fries. “I say we wait a little, maybe a week or two. We won’t make a final plan for next year until the meeting in two weeks anyway.”

Dan nodded slowly. “Right ... Okay, Jon, here’s our offer. The offer made here today still stands. However, if you want to make a new proposal in the course of the next two weeks we’ll consider it and make a new offer. Or not – depending on what you come up with. How does that sound?”

“That sounds better.” Jon breathed easier.

“Believe me, Jon,” Dan went on, “we’re not out to shaft you here. Even as a subcontractor, you’re a valued member of the team at Media International. I think you’ll find that if you can refine your proposal we can come up with a very attractive offer.”

"I need creative control and a percentage of the take," replied Jon.

Dan pursed his lips for several seconds. "In that case, you need to come up with a substantially richer proposal." He threw down his napkin onto his empty plate. "Come on, Ben, let's go."

Survival

Ruth accompanied Jon to the Media reception desk. The tall Afro girl was there again. Today she wore a halter-neck black dress that left most of her broad ebony back bare. Ruth and Jon paused by her desk.

"Well, I think you blew it," said Ruth. "You could have walked off with forty grand."

"Sure! I could have sold the best idea I ever had. I could have handed it over and never looked back. I could have gone back to Heidelberg with nothing more than README diskettes to look forward to."

"You could have taken their money, that's what you could have done!" Ruth was really annoyed. "They have your proposal in their hands. They can do what they want with it and you won't have a leg to stand on. It was forty grand, take it or leave it, no strings, on a plate!"

Jon threw his open hands out wide. "So I didn't take it! What's it to you?"

Ruth shook her head slowly. "I don't get it. This was a chance to grab a bit of what's yours and you just let it go."

Jon sighed heavily. "Well, thanks for your concern, but my ideas mean a lot to me and I'm not ready to sell out yet."

Ruth glanced at her watch. "I have to go soon."

"Okay. I'm off to Tokyo tomorrow ... Oh, shit, I haven't booked the flight yet – or a hotel room!"

Ruth shook her head in despair. "Do you want to book them from here? It'll be cheaper than going through a travel agent, and easier if you want to charge it to Media later."

"Yes, good thinking. See what I mean – I'm not ready to sell out yet. I couldn't handle the practical details. I'd need a business manager like you to survive at all."

"That's a job I wouldn't want ... You can call the travel office from here – extension 442." Ruth stepped over to the receptionist. "Hi, Lisa, we'd like to make an internal call from here. Would you mind?"

"Surely." Lisa reached out a long ebony arm to pass Ruth a phone.

Ruth keyed 442. "Hallo, Debbie. Ruth Barclay here. I have a colleague here from Media Heidelberg who wants to book a flight to Tokyo tomorrow,

and a hotel room ... I don't know, but he's here. I'll hand you over." She let Jon fix the details with Debbie.

Ruth stepped back. "I have to go now."

"Hey, look, I have an evening to fill and a debt to you for all your help. Are you free for a date this evening?"

She widened her eyes for a second. "I'm free if you want to introduce me to Marvin Klotzberger, yes."

"That can be arranged – a night out with Marvin and Miriam."

"Fine – call me when it's confirmed."

"Okay." Jon waved a hand and headed off for the street.

Trash

Jon had a few hours to fill and a lot of ideas to mull over. He decided to walk the streets for a while and let his thoughts drift.

He walked south from the Media tower, through SoHo down to the World Trade Center and the southern tip of Manhattan. He passed some burned-out shops and rows of abandoned, rotting, grimy cars. He passed rubble-strewn lots where crowds of homeless people sat around in glum groups amid sprawling cardboard-box encampments and scattered piles of garbage. The people were swathed in layers of dirty rags that camouflaged them among the boxes and trash. Hanging around the street corners were gangs of psychopunk street toughs who looked almost as grungy as the derelicts.

That was the side of New York that never ceased to amaze Jon – the chasm between its well-off citizens and its derelicts. How could Marvin live with it? How could he see all this human misery and all this *trash* every day and not flip out? Jon burned with righteous fury every time he saw a dog turd on the street in Heidelberg!

The political pundits agreed that this was why President Smith had been elected. The respectable citizens of America – a bare majority of them at least – were mad as hell and weren't gonna take it any more. There were too many alkies, bums, crackheads, dealers, exhibitionists, faggots, gangsters, hookers, idiots, junkies, killers, loonies, moonies, neonazis, outlaws, punks, queers, rastas, satanists, transvestites, users, vegans, weirdos, xanthippes, yahoos and zombies on the streets of the nation's cities. It was time for the big clean-up. Who better than a righteous Saint?

On the other hand, who worse? Short of stirring up a campaign to terminate the whole alphabet soup with extreme prejudice, there wasn't a lot that Smith and his gang could do. All they had for weapons –

A trio of psychopunks were suddenly beside him.

"Hey, smart dude, spare a dollar for the homeless?"

"Sorry." Jon eyed the punk. He looked malnourished. His hair was dyed like a parrot and he had rings in his nose and ears.

"Sorry," said another punk as he barged Jon from behind.

Jon stopped and turned. "Take it easy." The barger was tall but looked dull and slow. Jon flexed his hands.

The third punk tugged from behind at Hal Junior, which was tucked under Jon's left arm. Jon felt a hot surge of adrenaline. He spun and punched the punk hard in the solar plexus, then stepped back smartly.

Parrothead pulled out a gun. It was a Browning Hi-Power, a heavy piece, and it wobbled in his grip. "Gimme the case," he said in a reedy voice.

Jon's hot surge sank like a stone. His mind stayed high – *exultant* – and locked into his highly trained, supercool, punk-killer mode. "It's not a case, it's a computer," he said in a deep, steady voice. "If you hit the wrong key it locks up and radios an alarm. You don't want it." He took a slow step back to keep away from the punched punk, who was recovering.

"*Gimme the case!*" said Parrothead, louder. The gun quivered. It wasn't aimed well but at a range of one meter it didn't need to be.

Jon pressed a hidden button in Hal's handle to activate the R-alert dongle and held out the case to the big, slow guy, who took it cautiously. Jon watched as the guy tried to open the lid.

"Combo lock – wassa number?" he said in a deep, dull voice.

Jon shrugged. "Too late. The cops are on their way."

"*Asshole!*" Parrothead waved the gun an arm's length away –

Jon shot out a *karate* hand to deflect the muzzle. *Bang!* It went off, but pointed at the sidewalk, and the bullet ricocheted away with a harmless *zing*. Jon wrested the gun from Parrothead's weak grip. The punched punk grabbed Jon's ass. Jon spun and kicked him off, then stepped back to cover the trio with the gun. "Okay, guys," he said in a calm, low growl, "put the case gently on the ground and walk away slowly. Take it real easy."

The big guy put Hal down with a bit of a bump, but it had good padding and a hard shell. The trio slowly edged back a step or two.

A police prowler car drove up. A cop was aiming his gun at Jon. "Drop the gun, smartass!"

Jon stooped and laid the gun gently on the sidewalk. "Thanks, officer. You just helped me arrest these guys. They wanted my case."

The cop jumped out of the car. He kept his aim on Jon and the punks as he kicked the Browning aside. "All of you! On the ground, on your faces!"

The second cop was now beside the first. They quickly sorted out who did what. Jon reclaimed Hal and they let him go after he refused to press charges. Forget it – the punks had enough problems already!

Jon continued his tour and returned to Turtle Tower in pensive mood.

Sack artist

Jon dined with Ruth, Marvin and Miriam at a fine restaurant in Turtle Tower. They talked about the Megablob series, Media International projects ... and Jon's narrow escape from gory death. All very pleasant.

Later that night, back in the guest bedroom, Jon checked his Intelink mail drop on the Langley server. Another memo from Bob:

> Jon, we think Noboru Mekon, the chairman of Mekon Corporation, is the brains behind the Japanese AND. We think he plans to help his friend Shusako Mishima stage a political coup. You're the best guy we have to see if the pair of them plan to play nukular hardball. Mekon is the key. Get into his net and scoop the poop! Best, Bob

Jon smiled. Appended to it was a megabyte file called (1) THE JAPANESE AND (2) THE MEKON CORPORATION. A whole lotta text ... a day's work to read it. He downloaded it into Junior and left a one-liner for Bob:

> Bob, I'll think about it. No promises. Jon

He trashed everything in the drop and quit.

He rejoined Marvin in the lounge to watch the late news.

Miriam appeared in her long white bathrobe. "When do you have to leave tomorrow, Jon?"

"Before six. The flight's about 8:30. I can get myself up and out so as not to disturb you."

"No problem," said Miriam. "I'll set my alarm for 5:30 and see you off properly. Will you want a breakfast?"

"No, thanks ... actually, I'm ready to sack out now."

Marvin smiled. "So soon? Regular sack artist we got here, Toots."

Five minutes later Jon was in bed. In a few hours he'd be high over the Pacific Ocean ...

Robotics

Robots ain't human

Numero Uno

A long day for Jon – Wednesday in America, dateline, Thursday in Japan. And a big leap for our story as he learns more about Mekon.

•

New York, Wednesday, 5:45 AM Eastern Standard (daylight saving) Time. *Wakey-wakey!* Jon's drill-sergeant superego pushed him out of bed. Cold shower. Don black-and-white pop-art traXuit. Powersole to kitchen.

Miriam was there, bathrobed. "Hi, Jon, everything okay?"

"Everything okay. Should I call a cab or just take pot luck?"

"I'll call one for you. We have an agency." She phoned the agency.

Over coffee she asked: "How long's the flight?"

"About 18 hours, with a quick touchdown in Anchorage, Alaska."

"So what time will it be in Tokyo when you get there?"

"Thursday afternoon ... 11 hours ... about 3:30 in the afternoon."

"Then you really will need an aspirin!"

Kiss, cases, exit. In the elevator he checked his reflection. He looked fit. He strode out briskly past the guards – show right stuff at all times!

The cab was a new limo. The uniformed driver put Jon's cases in the trunk and they set off.

Japan. A century of hard work had pushed the Japanese nation to the front rank of industrial states. In 2013 the United States still strutted its stuff as *Numero Uno*, but President Smith's struggle to bring calm to the inner cities and stability to challenged industries showed there wasn't much chance of reversing its historic decline.

Japanese robots were the winners. No other nation had installed robots so effectively or on such a massive scale. Already in the 1980s and 1990s Japan had more robots at work per capita than any other nation, and the gap only widened as other nations failed to catch up.

Jon was impressed by the Japanese achievement. Even the alleged nuclear weapons didn't dent his admiration. They had to defend themselves against China, Russia, Korea ... and the U.S. was no longer so reliable.

The cab arrived at JFK airport. Jon checked in his suitcase and sat stoically listening to a Japanese language disk over another coffee.

Flying

Jon flew to Japan in a Japan Air Lines Boeing 777, a 400-passenger jumbo twinjet with engines in the 400-kilonewton thrust class and an integrated electrophotonic flight management system.

Jon had a window seat and admired the view. He loved flying and loved to admire the skyscape. The deep blue stratosphere above the cloudbanks, at an altitude of ten kilometers, had just over a quarter of the pressure at sea level, so he was above most of the atmosphere. The dense cloudbanks below him looked like snowfields and the wispy layers of cirrus above them seemed to float on a transparent pond. Jon was in his heaven.

The Boeing roared steadily on. Jon looked out at the silver wing flexing in the jetstreams and at the engine cowl hanging strangely still below it. He mused on the aluminum-lithium alloy and bonded composites, the fiber-optic control lines, the powerhouse turbines with hot parts of titanium and silicon carbide, and the two men surrounded by video displays in the office in the nose – the token humans in the loop.

He mused on the gaseous ocean the craft swam in. Each second, octillions of molecules were sucked into hot vortices by the engine fans and blown out again in a billowing trail of water vapor and carbon dioxide. The ethereal medium looked vast, deep, immense. It was a mere fuzz on a 64-cm Global, just a millimeter of haze over the hard surface features, with a halo hardly denser than the vacuum of space extending a bit further, yet this gas around his head was the breath of life for his human frame.

A Japanese stewardess with a charming smile served coffee and rolls. He ate and drank and meditated on his incarnation.

He was a moving feast of biomass. His hair and fingernails, extruded from his living flesh, were in the slow process of falling off and becoming part of the great externality. Yet he counted them as part of himself until he cut them off. Ditto the gases he farted and exhaled. Trapped in his gut or lungs or dissolved in his blood they were part of him, then seconds later they were part of the external world. And who could say the stuff he extruded, excreted and exhaled was consigned to a lesser life in the great externality?

America passed below, beneath the clouds, still king of the hill when it came to aerospace, as the Boeing he sat in reminded him. But America's aerospace sovereignty had long since vanished in multinational deals. Aerospace was a global industry. The aging 777 was already a mosaic of parts from numerous countries, Japan included.

Jon sighed for past glories. As a kid he'd been an airplane buff, naturally, and had built scale models of all the 1980s superfighters – the F-14 Tomcat, F-15 Eagle, F-16 Fighting Falcon and F/A-18 Hornet – several exact replicas of each, right down to the soot and scuff marks, including one of his father's Eagle in Gulf War colors. He'd built other models too: an F-117 Night Hawk and whole dioramas of UH-60 Black Hawk and AH-64 Apache helicopters. His adoration of these machines knew no bounds in his teenage years, before he joined the air force himself.

Now it was a different world. The glory days of the American aerospace industry – Apollo and the superfighters – were ancient history. The Acropolis lunar observatory project was unthinkable except as a multinational venture. As for the planned Mars mission, even with all the industrial nations on Earth pitching together the trillion-dollar tag was a bankbreaker ...

The plane landed suddenly in Alaska. Jon was so deep in his dreams that he hadn't noticed anything until the flaps and the undercarriage locked down with heavy thunking thuds. He followed the crowd to the Anchorage terminal building ... Soon they were on their way again.

The bluescape was awesome to behold. The clouds were behind them now and the deep blue of the Pacific Ocean reflected the blue of the sky. The azure faded into a pale yellow-gray haze at the horizon, so far away that Jon imagined he could almost see the curvature of the planet. It was *big* – the ball rolling below him was over a trillion cubic kilometers – six billion trillion tons – of rock and heavy metal. It was a colossal cannonball with a patchy patina of greenish mold.

The sky, the ocean, the surface of the land – they were the skin, the biosphere that sustained the patina. They formed Gaia. They kept Jon alive. They were extended parts of him.

The Sun kept him alive too, yet it surely wasn't part of him. No, that was where he stopped. Maybe he was a son of the Sun. Maybe his soul shone forth from the Sun of Heaven ...

Jon was an inseparable part of the biosphere. He was no more a sovereign being than the neural cells in his brain were sovereign beings. He was a pip in the terrestrial melon. His own DNA was Earthspawn, his own genes primed only to grow in the soft womb of Gaia.

He headphoned his Japanese disk ...

He spied land. An edge of dark green bordered the blue below. The edge grew into a crumpled form, a green velvet drape ruched against the glassy ocean. The ruches in the emerald-green velvet drew closer. Tiny jewels sparkled on the coastline and in the valleys. The plane descended majestically and the jewels became glinting, pin-sharp model houses. Threadlike ribbons – roads – ran between them. More glittering jewels appeared – cars.

It was Japan!

Roboculture

Narita International Airport was a monument to late 20th-century gigantism. With the style of a U.S. Navy supercarrier, the massive gray forms of hangars and control towers dwarfed the people who moved like ants beneath them. Striped pylons poked up above the gray boxes and tiny vans and trucks sped around them like toys. Tall watchtowers dotted along a wire-mesh perimeter fence hinted at hostility beyond.

Jon scrutinized all this with care as the Boeing taxied to a terminal finger. This was his first pilgrimage to the Land of the Rising Sun.

At the passport control Jon flashed his face and passport at a camera feeding an online hypernet that checked his personal files in Sacramento and Frankfurt databases before bleeping okay. He passed his luggage through a LIXIT (low-intensity x-ray interference tomography) scanner with a hypernet image analyzer designed to spot bombs and drugs.

He boarded a maglev train to take him into Tokyo. The train was part of a new high-speed superconducting electrodynamic magnetic levitation railway system and had three 64-seat cars in an aerodynamic form with a rounded nose at each end. It had a cruising speed of 400 kilometers per hour. The Narita–Tokyo maglev transported passengers to central Tokyo, 66 kilometers away, in less than 15 minutes. The platform slid behind them and they glided noiselessly to the airport perimeter checkpoint, where armed guards in gray paramilitary uniforms checked their papers one last time.

Jon knew the problem here – rumors were rife that international terrorists might try to smuggle a suitcase nuke into Japan and blow up some symbolic target as a gesture of protest against the growing Japanese nuclear industry. The fast-breeder reactor program, together with some 55 tons of plutonium imported from Britain and France over a twenty-year period, had given the Japanese the raw material for plenty of bombs, and it was an open secret that there were factories ready to build a new generation of advanced weapons.

Antinuclear Coalition activists were advertising the logical conclusion. And the CIA was hustling for HUMINT assets and NOC agents ...

Jon whooshed on in air-conditioned luxury in the maglev railcar along a raised railguide past bright green rice fields, smart modern factories, and the suburban skyline of northeast Tokyo. Finally the scenery stopped moving at the Tokyo City Air Terminal.

Architectronics

Jon took a taxi from the City Air Terminal to his hotel in the Shinjuku business district. The taxi was a new luxury sedan with anti-collision microwave impulse radar, four-wheel drive and steering, a ceramic rotor motor, stepless transmission, and anti-skid braking, all announced for the street-wise in icon bars along the sides. The body was white and adorned with wavy rainbow stripes overwritten with Japanese and roman promotional messages, and there was a multicolored plastic bauble on the roof. The whole effect was like a Disneyland rally car.

The rear door of the cab opened and closed automatically as Jon climbed in with his cases. The driver wore a peaked hat and spotless white gloves.

“Okashi Hotel, Shinjuku, *kudasai!*” Jon declared smartly.

“*Okashi Hoteru – Hai!*” the driver snapped back, almost with a bark, then turned rigidly forward and fixed a manic stare on the road ahead as the cab lurched into the traffic and squealed into the first bend.

The back of the taxi was prettied up like an old maid’s parlor, with white lace antimacassars on the seat backs and frilly white scatter cushions on the squabs. He reset his watch against the cab clock – 16:32 local time. It was hot and sunny and he turned up the air conditioning. Facing him was a color map display showing the cab’s moving position. He scrolled and zoomed to show central Tokyo from Marunouchi to Shinjuku, then turned to admire the view through the windows.

They took the expressway running between the Ginza and the Tokyo Bay dockside, and Jon saw the top half of Millennium Tower out in the bay. It measured 800 meters to its pointed tip, a huge slender cone with a 126-meter diameter base set on the landfill island created for the Harumi Exhibition Center. The sun glinted off the silver latticework and the microwave dishes on the top 200 meters. Beneath them were 150 floors of offices and apartments, divided into five stages like a giant rocket. Wow!

They turned and drove through Roppongi, past the Tron superintelligent buildings. These were tall round towers with a gentle inward curve to the

glass outer walls, with no hint from outside of the robot systems that micro-managed their interior environment. Okay, so he'd seen them too.

He admired the numerous little shops they passed. The sidewalks were so cluttered with street signs and shop signs and neon signs! This was a city with thirty million inhabitants – about twice as many as New York City (which in turn had about twice as many as London). Seeing this amazing concentration of shops and houses, packed so close together there was almost no room to thread between them, Jon could believe the figure. The roads felt bumpy and uneven – minor earthquakes regularly shook the city – but the car was agile and the driver driven enough to speed on regardless.

Soon they were there. Jon gave the driver the cashcard he'd purchased at the City Air Terminal. The driver docked it in his meter and returned it.

"Arigato gozaimasu!" Jon said.

"Hai!" the driver barked. The taxi jerked forward and was gone.

Bathroom pleasures

Okashi Hotel wasn't very big. From the outside it looked like an average block of new apartments sandwiched between others. Jon checked in at the desk. The receptionist was a young lady in a smart uniform.

"Irasshaimase!" she sang with a musical lilt.

"Hajimemashite. Media International New York no Dr. Jon Christie desu. Yoyaku ga arimasu." Jon inclined his head in a token bow.

"Hai, gozaimasu. Good afternoon, sir ..."

They completed the formalities and she gave him a plastic smartcard for the room. He picked up his cases and elevated.

The room was fully equipped but tiny. It was about three meters by two, with a capsule bathroom filling the corner by the door. There was a cheery little guarantee label sporting a cartoon frog on the capsule door. Jon looked inside. The capsule was a three-piece plastic molding – top and bottom halves and a door – in a pale shade of peach, with the shower base and washbasin as part of the floor molding, all shimmering clean. Jon undressed and stepped in. As he closed the door an overhead extractor fan came on. The white ceramic toilet was covered in a cling-film seal, which he peeled aside, and featured a built-in bidet with a control panel above the toilet roll. He sat down and extruded a turd. When he pressed the bidet button a jet of warm water squirted onto his anus – *ah!*

He enjoyed a long, cool shower and emerged refreshed and revitalized. Amazing how a pit stop in a clean bathroom can transform your whole

philosophy of life!

The rest of the hotel room was basic. The surfaces were all in shades of brown and the bedlinen was white. The window was as wide as the room and the bed fit snugly under it. Between the head of the bed and the capsule was a small desk with a standard videophone on it and a tiny refrigerator under it. A small hi-def television was hung above the foot of the bed. He looked up and saw four small speakers set in the ceiling above the corners of the bed – quadraphonic sound!

He looked out the window over a dense jumble of tiled roofs crammed higgledy-piggledy together. There was a small courtyard directly below with a tall wooden fence around it. It was crazy-paved and featured a row of *bonsai* trees growing in wooden tubs. In the middle was a small round pool with a white rim and a sky-blue bottom.

Jon unpacked his case and stowed it under the bed. Then he plugged Hal Junior into the ISDN socket (it fit) and checked his Langley drop. Nothing more from Bob. He stowed Hal (the R-alert dongle guarded the Mekon file), put on a shirt for the videophone and called Phil Ellis.

"Mekon de gozaimasu," chimed a bright female voice.

"Moshi moshi. Media International no Dr. Jon Christie desu ga. Kohobu no Philip Ellis-san onegai shimasu."

"Shosho o-machi kudasai –" The picture dawned to show a neat office lady vanishing off-screen. Jon waited.

A gray suit loomed across the screen. Phil's long thin face descended into view and broke into the conspiratorial grin Jon remembered from London.

"Hallo, Jon! Where are you?"

"Okashi Hotel, Shinjuku."

"Oh, well done! That's a smart joint!"

"Yeah ... Thought I'd come and visit you, if you have the time."

"Of course I have. We usually work pretty late here. Why don't you come right away – you wanna do that?"

"Yeah. How do I get there?"

"Quickest to walk. Twenty minutes, about two kilometers."

"Okay. I'll check the route on the tourist guide here."

"Alrighty. See you soon."

Jon put on his bizz suit and went down to reception. There he keyed his destination into the tourist guide, which printed him a color map of Shinjuku with his optimal route marked by a bold red line. He keyed up a can of orange juice from a nearby vending machine, chugged it down quickly as he studied the map, and strode out boldly into the bright Shinjuku sunlight.

Biomechatronics

Jon walked slowly, with his jacket over his shoulder and as far as possible in the shade, through the winding streets and prosperous boutiques of Shinjuku. Many of the shops were tiny and spilled out onto the pavement, with racks of clothes like hurdles to hinder those in a hurry. Newsagents overflowed with serried ranks of cheap, lurid *manga*, with covers shrieking out indecipherable titles and pictures ranging from sweetly winsome to repulsively violent or startlingly pornographic. He paused to flip casually through one. A crudely drawn sequence of cartoon close-ups of a pair of copulating humanoids with swollen, juicy pudenda prompted him to move on quickly.

Jon attracted curious stares from many of the people he passed. He was a *gaijin*, a foreigner, a Western barbarian. But he was a *gaijin* with a purpose. Well, he *thought* he had a purpose! His proposal for a multimedia series on the future of bionic robots seemed distinctly threadbare now he was here in the land of the robots. Japanese robotics engineers had invented mechatronics – the fusion of mechanics and electronics – and were just about to invent biomechatronics – their fusion with bionics. He knew now what he had to do. He was determined, as of now, that this little vacation was not going to degenerate into mere time out. Yasuko had pulled him here with her sweet smile, true, but now he was here it was up to him to show some steel. Anything less than a week of intense study of the emerging field of biomechatronics, to culminate in a decisive improvement of his Media proposal, would be a betrayal of his work ethic.

His step became firmer and his posture more erect as he formed his new resolve. There *was* a purpose behind his visit to this island paradise, even if he didn't plan to reverse the decline of the West.

He was sweating by the time he arrived at the Mekon building, an unassuming ten-storey block in the form of a chunky hexagon with sheer glass faces cut into squares by polished steel frames. There was a discreet brass plate by the main entrance and on each of the sliding glass doors was a red disk bearing a trademark golden **M**.

He showed Phil's business card to the doorman, a stout and aging gent with a ruddy complexion who wore a dark blue uniform and a peaked hat. "*Sumimasen ga kohobu no Philip Ellis-san wa doko desu ka?*"

The gent looked at it with a baffled expression for a few seconds. "*Gokai!*" he finally blurted, and held up his fist, thumb under fingers.

"*Hai, wakarimashita, arigato,*" replied Jon with a nod. He walked in.

Learning curves

Jon stepped into the elevator. It was a bare mirrored box with an attendant, another old gent in a uniform. “*Gokai, kohobu, onegai shimasu*,” he said, getting used to the intonation now.

“*Hai!*” the old man hiccuped with a jerk, every bit as manic as the taxi driver earlier, and pressed the **5** button.

Up they went, backs like ramrods, eyes straight ahead, in starchy silence.

Facing Jon as he stepped out of the elevator was a big open-plan office stretching ahead and to both sides, with maybe a hundred people scattered among archipelagos of desks and computer terminals. Directly facing him was a wide, curving, six-screen reception desk worthy of Starship Enterprise, crewed by three smart office ladies. He approached the lady in the center.

“*Konnichi wa ...* Do you speak English?”

“Ah, yes,” she answered in a bright, lively tone. “How can I help you?”

“I’m looking for Philip Ellis. He’s expecting me. Here’s my card.”

“Please wait a moment –”

Jon looked around as she called Phil. There were fewer green plants here than in the Media office in New York and the dress code was stricter. The men here wore white shirts and dark pants, and the women wore white shirts and dark skirts.

“Philip Ellis?” the lady said suddenly, “Dr. Jonathan Christie is here.” She gazed into space for a moment, then uttered an abrupt *Hai!* She looked up at Jon: “He is coming here.”

“Okay, *arigato gozaimasu*.”

“*Do itashimashite!*” She treated him to a radiant smile and turned back to her starship screen. Jon picked up a brochure lying on the desk and flipped idly through it. It was beautifully printed with massed ranks of tiny Japanese glyphs that meant less to him than the most abstruse math, but the diagrams and photos said enough.

The company was more solid than he’d realized. The brochure showed pix of robots for every conceivable industrial and scientific purpose as well as a map of the company’s photonic network (a Fluxnet – Jon had edited the system documentation) linking its robotic activities in 32 countries around the globe. A graph showed an exponential rise in the intelligence of the company’s robots. Another graph showed company turnover rising exponentially from a few billion yen in the year 2000 to over a trillion yen in 2012. Those were pretty impressive learning curves!

Bio-manipulation

Suddenly Phil was beside him. "Hallo, Jon, good to see you again."

"Hi, Phil, how are you?" They shook hands.

Phil grabbed Jon's arm and led him forward. "Let's go to my desk."

"I had no idea this company was so big." Jon followed Phil through the maze of desks and cabinets.

"Yeah, it's a big company, and still growing fast too. It was tiny at the turn of the century. It was the fast breeder program that made it take off. They needed a lot of robots to handle all that plutonium. Then there were robots for decommissioning old Soviet reactors, robots for factories all across East Asia, robots for space work – and robots for the secret bomb factories, of course. Now we've got robots in about thirty countries –"

"Secret bomb factories, really?"

"Just joking. I don't know anything at all about that side of things. But we do have a neat new photonic network between all our main factory locations. Did you see the company museum on the way in?"

"The museum? No, I didn't."

"You should some time. It's interesting."

"Okay ... I wanted to ask you about the network. Why does Mekon need so much bandwidth in the datalinks?"

"For the new telerobots. The new-generation telerobots can be operated remotely via the internet. Now we can monitor and reprogram them ourselves from here at Mekon."

"Really? Why would you want to do that?"

"Reliability, maintenance requirements, utilization rates, failure modes – all that dull stuff we need to make them better in future."

"But the datalink to Mekon – doesn't that breach user security?"

"Not really. Any data sent over public data highways is encrypted. As for us, what do we want with a zillion gigabits of raw user data a day?"

"Yeah, I suppose so ..."

They reached Phil's desk, which was an end segment in an S-shaped array of desks made of two incomplete hexagons sharing a center segment. Most of the desks featured workstations, and around the whole array were cabinets, printers, fax machines, database screens and so on.

"Here, let me show you something." Phil sat down at his keyboard and started keying. He gestured briefly at Jon. "Get yourself a chair."

Jon grabbed a chair – the other crew members for this end of the S were nowhere in sight – and pulled it up beside Phil.

Phil's workscreen showed a map of Europe. Phil increased the scale to show Germany with a bright red blob over Heidelberg. "Here, isn't that you, Heidelberg, Germany?"

Jon nodded. "Yeah, home sweet home. If you zoom in a bit more you might even see my apartment."

Phil zeroed in on a little box just south of downtown Heidelberg. "Here – the European Molecular Biology Laboratory. You know it?"

"Yeah, sure. That's where it's all happening in the new world of neuro-bionics. They recently got an enormous grant from Brussels to do some really high-grade neural resonance mapping."

"Well, they're the latest Mekon customer. They've just ordered a small army of Mekon telerobots with biomanipulation microp peripherals."

"Oh, wow, so they're really getting it together."

"So it appears." Phil played his hands over the keys and the picture on the screen panned back out to Europe, then zoomed in again on a red dot in southern England. "Here we go again – Oxford, England." A box just north of the city center appeared as Oxford swelled on the screen. "There ... the Crick–Dawkins Institute for Molecular Biology."

Jon reacted with a start. "The Seedy Institute! That's where Ann works."

"Ann – the girl I met on Sunday?"

"That's her."

"Well, the Seedy Institute is another new customer for Mekon telerobots with biomanipulator microp peripherals."

"Oxford and Heidelberg – they're the main European centers for the new consciousness research. The theory's all American, of course, but most of the lab work is being done in Oxford and Heidelberg. So – Mekon robots."

Phil sat back from the screen. "Yeah. Small world, huh?"

"Hmm ... why should they buy Mekon robots?"

"Why not? They're the best!" Phil replied without hesitation.

"Well, you should know."

"Hey, look, I don't know what your plans are, but I feel like going for a drink just as soon as I'm through here. How about you?"

Jon nodded. "I could handle that."

"Okay. But first I have to finish up here. That's half an hour max. Why don't you go and look around the museum while you're waiting. I'll come and find you when I'm through here."

"Good plan." Jon left Phil and made his way back through the archipelago of desks to the elevators, then took the stairs.

The scorpion

In the lobby, next to a smooth metal double door, was a large sign. At the top of it was the Mekon **M** on a red disk, at the bottom a lot of Japanese writing, and in the middle the word MUSEUM.

Jon stepped forward and the doors parted. He walked into a long room. Ahead of him were robots of all shapes and sizes, the bigger ones standing free in little patches of representative habitat and the smaller ones on benches or in glass cases. Around the walls and on partitions were several hundred pictures and charts. Here was a gold mine for the intrepid explorer!

Jon explored. Many of the robots could be turned on by pressing a handy button. He walked around quickly, pressing all the buttons and watching the machines work, cycling mindlessly through program loops, humming and buzzing as they assembled circuitry, filled and emptied test tubes, dismantled nuclear fuel rods, screwed and unscrewed nuts and bolts, threaded fibers into black boxes, and generally looked useful.

They were a motley crew, these robots. The big ones had gaunt steel arms in bright primary colors, with oily joints and hydraulic pistons. Their control modules were set in boxes above the arms and they had ruggedized video cameras mounted on the boxes. The smaller robots looked more refined, but they too were mostly single arms and hands jointed to a base. The smallest looked like erector-set models.

He could see now why Mekon robots had come to dominate the world market. He'd seen robots from a wide range of manufacturers over the years, and none impressed him with their dexterity so much as these. He watched with fascination as their metallic claws performing some delicate routine with utterly superhuman skill. Robotized factories were a giant leap away from factories run by humans, and computer integrated manufacturing – CIM – was a global standard no-one could reverse. Humans were finally liberated from assembly-line work.

Jon paused to operate a virtual telerobot. He put his hands in datagloves and his head in a VR helmet and saw a lunar landscape. His virtual hands grasped a pair of joysticks and drove into the landscape. He stopped for an interesting rock and picked it up with delicate claws on powerful arms. This was slower for real lunar robots due to a signal delay of 1.3 seconds each way between Moon and Earth. He moved on.

He found a Primrose assembly robot suspended under a domed starscape. It looked like a dwarf astronaut in a chair, with four white-sheathed arms set in a bulky rocket-powered box, and a round mirrored head for the cameras,

with antennas for ears. Next to it was a lunar construction robot parked on a patch of simulated moondust. It was a six-wheeled vehicle as big as a bed, with white beachball wheels and a gold-plated body. The arms at the front looked like lobster claws and the golden fingers like surgical instruments. Two vidcams were set in mirrored heads on stalks behind the arms. At the back was a raised telecom dish. The whole thing looked like a giant scorpion. This was the prototype for the virtual telerobot he'd driven, except that it was smart enough to control itself during routine operations.

Jon continued his tour. Robots in nuclear power plants, reprocessing facilities, contaminated areas, laboratories, electronics and photonics fabs, industrial production lines and more besides. No robots for building nuclear bombs, but all the rest were here, complete with charts showing productivity improvements, failure rates, running costs, operating specs and all the other figures he could want. This obviously deserved extended study.

Phil walked up beside him. "Hi! Enjoying yourself?"

"Oh, yeah, this is a treat. I'll have to spend an hour here tomorrow."

"Good idea. Let's go!"

Artificial Intelligence

On the way to the watering hole they talked.

"Well," Phil began, "that's my company. Not bad, eh?"

"Not bad ... Do you speak Japanese?"

"Sort of. I go to evening classes but it's a tricky language to master."

"How long have you been here?"

"Three years. Long enough to get along, not long enough to feel at home."

"Would you ever feel at home here?"

"If I met the right girl, maybe."

"Aha ... do you think you will?"

"Here?" Phil glanced at Jon with a quizzical frown. "The girls here treat you real good, but you know there's no real meeting of minds. The cultural gulf is too wide. You know most of them wouldn't dream of marrying a *gaijin*. It's like a Jewish-American Princess marrying a guy with no money. Hey, did you know the average IQ here is ten points higher than in the States? That's as high as the average for American Jews."

"Good for them ... You're not unhappy here, are you?"

"No, not at all. The work's great. And the pay's a lot better than I could expect in Philadelphia or Pittsburgh, believe me."

Jon believed him. "Tell me more about the language."

“The written language is a strange mixture. There’s an authentic Japanese script called *hiragana*. That’s phonetic, with about a hundred symbols, and is fairly easy to learn. Then there’s another phonetic script, with a matching set of symbols, called *katakana*, for transcribing foreign words. That’s easy too. But then there are the *kanji*, the Chinese characters. There are thousands of them. It’s a nightmare trying to find them in a dictionary. You have to count the strokes – can you imagine that?”

“I talked about this last summer with Yasuko in Heidelberg. My mind still boggles. How do kids manage in school?”

“Well, rote learning. And there are only about 1800 *kanji* in everyday use, so it’s not quite impossible.”

Jon smiled. “Sounds horrible!”

“It’s hard, it really is.”

Jon contemplated the problem of getting robots to use language. This was one of the biggest stumbling blocks in artificial intelligence. So far as robots were concerned, all traditional human languages were disastrously illogical. Robots of average intelligence – about as smart as the average insect – had to be spoon-fed with small gobbits of language carefully precut for a specialized application domain, and even then they could foul up absurdly.

The Turing test was the big hurdle here. The British mathematician Alan Turing proposed in 1950 that the test of whether a machine could be said to think was whether it could conduct a keyboard conversation that could fool a human into thinking it was human. Generations of AI buffs had come to grief on the test, but at least it was decisive. If one day a machine passed the test, there’d be no good reason to deny it had a mind.

They reached the pub.

Kamikaze robots

The watering hole was an old wooden shack set back a car’s width from the sidewalk. Two cars and a big motorbike filled the forecourt. The bike was a magnificent racing machine, a long fat beast with an injected ceramic twin-rotor heart and a nose fairing like a Desert Storm Warthog tankbuster. As an ex-biker Jon had a gut feel for the power behind the black-painted tangle of metal and ceramic parts lurking under the monster’s streamlined plastic shell. On the gas tank was a red rectangle with a white disk like a color-reversed Japanese flag, and on the white disk was a black Nazi swastika.

The shack had a tiled roof, bare wood walls and fragile paneled windows glazed with pearly glass. Short white curtains hung over the open doorway.

Phil and Jon had to stoop as they went in.

Inside it was pleasantly cool. On the right was a marble bar with glass paneling. Behind it was the barman, in a white chef's outfit with a white cloth around his forehead. He greeted Phil affably like an old friend.

"*Firu-san, hisashiburi! O-genki desu ka?*"

"*Konban wa,*" Phil replied, "*Okagesama de – kimi wa?*"

"*Boku mo – atsui, desu yo?*" Hiro-san replied as he casually picked out a fish from a tray of ice on the counter behind him.

"*Hai, so desu yo!*" Phil replied, then waved at Jon. "*Kore wa Jon desu.*"

"*Ah so!*" Hiro-san made a curt nod. "*Jon-san! Amerikajin desu ka?*"

"*Hai. Kare wa Nippon ga hajimete desu,*" Phil replied.

"*Ah so.*" Hiro-san expertly decapitated the fish with a big knife.

Jon looked around. The left side of the room was a large platform a step higher than the floor by the bar. The platform was carpeted with *tatami*, straw matting, and set with four low tables flanked by small cushions. Three suited salarymen sat at one of the tables. Straight ahead was a row of three video playstations next to a doorway onto a dark passage.

"What was all that?" Jon asked Phil.

"I introduced you and he asked if you were American. I said it was your first time in Japan." He turned to the barman. "*Hiro-san, biiru nihon kudasai.*" Back to Jon: "I just ordered us a couple of beers."

At that moment a figure appeared from the dark passage. It was the biker. He stepped down from the doorway and strode heavily toward the door, hardly noticing the two *gaijin*.

Jon looked him over. He was a head shorter than Jon and stockily built, with hair cut down to bristly stubble and a facial complexion like a pineapple. He wore racing leathers and carried a red helmet with a white disk and black swastika on either side.

Phil caught his attention again. "There's a great video game here." He gestured at the video playstations at the back of the room. "It's called *Zombie killer* and the idea is to kill zombies using an army of *kamikaze* robots."

"Sounds great – why are we waiting?"

They walked over and Phil took the killer seat.

Hiro-san came with two opened bottles of beer, along with two empty glasses, two glasses of iced water and two *oshibori* – plastic-wrapped hot towels. He placed them all on the nearest table.

Phil turned from the screen. "*Domo, Hiro-san.*"

"*Dozo,*" said Hiro-san as Phil killed a zombie.

Robot smarts

Jon waited until Phil's game was over. "Okay, I've watched you play and I still don't get it. They're very dumb robots, just blowing up like that."

Phil glanced up at Jon. "All robots are dumb. Work at Mekon for a while and you realize that."

"But not much for longer. When we can make them a few thousand times smarter it'll be a different story."

Phil smiled. "A few thousand times smarter is about right. But that won't be in our lifetimes."

"Why not? Nanoscale integration has plenty of mileage yet and photonic elements can do the rest."

"Sure," replied Phil with a wave. "When we can build gigaflops photonic processors the size of a football we'll be able to build robots as smart as humans. I wouldn't hold your breath!"

"Ten or twenty years, I'd say."

"Actually, Mekon does it a different way. Our telerobots aren't very smart but we have a room-sized teraflops hypernet up at mission control and broadband datalinks to the robots. So they act smart via the network."

Jon considered this. With a teraflops – a trillion floating-point operations per second – at home base to call on over a megabit-per-second datalink, a robot could look pretty good. A hypernet was a massively parallel machine with a virtual-topology node configuration that used neuronet learning logic to reconfigure itself in real time, so it could handle a lot of robots at once without blinking. But still ... "I don't buy it. What if all the telerobots need the hypernet at the same time? Anyway, if your room-sized hypernet is a hundred kilometers away then you have a millisecond delay loop."

"So what? The hypernet can use the time to look after the other robots."

"But the robot is still hanging around like a dummy waiting for its orders. Remote control is no good. Data fusion is the key to smart robots. They need real-time coupling between all their senses. That means short signal paths, a few centimeters, so you only get nanosecond delays."

"Remote control via hypernet was a Seventh Generation goal."

"Big deal!" The Japanese government's Seventh Generation project had ended a few months earlier after a decade of research. Its aim had been to program hypernet machines to see, hear and speak at moronic rather than idiotic levels. Jon recalled it had been a bit of a flop.

"Hey, I feel like eating," said Phil zestfully. "How about you?"

"Me too." Jon's last meal had been over the Pacific Ocean.

"I recommend the curry rice – *karirais*."

"Okay. I like curry – I'll try it."

"Good." Phil waved at Hiro-san. "*Hiro-san – karirais futatsu kudasai!*"

Extraterrestrial intelligence

The Japanese custom was to take off one's shoes before stepping up onto the *tatami*, then to sit back on one's haunches on a cushion. (Ouch.)

"So," said Jon, "tell me about Mekon's move into biotechnology. What's the real reason behind their selling biomanipulation robots to Oxford and Heidelberg?"

"Profits. Simple as that. Our traditional market – the nuclear sector – is about saturated. Mekon can only offer marginal improvements on present levels of productivity. Whereas in the new sectors we can offer an order of magnitude gain. That means an order of magnitude more profit – until the opposition moves in and breaks our monopoly."

"So you don't see any link with consciousness research and bionic consciousness in robots."

Phil shook his head. "Nah ... Most robots are better off stupid. Their intelligence, or lack of it, isn't what's holding up expansion. Task definition in the new sectors is the key bottleneck. Once the tasks are defined we can go ahead and optimize the product for those tasks. As it is, we're selling fancy general-purpose systems for routine laboratory chores like bottle-washing. It's like using a luxury limo to do door-to-door deliveries."

"So how come the labs are buying robots?"

"First, their productivity with human bottle-washers was so miserable that anything was an improvement. Second, we're shaving our profits to get a foot in. When the customers are locked in we'll gouge 'em – just like we did in the nuclear business."

"So the European trade ministers are right after all – the Japanese robot manufacturers are dumping."

Phil frowned. "No more than any other company anywhere else. It's all within the boundaries of commercial sharp practice."

"Doesn't it embarrass you to be supporting that sort of thing?"

"Why should it? We all gotta living to make."

"But what do you do if Tom Smith declares a trade embargo?"

"Not my problem. Let Chairman Mekon worry about it."

"Chairman Mekon – the founder."

"Right. Dr. Noboru Mekon, founder and president of Mekon Corporation."

His politics are rather right-wing, so I guess he'd be happy enough to fight the Western barbarians."

"Right ... Does he have any direct political connections?"

Phil took a deep breath. "Yes, he does."

At this moment Hiro-san appeared with two bowls of *karirais*. He set the bowls firmly on the table and uttered a loud "*Dozo!*"

"*Domo*," Phil replied, and gestured at the two empty beer bottles. "*Biiru mo nihon kudasai*."

"*Hai!*" Hiro-san picked up the empties and walked off.

Jon and Phil started on the curry rice with stainless steel dessert spoons. The other tables on the *tatami* platform were all now occupied.

"You were saying," said Jon. "Mekon's political connections."

"Yeah ... you heard of Shusako Mishima?"

Jon thought for a moment. "Sort of – remind me."

"He's a Member of Parliament here. He's the leader of the National Heritage party, which is a radical right-wing grouping. He wants firm and decisive action against European and American trade threats."

"Firm and decisive action – that sounds vague enough."

"He's hanging tough on the Northern Territories too, and that's more dangerous."

"You mean the Kuril Islands, the ones the Soviets grabbed in 1945."

"Right."

"Okay, so this Mishima chap wants a fight with Russia and he wants to get tough with Europe and America. Should we be worried?"

"Well, he's been getting a lot of popular support recently. And the Liberal Democrat coalition is looking weak. He could topple them."

"So Chairman Mekon is seriously into politics, huh?"

"Well, actually, he's big on space right now – the Primrose assembly robots and the Acropolis construction crew – and he has a kinda hobby interest in the search for extraterrestrial intelligence."

"Alright! He must be really excited by the Epsilon Eridani signal!"

The missionary position

Two young ladies, one with long blonde hair and the other with long red hair, stood beside Jon and Phil's table. They both wore long black skirts and white shirts buttoned to the neck. The redhead spoke.

"Hallo, do you speak English?" She was American.

"Yes, indeedy," said Jon.

“May we sit at your table? The others are all filled up.”

“Why, certainly, be our guests.” Jon glanced meaningfully at Phil.

“Thank you,” said the redhead. Jon appraised them as they stooped to unlace their shoes. They were quite good-looking. Both had naturally wavy hair, parted in the middle and hanging free, and neither wore any make-up or jewelry. Both had bulky black nylon bags with them, which they dumped onto the *tatami*. And both wore black rectangular badges on their breast pockets. They stepped up onto the tatami in white ankle sox, picked up their bags and settled demurely on the cushions at the far end of the table.

Phil turned to face them. “Are you both American?”

“Yes, we are,” said the blonde, who sat on his side of the table.

“We are too.” Phil waved inclusively at Jon.

“Pleased to meet you both,” the blonde said warmly.

“My name’s Phil, his name’s Jon.”

The blonde nodded. “My name’s Sister Snow.”

“And my name’s Sister Pratt,” added the redhead.

They were Mormon missionaries. Their names were printed in white caps on their badges.

Sister Pratt looked at Sister Snow. “Curry rice okay?” Sister Snow nodded. Hiro-san appeared again and Sister Pratt ordered with an American accent so heavy that Jon marveled at Hiro-san’s ability to understand.

Phil was looking at Sister Snow. “You Mormons sure get around ... how many Japs have you managed to convert?”

“We don’t keep score,” replied Sister Snow. “We baptize all those who find their way to the Lord.”

“No, really, how many?” Phil insisted.

“A few.” Sister Snow looked slightly embarrassed.

“That’s no answer,” said Phil gently.

“That’s a perfectly good answer – in fuzzy logic,” said Jon.

“Fuzzy logic,” sighed Phil, turning to Jon. “That’s all I’ve been hearing all day. Our robots are programmed to interpret user commands in fuzzy logic. I’ve been trying to explain to a customer why it’s okay and why the robots won’t go and fuzz up exact commands.”

“Should be easy enough.” Jon knew enough about fuzzy logic to know it could be as sharp as you wanted it to be. That was one reason why it had been so popular with the Japanese for three decades, for they prided themselves on being as sharp as could be but also on knowing the limits of logic and the value of vagueness.

“It is, really,” Phil shook his head. “I just got sick of trying to explain it.”

Jon turned to Sister Pratt. “Hey, sister, how about President Smith? Do you think he’s a good thing for your church?”

She blinked. “Yes ... he’s a believer and a righteous man. I support him.”

“Even against the New Yorkers?”

“Yeah ...” she nodded her head slowly. “Those guys on welfare think it’s their right to get paid to insult the taxpayer with their loose morals and their ignorance of God.”

Jon nodded his head slowly, his mouth set in a corners-down anti-smile. “I understand ... How about Tom Smith’s aggressive stand against Japan?”

Sister Snow cut in. “Japan is still a heathen land. The Japanese haven’t yet found the Lord. It’s our job to lead them onto the path of righteousness.”

Phil cut in to answer. “Don’t you think the Japs are doing just fine with Shinto and Buddhism?”

“No,” was all Sister Snow said in reply.

Jon took up his line again. “Sister Snow, how do you think President Smith should handle Japan?”

“The church has no special policy on Japan.”

Jon gave up and attended to his beer.

Cyborgs

Some heavy techspeak coming up, but we need the ideas later, believe me. You’ll be amazed how it all fits in. I was, anyway.

•

Jon topped up his beerglass carefully. “Phil, tell me about Mekon’s long-term plans. What will their next generation of robots look like?”

“I dunno ... but I guess more stand-alone intelligent vision functionality and natural-language dialog capability.”

“That’s not very specific.”

“No, it ain’t. Actually, I don’t know any better than you do. My job is largely promotion and client relations. What they tell me about new products is what we tell the whole world in our press releases a few days later. And what I can understand is even less.”

“Mmm ... vision and speech ... more stand-alone intelligence. That means more on-board logic.”

“More on-board logic – that’s the direction.”

“So less dependence on the link back to ... mission control?”

“Well, that’s what we call it. Or the CPU – the central processing unit – where we keep the teraflops hypernet.”

“Aha – the CPU. So am I right in assuming the robots will have more autonomy and less reliance on the CPU?”

“You’re asking me questions beyond my pay-grade again. But what’s it to you? Are you spying for someone here or something?”

“No, not spying. I just need to see how all this robot stuff fits in with bionic consciousness.”

“Bionic consciousness – you mean artificial consciousness that’s built using a biological model.”

“Right. I would guess that it’ll be the, ah, ninth generation goal.”

“Ninth – why not the eighth?”

Jon shook his head. “Eighth has to be closer. Bionic consciousness isn’t so far along yet. Eighth generation would be ... using hypernets for neural evolution ... to mutate and select generations of automata to converge onto good heuristic solutions for non-computable problems. That’s a step on the way to bionic consciousness.”

“What the hell does all that mean?”

“Well ... you know we can make lines of cyborgs that mutate and evolve as they reproduce.”

Phil grinned. “Wait a minute! What do you mean by lines of cyborgs?”

Jon smiled too. “A cyborg is a cybernetic organism. Artificial life and all that. A cyborg is any organism, like a computer virus, that lives inside an information system.”

“A real, live organism? Isn’t that stretching it a bit?”

“Not at all. Cyborgs have all the essential characteristics of life. It’s just that they live in electron patterns rather than in protein patterns or whatever primitive DNA organisms live in.”

“Okay – you just threw me with cyborgs. That’s an ancient science-fiction word for me. Like some kinda Frankenstein monster.”

“That’s why I like it. Anyway, cyborgs are still very primitive things, hardly beyond the virus level. But we need to evolve better ones to mimic brain behavior. Neural groups in the brain function like highly cooperative cyborgs. That means they can work on problems that are computationally unsolvable. If they know what the solution should look like, they can work toward it by trail and error.”

“Okay, now you’re making sense. Cyborgs are like little demons in the brain that tackle untidy problems using quick-and-dirty methods.”

“Yeah ... *demons* ... I like that ... so getting packs of demons to work together would be a good eighth-generation goal.”

“So you think bionic consciousness will be a ninth-generation goal.”

“Well, what I think is that in about ten years or so people will begin to implement consciousness in hardware.”

“Then we’ll need another ten years to do it on a commercial basis. That makes it rather late for Chairman Mekon.”

“Is he so important?”

“He’s the creative force in the company. When he goes, Mekon will be just another manufacturer in a crowded market.”

“The creative force ... he sounds really interesting.”

Android souls

The missionary girls were finishing up. Sister Pratt turned to Jon.

“I couldn’t help overhearing part of your conversation. You were talking about intelligent robots, right? My father’s a robot engineer and he told me there’s no way they’ll ever replace people.”

Jon considered this for a second. “Well, he’s right if we look at robots as they are now. Right now they’re about as smart as insects. But you have to look ahead a bit. Consciousness is what makes humans special, but it’s only recently become understood. The news came out this year, in fact. So in a few years we’ll be able to build consciousness into robots.”

Sister Pratt frowned. “What do you mean by consciousness?”

“Consciousness is the human ability to see the whole picture in one act of understanding. It’s the ability to relate everything together and decide what to do on the basis of that global understanding.”

Sister Snow interjected. “Consciousness is a gift from God. How can you say we understand it?”

Jon knew better than to argue theology with a Mormon. “Consciousness is now understood to be a brain state like any other, and that means that in principle we can reproduce it in machines. If we can make machines with internal states corresponding to those brain states then we’ll have no reason to deny they’re conscious.”

Sister Snow wasn’t satisfied. “But they won’t have souls. They won’t have the spark of divinity within them.”

Phil interjected. “The Japanese religious tradition has its own views about that. Divinity can be in anything – trees, mountains, streams – even robots. Japs are quite happy to see robots as having souls like people.”

Sister Snow wrinkled her nose. “That’s just pagan idolatry!”

“I believe,” declared Jon, “that human souls are information structures, like cyborgs in computers but much more complicated, whose immortality is

like the immortality of any mathematical object.”

Phil grinned. “Mathematical objects! I like that!”

“Yes,” continued Jon in trance mode, “souls are like other mathematical objects – immortal, invisible to the vulgar senses, indestructible by physical means, bound only by the logic of their own consistency. Souls inhabit a paradise whose landscape is formed from mathematical objects of all kinds – Mandelbrot mountains, Cantor dust, Platonic solids, Navier–Stokes rivers, Lindenmayer trees and flowers, Hilbert hotels, virtual reality, animatronic characters ... Oh, to spend eternity in such company!”

“Wow,” said Phil, “all you need is a machine to run them on.”

“Right,” agreed Jon with a smile. “So much for immortality. If and when someone builds a machine and runs me on it, then I’ll be reincarnated as a cyborg, but not before.”

Sister Pratt looked grim. “Robots will never have human souls.”

“By definition,” said Jon. “They’ll have *android* souls. Androids are to present-day robots what humans are to insects.”

“In that case,” Phil replied, “we’ll have to wait a billion years for them.”

“Not at all!” Jon retorted. “Evolution is accelerating exponentially. I say androids will be the ... *tenth* generation!”

Phil laughed. “Androids – that’s Chairman Mekon’s big dream.”

Sisters Pratt and Snow said polite goodbyes and left.

Girlfriends

Jon and Phil discussed personal affairs for a while longer.

“Don’t you miss living in America?” asked Jon.

“No. I travel a lot on business. I spend several weeks a year in America and Europe.”

“Is that how you met Ruth?”

“Yeah. Mekon had a delegation in Brussels. Ruth was in Brussels for a Media project. We were sharing the same hotel.”

“Aha ... when was that?”

“Oh, a bit under a year ago ... How long have you known her?”

“We’ve been colleagues for about four years now.”

“How often do you see her?”

Jon had to think. “This weekend was the first time since last Christmas. Before that ... over a year ago.”

Phil nodded thoughtfully. “How about you and Ann?”

“Ann? That was our first date, last weekend. We had a good time together

but we don't have a relationship."

"You looked like you did on Sunday."

"We did? No ... I'm not into that sort of thing right now."

"You're not? Why not?"

"I have work to do. I have to get my thoughts together."

"Is that why you came here to Japan?"

"Well, no. I had the idea that seeing Yasuko might cheer me up."

"Yasuko – when are you seeing her?"

"At the weekend. This stopover in Tokyo is unplanned. I thought learning more about Mekon would help me with my consciousness project."

"So you want to see how close Mekon has come to building robots with consciousness, is that it?"

"Something like that." Jon remembered Bob and the AND and frowned.

"What about this girl Yasuko?"

Jon smiled. "I fixed up the date with her on Friday. It's only last weekend that I really got started on the consciousness project. Seeing Yasuko just has to fit in somehow."

"I see. Do you lust after her?"

"I haven't seen her for a year. I certainly lusted after her last summer ... Do you have a Japanese girlfriend?"

Phil smiled. "Well, sort of ... I dunno."

"What do you mean by 'sort of'?"

Phil looked slightly uncomfortable. "There's a girl I used to see before I met Ruth. Girl called Miko who lives in Shizuoka ... I haven't seen much of her recently. Getting lazy, I guess ..." Phil frowned and looked at his watch. "I don't wanna stay here too long. I have a long commute back to my humble abode in Musashino."

They got up and went. It was dark outside and they took a taxi. Phil got off at the railway station and Jon went on to his hotel.

Back in his tiny room, Jon checked Hal's R-alert dangle log – *bad news* – someone had tried and failed to probe the hard drive with a spy worm. So the room wasn't secure and some little sneak had come snooping. He'd have to find a new home for the Mekon file.

He got into bed and surfed the boob tube. Up came an erotic love scene. The female's body parts looked good in hi-def vision and her amorous groans were clear in quadrasonic sound. Virtual sex. Off with it!

Informatics

Information is power

Booting up

Another day replete with techspeak coming up. You have been warned!

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Tokyo, Friday, early. Jon opened the window shade to bright sunlight. He slid open the window and leaned out. The pool below looked inviting.

Swim inventory – towel, costume, robe, sandals, smartcard.

Procedure – put on (costume, robe, sandals), pick up (towel, smartcard), exit (room), enter (elevator), select (ground floor), exit (elevator), traverse (lobby), find (door to courtyard), insert (card), enter (courtyard), drop (towel, card), remove (robe, sandals), enter (pool).

Preliminary subroutine – select (towel, costume, robe, sandals). Towel – courtesy of Okashi Hotel. Costume – his leopardskin-patterned tanga.

Pause. Clean innerwear supply = (boxer shorts 1, shirt 1, pair of sox 1). The jock, other boxers, four shirts, five pairs of sox, and pop-art traXuit all needed washing. Activate laundry subroutine! Call room service. Reply – for same-day laundry service leave items in plastic bag on bed.

Continue swim algorithm. Robe – also courtesy of Okashi Hotel. It was a standard *yukata*, a light cotton mini-length sleeping jacket with short wide sleeves and a waist sash. Sandals – his flip-flops.

Implement procedure.

Wow, that was good!

He pumped around zestfully for ten minutes. He climbed out, toweled dry, put on *yukata*, pulled off tanga, returned to room, showered, shaved, put on bizz suit. This boot routine wasn't routine at all!

Hal! Download CIA file to EPROM chip card, put card in wallet. The other files in Hal were private enough too, but not incriminating.

Next, breakfast routine. Go to ground-floor dining room. Grab *Newsweek* from rack and sit down. Await breakfast waitress.

He drank orange juice and coffee and ate muesli and toast. He read a story on the alleged (by the CIA, who else?) Japanese nuclear self-defense system. It may have been deployed since 2012 in response to reports of a Chinese threat. He mused ... had the Japs booted up?

He returned to his room. Next procedure. He had to use the loo but the floor of the bathroom capsule was wet. Strip naked, enter capsule, shit, wash bum, clean teeth, exit capsule, redress.

Inventory management – what to take with him for the day at Mekon. Ziparound folder – he planned to collect a pile of papers from the museum. Biomag, with his resumé and so on – two copies. Camera – check battery charge, load blank chip card. Photo album – it needed gift-wrapping for presentation to Yasuko – see to it today. All into the bag.

Suitably equipped and accoutered, he set off for the day.

A glorious walk

The walk to Mekon was a glorious experience. Sun shone down from a blue sky, people went peaceably about their daily rounds and all seemed well with the world.

Jon thought about preparing programs for robots and computers. Everything depended on specifying the details as exactly as necessary in advance, and that could easily lead to an infinite regress as more and more bugs were found that had to be fixed before the program would run. For a digital machine, the details had to be predigested into a binary code. Once the data was in any well-defined form, the coding into binary strings was routine, so long as the procedure for encoding the data matched that for decoding it. (A binary string is a string of digits, each either 0 or 1, coding a single bit of information.)

The key to making general purpose computers was to code not only their input data but also their programs as bit strings. A program is just an algorithm, a recipe for doing something, expressed in a formal language. It can be fed into a computer as a bit string and stored in a working memory. Coding and storing programs was the step that allowed computers to become all-purpose machines ...

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Note for those who care. The computer revolution grew from mathematical logic. Without the logical calculus of truth-functions there would have been no coded programs and no general purpose computers. The pioneers of that logic included Gottlob Frege and Bertrand Russell.

The syntax of the calculus is based on propositions, assumed to be either true or false. Atomic propositions are seen as having no internal structure. Compound propositions are built up from them using the logical operators NOT, AND, OR, and IF–THEN.

The semantics of the calculus is based on two truth values, 1 (true) and 0 (false). The truth values of compound propositions are defined in terms of the truth values of their constituents, and so on down to atomic propositions, using rules listed in truth tables. The rules are simple enough to build into small, cheap devices.

General purpose computers first appeared in the 1940s. Konrad Zuse built an electromechanical machine in his parents' front parlor in Berlin in 1941. Howard Aiken at Harvard University, with half a million dollars from IBM, built the much bigger electromechanical Mark I in 1944. A team at the University of Pennsylvania built the even bigger ENIAC (30 tons and 18 000 vacuum tubes!) in 1946. With transistors in the 1950s, integrated circuits and high-level programming languages like BASIC and FORTRAN in the 1960s, microprocessors in the 1970s, desktop PCs and the Macintosh in the 1980s, networking, the Internet and the World Wide Web in the 1990s, and global broadband superhighways, nanoscale hypernet architectures and consciousness in the new millennium, computers hit the big time.

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Jon loved to think about all this stuff! At last he reached the Mekon building. With a curt nod at the doorman he walked in.

The number of the beast

Jon was back in the Mekon museum. This time he was prepared. He got out his camera and snapped the robots (its CCD worked well at low light levels). He read the wall charts carefully and stuffed leaflets into his bag. There were no Mekon goons in sight but there were several vidcams set high on the walls with a grandstand view of his walkabout.

As he snooped and studied he reminded himself that all these devices were animated computers. They were all Turing machines. He'd been taught to believe that even humans were Turing machines ...

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Another note. Alan Turing developed the concept of the Turing machine in the 1930s. A Turing machine is a digital computer reduced to its ultimate essentials. It's a box that has a finite number of possible internal states. It has a slot running through it for an infinite tape. On this tape is a finite string of

symbols, 0 or 1, with infinite lengths of blank tape left and right of the string (blanks can be coded as 0 with a bit of trickery). The box has a tape reader/writer that reads one symbol at a time and either leaves it unchanged or replaces it with the opposite symbol. An operating cycle of the machine consists of a read/write action, a stepwise move of the read/write head one place to the left or right, and a transition to the next internal state. Some operating cycles stop the machine.

The key property of a Turing machine is that it's *deterministic*. The internal state and symbol under the read/write head together determine the next operating cycle – whether the head overwrites the symbol, whether it moves left or right, which new internal state the machine goes into, and whether it stops. Since there are only finitely many internal states and two symbols, all the possible combinations can be listed in a machine table that says what happens next in each case. The machine table defines the machine. The art of designing a Turing machine is to write an interesting and useful machine table.

That's all there is to a Turing machine. The machine table is the program, the initial state of the tape the input, and the final state of the tape the output. For some input the machine never stops – then the problem it represents is unsolvable by that machine.

What makes the idea of Turing machines so powerful is that the machines themselves can be defined by bit strings. Any Turing machine is defined by its machine table, and its machine table is just a list that can be coded into a binary number T . This number T can be written on a tape and fed into another machine. Now we can define a machine that reads the string T and promptly proceeds to behave like machine T . Such a *universal* machine can read the number T of *any* machine and emulate that machine.

Universal Turing machines are general purpose computers. The hardware of read/write heads and infinite tapes is merely schematic. Practical machines are vastly more efficient. The ideal Turing machine has the sole advantage that its tape can serve as an infinite memory.

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So any deterministic machine that has a finite number of distinct internal states and relates to its environment via digitized input and output streams is computationally equivalent to a Turing machine.

This was what captivated Jon as he circumnavigated the Mekon museum. All these robots were Turing machines. They were all deterministic: they reacted in predictable ways to specified input. They all had a finite number of internal states (permutations of memory cell contents and so on). And

they all related to their environment via digitized input and output streams. Each of these beasts had a number T . If you knew the number (or rather a number – it depends on the coding scheme you choose), you knew all there was to know about the beast, logically speaking. The number T was the nearest thing you could find to a soul in these primitive monsters.

What especially bemused Jon was that humans might be Turing machines too. We too appear to be deterministic, since we conform to the laws of physics and our behavior may well be predictable in principle. We too seem to have a finite number of internal states, assuming we're unaffected by tiny changes in the quantum states of individual atoms in our bodies. And we interact with our environment via trains of coded nerve impulses that are for all practical purposes digitized. So it was plausible to claim that we were Turing machines.

But was it true? Jon had new doubts, triggered by the quantum theory of consciousness. Determinism gets lost if we take quantum holism seriously. We have a continuum of internal states if the now-zone fuzzes out to infinity. And the environmental influences upon our field of consciousness can't be digitized if consciousness is open-ended and holistic. Suddenly the answer was clear – *no*. Case dismissed!

Androids wouldn't be Turing machines either. Like humans, androids would be deterministic in simple situations but would depend in complex ways on invisible influences whenever the visible ones weren't clear enough or led to conflicts. No lifeform sensitive to holistic quantum effects in the now-zone was a Turing machine. Hmm ... what about cyborgs?

Jon had seen enough. It was time to seek out Phil.

Data scam

Phil was sitting at his desk staring at his workscreen when Jon walked up.

"Morning, Phil. How's life?"

Phil glanced up. "Ah, hi. Grab a chair."

Jon grabbed a chair – Phil's neighbor was absent again – and pulled it up. "So – what's new?"

Phil was staring at a block of text on his screen. "I have a little problem here ... You recall we have biomanipulator telerobots in life science labs in Japan and America, and will soon have them in Europe too, in Heidelberg and Oxford in particular."

"How could I forget?"

"Okay, well, the problem is I'm writing a promotional brochure for the

telerobots and I have to explain the datalink back to the central server.”

“The datalink – you mean the internet link that goes back to the Mekon CPU – the main server.”

“Right. The robot sends out a datastream and the big hypernet server at mission control picks it up together with the streams from all the other telerobots. The dataflow at this end is enormous and the hypernet is a teraflops machine with a megachannel intergate in its firewall. The flow is monitored continuously and any blips are picked up and analyzed.”

“Okay, so far so good. So what?” Jon rolled his chair back slightly to stretch his legs.

“So users are gonna be worried about data security. I have to find a way to reassure them that their precious results aren’t being tapped.”

“I thought of that yesterday. You said the robots had encryption gates to scramble user data before it gets sucked down the datalink.”

“Right, I did.” Phil rolled his chair back from the keyboard and raked his hands through his hair. “Unfortunately, it’s not quite that simple. I’m not a technical man and I don’t understand the access protocols, but I’m not sure they’re 100% clean, if you know what I mean.”

“Well, no, I don’t, but go on.”

“It’s my job in this brochure to say the whole system’s watertight and that users can teleoperate their robots without leaking data. But we had a similar range of telerobots a couple years back for working on photonic networks and there was a scandal over illicit data capture.”

“There was?” Jon was startled.

“It was hushed up, of course, so it’s not likely you’d have heard about it, but the point was the robots were feeding data to a hypernet here that was designing the company’s new network. Someone in Mekon was stealing other companies’ data to build the Mekon network.”

“Hey, that’s terrible! You’re working for a cowboy outfit!”

“Well, as I see it, it ain’t so bad. You know as well as I do that a scam like that – I should say it wasn’t clear whether Chairman Mekon authorized it – practically counts as normal sharp practice in this business. So Mekon skips paying a few licensing fees. Where’s the big deal in that?”

Jon nodded slowly. “Okay, if you say so. Where’s the big deal? So what’s the problem with these biomanipulation robots?”

Phil took a deep breath and exhaled forcefully. “Biotech is different. If someone in Mekon skims data from the consciousness labs, it won’t be just to skip a few licensing fees. After what you said yesterday about androids, something like this could have awesome implications. If it is some kind of

scam, then it's a new league of criminality that I don't wanna get involved in, especially not by reassuring users that the robots are leakproof."

"I see," Jon said quietly. "How about finding a new job?"

"And walk away without doing anything about it?"

"Wait a minute. This is all conjecture. Do you have any proof that some dirty deed is being done here?"

"Proof, no. But the access protocols for the new biorobots are the same as for the old photonet robots. The loophole is still there. And Chairman Mekon has a passionate interest in bionic robots. His big dream has always been for Mekon to build androids in his lifetime."

"You said last night it wouldn't happen in his lifetime."

Phil shrugged. "Who cares what I think? He can see it's a long shot, but he can also see the prize. His idea is that androids will be the next big step in evolution after *Homo sapiens*. And all he needs to take that step is privileged access to the latest research on bionic consciousness."

Jon shook his head sadly. "Looks like a problem ... But I still don't see a crime worth getting all self-righteous about. He sounds like just another man with a mission. Why get in a sweat about it?"

"Let me show you something."

World domination

Phil strode casually but purposefully to the southwest corner of the office. Jon followed. It was a quiet enclave, screened off from the rest of the office by a row of robot vendors offering soft drinks, donuts, coffee and cigarettes. A row of cabinets stood against the wall and a pair of grubby armchairs faced a low table and a butt-filled ashtray.

"As you see," said Phil, "this is addicts' corner, where employees can indulge their nicotine and caffeine habits."

"Very nice," said Jon, catching the stink of the ashtray in his nostrils.

"At least it's quiet most of the time." Phil pulled open a cabinet drawer and lifted out a fat plastic folder stuffed with papers. He sat down and riffled through it to a particular page. "This is what I wanted to show you."

Jon looked at the page. It was a photocopy of a letter in Japanese. "I can't read it. What does it say?"

"It's from Dr. Noboru Mekon to Shusako Mishima, MP."

"Shusako Mishima – he's the leader of the National Heritage party, right? The ultra-rightist you told me about yesterday."

"That's the man," Phil replied in a quiet, conspiratorial voice. "You know

what – in a speech recently he said it was Japan’s destiny to dominate the entire planet with machines that would either domesticate or eliminate all humans outside Japan.”

“Uh? Domesticate or eliminate all humans outside Japan?”

“Right. He has the idea that most human beings are like cattle whose highest purpose in life is to satisfy their material needs. If you just give ’em enough machines to play with they’ll be too busy with cheap thrills to be a threat to anyone. The rest – the rebels, the fanatics, the activists – could be taken out or neutralized by robot security systems.”

Jon smiled. “That’s a tall order. Robots aren’t that sophisticated by a long, long way.”

“Right. But this is where Mekon comes in. Mekon will pump massive funding in Mishima’s direction if Mishima will help him set up a consortium with other companies and research labs to build a line of androids.”

“Aha. With androids you’d have a real shot at world domination. But ... *why* does Mishima want Japan to dominate the world like this?”

“Does he have to have a reason?” Phil looked puzzled.

“I think so, yes. Take Tom Smith, for example. If he said it was America’s destiny to dominate the world with machines or some such thing, I’d expect him to have a reason, like that God revealed to him in a vision that only the righteous would learn to control the machines. I dunno exactly, but you get the idea. There’d be more behind it.”

Phil nodded. “Yeah, okay, I see what you getting at. Mishima’s a Japanese racist who thinks that Japanese people are genetically special. The old Shinto tradition is that Japanese people are descended from the Sun goddess, and this is some kind of symbol for Mishima. Have you heard of a Japanese guru called Ryuho Okawa?”

“Okawa ... vaguely, yes. He wrote a lot of best-selling New Age stuff at the end of the century.”

“Right, that’s him. He’s a Buddhist who’s big thing is to put the whole Jewish tradition into perspective. Well, Mishima was influenced by all that, which is all good and harmless so far as it goes, but he’s added his own twist to it all by seeing the whole history of Western civilization as the history of the rise and fall of the Jewish God. Now, says Mishima, it’s time for the Japanese God, who seems to be some kinda Sun God.”

“Fascinating ... why don’t we hear about all this in the Western media?”

“You will if Mishima gets into power, you can be sure of that.”

“Is that likely?”

“More so than you might think. He’s got a big following among people

here who are fed up with being pushed around by the likes of Tom Smith. What with the Northern Territories problem as well, the Liberal Democrats are having a hard time.”

“Hmm ...” Jon didn’t really want to get sucked into all this.

Phil looked at the letter again “Chairman Mekon is an Okawa fan too, so he has a certain sympathy with Mishima. I think Mekon sees this as a chance to get some real push behind his android ideas.”

“So he supports a rabid racist just to get government funding.”

“More than funding. A whole new level of priority. An agreement that androids are a national goal, like Seventh Generation but bigger.”

“Seventh Generation ... that wasn’t such a big deal. Anyway, as I said last night, androids would have to be about the tenth generation.”

“No, right, but it sets a precedent. And Mishima is the only politician with that sort of long-range vision, even if it is badly skewed.”

“Okay, now I can see a problem worth getting upset about ... But what about this letter? How did you get it? What does it say?”

“It spells out the offer Mekon made to Mishima. The letter’s a few months old now and Mekon has already started funding Mishima’s party. I got the copy of the letter from a colleague here – that’s all I can say about that.”

“Aha. How do you know it’s not a fake?”

“I know. Everything fits. A few of us have checked.”

“And why have you got it in an ordinary file in an unlocked cabinet?”

Phil smiled. “It’s safer here with a million other papers. If anyone finds it we can say we had no idea what it meant.”

“Okay. You’ve given me something to think about. It looks to me like we oughta put our spanner in the works here. The research work in Heidelberg and Oxford is ripe for some big breakthroughs. I’d hate to see it in the hands of a maniac who wants to dominate the world with zombie killers.”

“I’m glad you think so. I’ve been in two minds about the whole thing. I mean there’s no sense rocking the boat over a paranoid fantasy.”

“Well, yeah, but if what you say about the access protocols is right then we have a real problem, and we ought to do something about it.”

Phil sighed. “Good. We’re agreed. I suggest you check out the access protocol situation yourself. I’ll introduce you to the guys who work on it.”

“Okay, good.”

“But be discreet. I don’t want to get anyone alarmed. The guys here are nearly all okay, and most of what Mekon does is squeaky clean.”

“Yeah, yeah, I understand already.”

“Okay, let’s do it.”

The cloud

The telerobot datalink access protocol department (TRDLAPD) was on the fourth floor. When Phil and Jon arrived there were six young men there, three busy at their screens and three hunched over a network chart spread out on a desk. Two office ladies slaved at the far end.

Phil walked up to the three men with the chart. “Hi, guys! Mind if we interrupt you for a minute?”

They looked up. The one in the middle replied: “Hey, Phil, how’s life? We’re nearly through here. Give us a minute.”

“Okay, sure, no panic,” Phil said in a reassuring tone. Jon and Phil gazed at the scenery for a minute.

Jon mused on global photonic data networks. A single fiber-optic cable could carry up to a trillion bits of data per second at 200 megameters per second around a planet only 40 megameters in circumference. Look at one of the hair-thin strands – in each millimeter slice at any instant there could be five bits flashing along at the speed of light (a third slower in glass than in space, but still fast). When he considered how many megameters of cable had been laid down in the global internet in the 21st century and how many giant gigaflops and teraflops servers were spliced into the *cloud* (as they called the global net) his mind boggled.

The informatic cloud was a post-historic phenomenon, as Marvin put it in *Megablob*. The *now* defined by the interactive mass of zillions of bits of data zipping around the planet, all tangling and tumbling together as gigahertz logic engines filtered and sorted them, was beyond any human timescale. The human span of years was an evolutionary eternity to the cyborgs that lived and died in the cloud. What did we know of their flickering lives? What *could* we know of them?

Jon’s imagination saw the Earth’s surface veiled with a candy-floss cloud of glass cobwebs. The cobwebs were spun not by humans but by machines. Humans were merely the facilitators, the slow shapes made of low-grade mud that somehow attended the birth of the informatic machines from the various minerals in the outer crust of the rockball. Humans were fine shapes – as graceful as any ocean wave or blooming plant – but their rough symmetries hardly compared with the nanoscale precision of the machines that pumped their informatic vapors into the cloud ...

The three Mekon men were through and the one in the middle stepped forward. “Okay, Phil, what can we do for you?”

Phil indicated Jon. “First, let me introduce my colleague here, Dr. Jon

Christie, a network software specialist from Heidelberg, Germany. Jon, meet Akira Watanabe, head of the TRDLAPD.”

They said hallo and shook hands.

“What we wanted to discuss,” Phil continued, “was the problem of maintaining data security via the access protocols. The background is that I’m writing a brochure for telerobot users and I have to persuade them that their data is secure, that it won’t get sucked up along the datalink and used illicitly here at Mekon. I don’t understand the technicalities and I need to say more than I can on the basis of what I know now.”

“Aha,” said Akira, nodding fast.

“This is where my friend Jon here comes in. He’s a network software documentation expert who’s more or less new to Mekon. I’ve explained to him what I know about our datalink, which is practically zilch, and now I want you to reassure him that our procedures are leakproof. See him if you like as a typical user. Can you do that?”

Akira’s face was hard to read, but Jon sensed a shadow of suspicion clouding his fresh face. “Okay, Phil,” said Akira, “that sounds reasonable. I treat Jon here like a new customer who wants to know the works. But what does Jon really want? I have to know that too.”

Phil nodded. “Fair enough, you do. Jon, why don’t you explain?”

“Okay ... well, I work as a freelance software editor in Germany and I’ve spent a lot of time in recent years on network software. My interest in Mekon is that I’ve been invited to advise two European customers for Mekon telerobots. The customers are the European Molecular Biology Laboratory in Heidelberg and the Crick–Dawkins Institute in Oxford. They need to be reassured that their data will be safe, which means explaining the datalink to them. They’re molecular biologists and they don’t understand these things.” Jon sighed – he hadn’t lied.

Akira’s face seemed to lighten up a shade or two. “Good, I guess I can handle that ... Did you come to Japan just for that?”

“No, I’m here on vacation and just visiting Phil here. But when I told him about my work he realized you were the man to talk with.”

Akira nodded his head slowly, still unconvinced somehow. “Okay, I’ll see what I can do for you ...”

Phil spoke again. “One more thing, Akira. Jon here wrote some of the software you’ve been using for the Mekon network. Tell him, Jon.”

“Right, I was the documentation editor for the Fluxnet system. I edited all six Fluxnet manuals.”

Akira’s face lit up with genuine warmth. “You did? The Fluxnet system

was a great inspiration for us! The manuals were beautifully organized. Don't worry, Phil, I'll explain everything Jon wants to know."

"Great!" Phil patted both Jon and Akira on the back. "I'll leave you to it. Jon, let's have lunch together when you're through here."

"Right." Jon smiled at Akira.

Prime keys

Akira thought for a moment. "Okay, Jon, first, you need to know the overall layout of the Mekon global network. Has Phil explained this to you?"

"No, he hasn't. He's not so hot on the technical stuff."

"Okay, come and look at this chart. It gives you the basic architecture. The Mekon network is a global star with a giant hypernet server at the center. The star is linked via remote servers to local-area dual-ring nets for teleoperating robots inside companies. The arms between the servers are public internet lines. We use enigma-encrypted packets on those lines." Akira waved his hands over the chart. "Do you get the picture?"

Jon nodded. "Yeah, yeah, I see."

Akira went on to explain the details and Jon listened, occasionally asking pertinent questions and hoping Akira wouldn't think him too dumb. His insider knowledge of the Fluxnet system and his careful study in the Mekon museum stood him in good stead. An hour later, Jon understood not only the technicalities but also the motivation.

"So there it is," said Akira. "The encryption protocols decide what data flows to the central processor and encrypt it in two nested enigma packets. The robots encrypt the inner packet with the user's public key so that only the user can read it. The remote servers encrypt the outer packet with the user's private key to sign the sealed inner packet. Enigma uses 64-bit prime keys – secure enough for normal users."

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Note for the careful reader. Dual-key encryption, invented in 1977, provides both security and authentication. The keys are large numbers. Each user has a public key and a private key. Public keys are listed for all users. Each pair of keys is matched so that either one of the pair will only decrypt documents encrypted using the other one.

Imagine Alice and Bob exchange email. Alice encrypts her message using her private key and mails it to Bob. Because he can decrypt it with her public key he knows the message is from her (although anyone snooping on Alice could use her public key to decrypt it too). Bob encrypts his reply using

Alice's public key so that only she can decrypt it. Because her private key works, Alice knows the message is for her and her only (although a spoofer pretending to be Bob could have written it).

Each private key is based on a large prime number and the paired public key on its product with another large prime. The private keys are fairly safe because it's very difficult to compute the prime factors of large numbers like the public keys. But not completely safe. In 1993, to prove this, a group of enthusiasts took only a few months, using free machine time on the internet, to factor a number with 129 decimal digits into two primes with 64 and 65 digits. Most dual-key systems are based on much smaller primes, for example with 64 binary digits (bits), equivalent to 19 decimal digits.

•

Jon frowned. "Can Mekon crack the user crypts?"

"Yes, in principle. We can find 64-bit prime factors in ... a few hours of hypernet time."

"So you can crack them if you can afford the time."

Akira smiled. "Exactly – but it's not worth it. Our users can change their keys whenever they like. We can't cheat them."

"And all the user data is encrypted."

"Yes. The only data that isn't encrypted is the robots' vital signs data. We need that data to monitor component reliability and maintenance intervals."

"How's that data distinguished from the user data?"

"It's tagged. The tags are industry standard."

"I see ... could a robot be programmed to tag the wrong data?"

"Yes, but only by tampering with factory-sealed software."

"Can the customer check the software?"

"Not without breaking the warranty. But the warranty says the user can ask us to show them tagged data at any time."

Jon nodded. "Okay, thank you. That was very reassuring."

Akira bowed slightly with a tense, clipped movement. "You're welcome. May I ask you some questions about the Fluxnet system?"

Jon smiled. "Please do."

Completely illegal

Jon and Phil lunched in the Mekon canteen. They chose *karirais* and sat at a small table where they wouldn't be overheard.

"Well," said Phil, "did you learn what you wanted?"

"Yes, I did. It was a bit complicated but I think I have the general picture.

User data is encrypted using 64-bit prime keys. Vital signs data is tagged with industry standard tags and not encrypted. All the data can flow to the central Mekon server.”

“Did you ask *why* it can all flow to Mekon?”

“Yeah. The encryption doesn’t hide everything. It provides a kind of swimsuit coverage. The outlines are still plain to see. The idea is that Mekon can still do useful statistical analyses. The detail, the stuff hidden by the swimsuit, is dumped – or at least that’s the story.”

“Yeah, still right, so far as I know, but there’s more.”

“Right. The 64-bit prime keys aren’t really big enough. In fact, they offer no serious protection at all against decryption.”

Phil nodded. “Right, that’s it. I heard the Mekon CPU could crack most user data, if only it could find enough time.”

“Okay, so that’s one loophole. If a user has sensitive data, all he has to do is keep changing his keys. It’s so obvious, given the number-crunching power of the central server, that I can’t imagine many users falling for it.”

“Anything else you discovered?”

“Yeah – there’s a more serious loophole. The vital signs data is clear. It’s not crypted. The access protocols pick it out by the tags. There’s nothing to stop someone here from tampering with the tagging software to make it tag user data.”

“That’s new to me. Maybe this is what I didn’t understand before. I was told the photonet users changed their keys often enough, so I couldn’t quite see what went wrong. But the tags ... That’s dirty!”

Jon nodded. “That’s what I thought – if it’s really what happened. The warranty seal is put on inside Mekon, so anyone here could tamper with it. The only safeguard is a warranty clause that says the user can ask to see the tagged data that flows back to Mekon.”

“Well, okay, but who reads the small print in warranties?”

“So if the guys in Heidelberg and Oxford keep changing their keys and insist on seeing the vital signs data regularly, the obvious gaps are covered.”

“I can put that advice in my brochure. Thanks ... But what about Mekon decrypting normal research data?”

Jon sighed heavily. “I find it hard to imagine. Tapping all that raw data is a helluva job, really not worth the bother.”

“Well, that’s what Akira thinks too.”

“I didn’t mention the photonet scam to him. Does he know about it?”

“Of course he does, but it’s not company policy to dwell on it. The official line is that it was a department head who thought he’d cut a few

corners. He was fired and that was it.”

“So Akira wasn’t implicated.”

“No. Clean as a whistle. He was a junior at the time.”

Jon pondered for a moment. “To go back to your question, my estimate of the chance that Mekon can profit significantly from data drawn illicitly from biomanipulation robots is approximately zero.”

“Approximately. Would you care to explain?”

“It’s specialist data. You’d need to know as much about neurobiology as the guys who generated the data before you could even understand it. And almost all the data that’s worth anything is published anyway.”

“Ah, but when? We’re talking about a time advantage here.”

“Well, okay, it can take a long time to publish scientific data. With peer reviews, editing, production and so on it can take a year or more.”

“So Mekon can get a one-year head start by tapping the data at source.”

“Only if he can process the data, check it, get it properly evaluated and so on in a matter of weeks. He’s paying a lot for a very marginal advantage.”

Phil frowned. “You’re right. It doesn’t look very scary. But what about Shusako Mishima?”

“What about him? So Mekon is funding Mishima. He isn’t the first corporate boss to make a shady deal with a right-wing politician.”

“Mekon is a key player in the nuclear bomb shenanigans. Mishima would like to get his hands on a bomb.”

“Yeah, I’m sure he would, but if he gets into power legally, who are we to blow the whistle?” Jon pondered the CIA file gloomily.

Phil ate in silence for a while before replying. “We shouldn’t forget that the deal with Mishima is completely illegal. Mishima could get thrown out of Parliament and Mekon could get voted off the board if the news got out.”

“Really?” Jon brightened up. “In that case we should get it out.”

Weekend dates

Jon and Phil returned to Phil’s desk.

“I still have some work to finish up here,” said Phil. “Hey, this weekend. You’re off to visit your friend Yasuko, right?”

“Right – that reminds me. I have to call her.”

“Where does she live?”

“In Hamaoka. She says that’s about two hundred kilometers southwest down the coast, between Shizuoka City and Hamamatsu.”

Phil smiled, as if an amusing thought had suddenly occurred to him.

“Really ... when are you going?”

“Tomorrow, I guess. Or I could stop off for a day somewhere and meet her Sunday. I haven’t planned the detail.”

Phil mused with studied casualness as he sipped coffee. “I have an idea. You remember I have an old girlfriend in Shizuoka City. That’s Miko – we discussed her last night.”

“Yes, I remember. What of it?”

“Well, I was just thinking I’d quite like to see her again, for old time’s sake. She lives with her sister in a little two-bed apartment. Her sister is two years younger and is some kinda student. It occurred to me that you and she might get along well together.”

Jon smiled. What was Phil up to here? “Are you kidding? Are you asking me to go on a blind date when I’m just about to meet my dream girl?”

Phil grinned. “Dream girl, eh? No, really, I’m not suggesting you abandon all your scruples for some hot tramp. The sister is a real nice girl, with good manners and so on. I just thought it would be a good excuse for you to get acquainted with a pleasant provincial city, not a monster like Tokyo and not buried in the sticks like Hamaoka.”

“Buried in the sticks?”

“Shizuoka and Hamamatsu are about seventy kilometers apart. If they’re the nearest big towns you’re some way out.”

Jon hadn’t thought of that. But the boonies were fine by him. “Thanks for warning me. So you want me to help you out by getting Miko’s sister out of the way while you pursue your evil designs on Miko.”

Phil grinned again. “Something like that. How about it?”

“What can I say? What about our mutual friend Ruth?”

“She’s on the other side of the planet. No good for tomorrow night.”

“Oh dear, this is tempting ... Okay, I’ll play along. Yasuko can wait another day, I’m quite sure.”

Phil nodded with satisfaction. “Good. You’ve made a wise choice. I’m sure you won’t regret it. Now I’d better call Miko and make a date.”

Phil called her and Jon went off to the loo.

...

Jon returned. “Hi, Phil, did you reach Miko?”

“Yeah. It’s all fixed. We go there for lunch tomorrow and spend the rest of the day with them.”

“Good. Now I have to call Yasuko. Can I do it from here?”

“Go right ahead. You can do it from my neighbor’s workstation here.” Phil turned to his screen and Jon sat down and keyed Yasuko’s number.

“*Moshi moshi* – Tanaka Yasuko *desu*,” she said in a light, musical voice.

“Hallo, Yasuko! Jon Christie here. I’m in Tokyo.”

“In Tokyo!” Yasuko answered as her face appeared on the workstation screen, framed in long, loose black hair. Her face was as pretty as always and her shoulders were bare above a light summer top.

“Yeah, I thought I’d join you Sunday, if that suits you.”

“Sunday! Yes! When?”

“I don’t know yet, but Sunday afternoon maybe.”

“Sunday afternoon, okay. Where shall we meet?”

“I’ll be in Shizuoka with my Tokyo business colleague here. We have some business to take care of in Shizuoka.”

“Shizuoka City?”

“Right. Could we meet there?”

“Yes, of course! I can meet you there and drive you down to Hamaoka.”

“Sounds good. Where shall we meet in Shizuoka? I don’t know the city.”

“We can meet in railway station. Next to railway station, in same building, is big *depato* store called Parché. We can meet in music department. We can listen to music if we have to wait.”

Jon nodded. “Sounds great. Parché music department. Say five o’clock.”

“Five o’clock – *Hai!*”

“Hey, wait! Is the store open on Sunday?”

Yasuko looked puzzled for a second. “Parché is open every day.”

“Okay, then. Look forward to seeing you Sunday.” He waved goodbye.

She waved back. “*Bai-bai!*”

Jon put down the phone. He turned to Phil: “I’d better leave you to work. See you, ah ...”

“In two to three hours. Then we can go enjoy ourselves.”

The biomags

Jon spent another hour in the Mekon museum admiring the beautiful dances of the robots. Actually, he was beginning to get blasé about all these insect-brained machines. They were just puppets. There was no sensitivity to the here and now in their rigid routines.

But what about cyborgs? Computer viruses and the like were equivalent to Turing machines. Was it wrong to say they were alive? Hmm ...

Jon remembered the biomags in his bag. Time to put them to good use. He made his way to the *jinjibu* – the personnel department – and stopped in front of a smart office lady who appeared to be in charge.

“*Sumimasen, jinjibu desu ka?*”

“*Hai, so desu.*”

“Do you speak English?”

“Yes – I’m the manager.”

“Ah, good. My name’s Dr. Jonathan Christie and I’m a freelance journalist and software editor from Europe. I’ve been visiting a colleague here, Philip Ellis, in the promotion and public relations department.”

“Yes, I know him.” She was nodding sharply, as if impatient.

“I’ve just spent some time in the company museum and formed a very good impression of the company. I’d be delighted if I could do some publicity work for you, or some technical work, on a freelance contract basis. I’d like to leave my resumé with you.”

“Excellent. I’ll be happy to put your resumé in our files, Dr. Christie.”

Jon handed her the two copies of his biomag: “Here.”

“Thank you,” she said as she leafed through them. “We’ll contact you if we’d like to work with you.”

“*Arigato – shitsurei shimasu.*” Jon bowed awkwardly.

“*Gomen kudasai.* Here’s my card – please.” She held up a business card.

Jon took it and checked that one side was printed in English. The lady’s phone beeped and she picked it up. “*Mekon de gozaimasu* –” She glanced at Jon and held up a hand, palm facing Jon.

Jon raised a hand too and made his departure.

As he walked down the stairs he considered the prospects of his initiative bearing any kind of fruit ... rather low, but nonzero. At least the possibility was there. Working for Mekon could be fun. Would he tell Bob at Langley about all this? Was there anything worth reporting?

He emerged into bright sunlight and his thoughts dissolved.

Packaging

Jon spent the next two hours strolling around department stores in Shinjuku. The shops here looked better than in European cities.

There was a grace, a poise about their glittering displays, a magic sparkle that was more than mere professionalism. Yes, the displays were like *shrines* – to the brand-name gods of consumerism, to success in the international capitalist club, to the divine power of money. They were made by people who still *cared*, even when their work was just window-dressing, or the zen ritual of bowing politely to customers to make them feel like gods. Walking the shops here was an experience to be treasured, and time passed fast.

Jon sought out the photo album department in one store and approached a salesgirl. He extracted his own photo album, held it out to her with both hands in a gesture like that of the archetypal tea lady in the classical Japanese tea ceremony, bowed slightly in the correct manner and said:

“Purezento o tsutsunde kudasai.”

The girl gave a beatific smile, radiant with unspoken promise, and gently accepted the album with both hands in a rapture of soft receptivity. *Hai!* she breathed, with a musical tone as soft as a lover’s sigh.

She was skilled in the art of *origami* and wrapped the album with miraculous speed and precision. When she was done she handed back a shimmering package as neatly folded and layered at the corners as one from a Mekon robot. *Dozo!* she sang in a tone as pure as the coo of a dove.

“Arigato gozaimasu,” Jon remembered to say, in a growl laden with unslaked passion, as he ceremoniously accepted the beribboned parcel.

“Do itashimashite!” she chimed, clear as a bell, and irradiated him with a yet more angelic smile.

Jon wandered off in a daze, gazing with awe at the wondrous token in his hands, hardly daring to touch it in case it vanished like a mirage.

The street brought him down again. He stuffed the package into his overstuffed bag and walked on.

Holiday snaps

Jon rejoined Phil at his desk.

“Hi, Phil, how’s work?”

“Hi, Jon ... just let me finish this here.”

Jon pulled out his camera. “Mind if I take a quick photo of you?”

Phil glanced up. “Ah, the holiday snaps! No, go right ahead.”

Jon shot a few frames. “Hey, Phil, I’ve got another idea. How would you feel about my taking a quick snap of that letter you showed me?”

Phil looked up suddenly. “What for? Why?”

“Just an idea. Don’t worry – I just want my friend Yasuko to translate it and give me a sense of its tone.”

Phil frowned. “Why bring her into it?”

“I just want a second opinion, a native opinion, before I make up my mind about Chairman Mekon. I need to be sure of my position.”

Phil exhaled forcefully. “Well ... okay. But only a close-up. I don’t want you implicating me here.” Phil keyed off and stood up.

“Thanks. I appreciate it.” Jon followed as Phil headed for the cabinet in

addicts' corner. Happily, the corner was free of addicts.

Phil pulled out the file, found the letter and handed it silently to Jon, who laid it on the table and shot it close up. Phil put back the letter and the file. "Don't forget I'm trusting you to take care with that picture."

"Don't worry, I don't plan to make waves. I just want a second opinion, that's all." Actually, Jon could hardly imagine Yasuko's opinion making any difference, but it seemed sensible to check. "How's the work going? You said you needed three hours. Are you ready to quit yet?"

"Well, not quite," said Phil as he fished a coin out of his pocket. "I need about another hour. Sorry about that, but we've revised the specification for the brochure and now it needs reorganizing." He pushed the coin into a robot vendor, which rudely coughed up a can of orange juice. He waved the can. "Do you want one? Do you have coins?"

Jon nodded. "Yeah – hundred yen, right?"

"Right." Phil popped the top and drank.

Jon bought a can. "What do you have planned for this evening?"

"Aha – a special treat! I'm gonna go and hang out in a Ginza club with Ken and Nobo. You're welcome to come along too if you want."

"Who are Ken and Nobo?"

"Just a couple guys from photorobotics. Japanese guys – they're good to get drunk with."

Jon smiled. "Count me in – although I don't really wanna drink. Normally I hardly drink at all, but this week I seem to be drinking every night."

"Drinking? Last night? We didn't even get started!"

"Two beers. For me that's two more than usual."

Phil pulled a long face for a moment. "I plan to meet Ken and Nobo at the watering hole at seven, then we can all taxi together down to the Ginza. It's 5:30 now. I have time for another hour or so. Can you get lost for an hour?"

"Sure – watering hole at seven!"

Cyberspace

Jon walked into the watering hole a few minutes after seven. Phil stood with Ken and Nobo at the bar.

"Hi, Phil. Get your work done?"

"Near enough, yeah. Let me introduce you: Jon – Ken – Nobo."

"Hi, Ken. Hi, Nobo." Jon surveyed the pair. Ken was taller and seemed reserved in manner whereas Nobo was rounder and had an air of ebullience.

"Hi, Jon," said Ken.

“Hi, Jon, good to meet you,” said Nobo, extending a hand. Jon shook it. Ken extended one too and Jon shook it.

“We’re eating here before we start on the evening’s festivities,” said Phil.

“Good,” said Jon, “I’m hungry.”

“There’s a free stool,” said Phil, pointing. “Grab it quick. We’re eating *sushi* – you want in?”

“Of course,” answered Jon as he grabbed the stool.

Phil called Hiro-san and ordered more beer and sushi, then turned back to Jon. “Nobo says the club tonight is the best one he’s found so far.”

“Good. I’m looking forward to something different after all those robots.”

“I bet you are,” said Phil. “You can be sure that if Nobo likes the club it’ll be good. He must have tried all the clubs in Tokyo at one time or another.”

“You said he was in photorobotics, right?”

“Right. Ken too – but no connection with the scam.”

Jon nodded as if reassured. “I’ve been thinking ... I don’t think robot manufacturers will be able to make bionic consciousness modules at all. It’ll be a completely new technology, like silicon chips fifty years ago. I think the robot guys will get wiped out by a new wave of start-ups.”

Phil paused with a riceball in his hand. “Nah, I think you’re wrong. Chairman Mekon is too canny for that.”

“Chairman Mekon won’t be so canny in twenty years.”

Phil turned to Ken and Nobo. “Hey, guys, Jon here says Mekon will lose out when robots get bionic consciousness. What do you think? Do you think we’ll survive the transition?”

“Yes,” said Nobo, “as long as Nobby Mekon is in charge.”

“Right,” Ken added. “Mekon is at least five years ahead of the pack.”

Jon nodded. “I’m glad to hear it. But consciousness will need a completely new substrate, like silicon was new fifty years ago.”

Ken replied, “But IBM survived that transition. Mekon will survive this one. No-one builds better robots than we do.”

“Aha,” said Jon, “I guess I can agree on that. But what will Mekon do with robots with consciousness?”

“Sell them!” said Nobo with a grin.

“Yeah, but who to? What are the applications?”

“Same as for smart robots,” said Nobo.

Hiro-san set a beer and all the trimmings in front of Jon. “*Dozo!*”

“*Domo arigato*,” said Jon. He broke out the *oshibori* and wiped his hands. He turned back to Ken and Nobo. “But conscious robots won’t follow orders. They’ll decide for themselves what to do.”

Ken replied. "Smart robots are evolving in that direction. There isn't a sudden difference."

"I think there is." Jon saw this as a point of principle. Either there was a sudden difference or humans were Turing machines!

"Consciousness is data fusion at the quantum level," asserted Nobo. "Smarts is data fusion at the classical level. The difference is like between classical and quantum physics. But the correspondence principle implies no *sudden* difference."

Ken and Nobo started a dialog of their own in Japanese.

Phil shook his head sadly. "You've started something now. Hey – how would you describe what makes robots different from humans?"

"Well, you can always say in advance what a robot will do, given its input. The space of all its possible moves is fixed by the designer."

"Can't you define a space of possible moves for humans too?"

"No. Not in the same way. The robot space is a subspace of cyberspace. It's a countable infinity of finite configurations that contains predictable trajectories of arbitrary length. Whereas the space of human behavior is infinite in all directions, with no exactly predictable trajectories."

"You've lost me again ... here's your *sushi*."

At nightfall they took a taxi to clubland.

Nopan club

Shortly after nightfall, Jon and Phil plus Ken and Nobo were strolling along in the Ginza district, right in the heart of the city, between the Imperial Palace and the Tokyo Bay waterfront looking out onto Millennium Tower. The street was a dazzling arcade of giant neon signs on giant buildings. The wide sidewalk was packed with happy people – it was the weekend!

"Here it is, Nopan club!" said Nobo, pausing by a plain doorway set back in an alcove. The door was a slab of polished metal. He pressed the buzzer. The door opened slightly and a heavy-set goon in an ill-fitting suit and dark shades stood in the gap. Nobo exchanged a few quiet words with him and he let them in.

They stepped into an elevator and stepped out into a civilized scene, with subdued lighting, plush carpeting, potted plants, a long bar and sexy soul music. The customers they passed as they walked the length of the bar were mostly salarymen, but some guys in rakish suits and garish shirts looked more like *Yakuza* mobsters. The women looked like sex workers.

"This looks like it could be horribly expensive," said Jon.

Phil turned to Nobo. "Are you sure we can afford this?"

Nobo waved an arm casually. "No problem. The door charges are on the Mekon account. We only pay for the drinks."

They walked on until they reached a spread of armchairs surrounding low tables separated by tubs of lush vegetation. Except for the loud soul music, it could almost have been a hotel lobby. They sat down.

Jon looked around. Ahead of them, a step away from the end of the bar, was a circular stage, about waist-high and maybe five meters in diameter, surrounded by bar stools. It was unlit and no-one sat there. He looked back at the bar. Behind it served young men in penguin garb. Several pretty girls walked around in short white dresses.

Jon admired the girls, who were now grouping near the end of the bar. They looked rather like a bunch of sexy schoolgirls about to go and play tennis. Some of them wore light dresses, others separate skirts and tops. The dresses and skirts were pleated or flared and very short, and the tops left shoulders or midriffs bare. All of them wore little white sneakers. Jon was disturbed by how young they looked.

One of the girls separated from the group and walked over to the four. "*Konban wa – irasshaimase!*" she said in a high-pitched, playful voice. Nobo talked with her briefly. *Hai!* she piped and skipped back to the bar.

"I ordered double scotches all round," Nobo said.

"We'd better not do that too often," said Phil.

"We have to be in style," replied Nobo.

He was in style, thought Jon, almost raffish.

Jon turned to Phil. "How come Ken and Nobo speak such good English?"

"They studied in America. I pick my friends carefully."

A higher infinity

A spot of rather exotic math next, I'm sorry to say, but it's fairly painless.

•

Phil caught Jon's attention. "Hey, Jon, in the watering hole you said that the space of robot behavior was countably infinite whereas the space of human behavior was infinite in all directions, as if that was something more. What did you mean by that?"

"It's a question of ordering," declared Jon. "All possible robot behaviors can be ordered into a list, and therefore counted using the natural numbers. But there's no known way of ordering all the possible varieties of human behavior. I mean where would you start?"

“Does that mean there are *more* kinds of human behavior than robot behavior?”

“Well, in a way, yes. Uncountably many kinds, certainly.”

Phil frowned and took off his jacket. “Warm in here ... this difference between countable and uncountable gets me. I never understood it.”

“I can explain.” Jon pulled out a pen and grabbed a paper napkin. “Do you know how you can set up a one-to-one correspondence between the natural numbers and the rational numbers?”

“The rational numbers are just the fractions, right? So they’re like pairs of natural numbers, numerator and denominator.”

“Right. So you just list all the pairs in some systematic way and there’s the correspondence. That proves there are no more rational numbers than there are natural numbers.”

“Even though there are infinitely many rational numbers between any two natural numbers.”

“Right. The set of rational numbers has the same order of infinity as the set of natural numbers. They’re both countable sets.”

Phil frowned. “Okay. But the set of real numbers is different, right?”

“Right. The set of all real numbers is uncountable. It has a higher order of infinity.”

Phil shook his head. “That loses me every time. To be sure I’m getting this right, what exactly is a real number?”

“A real number is like an infinite decimal. Imagine writing an ordinary number with a decimal point and then just writing more and more digits after the point, randomly, to infinity. The result would be a typical real number.”

“But if you stop after a finite number, you get a rational number, right?”

“Right. That’s the funny thing about real numbers. They go on to infinity. All rational numbers are real numbers too, of course, but not all real numbers are rational. There are strictly more reals. Let me show you why. Imagine listing all the real numbers between 0 and 1 as infinite binary fractions, in any order you like –

0.0000 ...

0.1000 ...

0.0100 ...

0.1100 ...

...

Now consider the following real number. Let its first digit after the point be different from the first digit after the point of the first number in the list,

which in this case makes it a 1. Let its second digit be different from the second digit in the second number in the list, which in this case makes it a 1 again. So you get

0.1111 ...

You can see this number never appears in the list. It's different from the first number in the list at the first digit, the second number at the second digit and so on. It's different from *all* the numbers in the list, however long the list is, even if the list is supposed to contain all the real numbers between 0 and 1. Since this new number is also a real number between 0 and 1, that proves the list can't be a list of all real numbers between 0 and 1. The real numbers can't be listed, and therefore they can't be counted, and therefore the set of real numbers is uncountably infinite."

Phil furrowed his eyebrows into a perplexed expression. "I see that, in a way, but the conclusion still leaves me puzzled somehow. You're talking about infinite numbers and infinite lists."

"You're in good company there. Georg Cantor invented this argument in the 19th century, and people are still arguing about what it proves. Cantor thought it proved the existence of a whole hierarchy of infinities."

"What do you think it proves?"

"I think it gives us the mathematical space to deny that humans are machines. I think the infinity of human behavior is a higher infinity than the infinity of machine behavior."

Suckered!

The club slowly filled up with more people. Then the stage lit up. The whole circular floor of the stage glowed a uniform white, illuminated from beneath. Men from around the room got up and walked toward the stage.

"Time to move," said Nobo. "We need ringside seats!"

The four stood up and walked to the stage. They sat on four neighboring stools – just in time, for the others were soon occupied.

Jon set his whisky glass on a shelf around the stage and looked over at the bar. The girls were moving around, about to put on a show. The music now was a fast, thumping disco hit. One after the other, the girls skipped up the steps onto the stage and started dancing, disco style, on the platform.

This was pleasant to watch. Jon always enjoyed seeing pretty girls dancing. As their routine became more energetic their skirts flared up. Oh, wow – no panties – *nopan*.

Jon watched with a smile. As the girls twisted and shimmied, twirled each other around, kicked up their legs, and did tricks worthy of gymnasts, he verified that all seven had completely depilated vulvas, no pubic hair in sight. The smooth flesh tone of their crotches greatly reinforced the sense that they were all underage.

The music declimaxed and the girls left the stage. They went behind the bar and recovered their breathing. Jon drank down his whisky with a throat-burning gulp.

Nobo turned to face Phil and Jon. "Well, that was it. Not bad, huh?"

Phil nodded slowly. "Not bad at all."

"Charming," concurred Jon.

Nobo nodded and smiled. "There's more."

The audience waited a few moments. The music was sweet soul again. The girls came back up onto the stage. They squatted around the edge of the stage and talked with the spectators. One girl squatted in front of Jon. Her knees were apart and Jon's eyes stared at her soft pink labia, lit from below and glistening moistly just an arm's length away. "*Amerikajin?*" she asked.

Hai, he answered.

"You want more whisky?" she asked, with a Japanese inflection.

Hai, he repeated before he could stop himself.

The girl turned to Phil and asked the same question. The other girls were doing the same. Soon the girls stood up and walked offstage.

Moments later they returned with trays of drinks and handed them out. Jon looked at the whisky and sighed. He didn't really want it.

Phil turned to Jon. "I bet these are the expensive drinks!"

Jon grinned. "Hmm – we've been suckered. Nice show though."

"Too right. That's one experience you can't digitize. When it comes to sex, gimme real reality over virtual reality any day!"

Jon found himself musing again. Not all input to human consciousness could be effectively digitized. All three points in the definition of Turing machines were inapplicable to humans. He breathed a sigh of relief as he downed the whisky. It was worth it to prove he wasn't a machine!

...

They shared a taxi to Shinjuku station and Jon continued to Okashi Hotel.

He undressed, pissed, and flopped heavily into bed.

He glanced at Hal. To hell with it all – he was *on vacation!*

Anthropology

Humans are only human

Tribes

A weekend of pleasure coming up – sweet relief after so much hard work.

•

Okashi Hotel, Tokyo, Saturday, 9:00 AM local time. Headache. Jon-san open window, reach into fridge, pull out cola, swill down, belch loudly, crush can, rise from bed. Long, cold shower feel better. Mild hangover.

No bizz suit, no traXuit. Too warm. Laundry – call reception – maid bring up. Plastic wrap! Don cybergrunge shirt and baggy white shorts. Balls hang loose and cool. Feet on flip-flops.

He breakfasted in the lobby and read *Newsweek*. There was a piece on the signal from Epsilon Eridani – no news – good news – maybe it would blow over. A piece on the Quasar sabotage had some dramatic pix but a thin story. President Tom Smith was barking aggressive sound bites about Japanese robot exporters dumping in California. The Russian government had issued a press statement alleging Japanese fishing violations around the Kuril Islands and threatening a naval blockade. The Japanese government was struggling with another corruption scandal.

Politics was depressing. He'd once read the average person could maintain truly interpersonal relations with an average of about 150 people – the size of the traditional tribe, clan or village community. All the rest were just faces in the crowd. But now video stars were in everyone's inner 150.

The first President of Planet Earth would probably be an ex-video star. Starstruck Earthlings would trust no lesser personage to drive a hard bargain during interstellar negotiations with Commander Iman Alien of the Starship Eridanus from the Epsilon Eridani system for universal rights in perpetuity to Spaceship Earth.

Jon's head was better now. He packed his case and made his exit. He took a taxi to Tokyo Central railway station.

Boy scout code

Jon met Phil in front of the station at eleven. Phil too was in tropical kit but his shirt was white, his shorts were khaki and his sandals were leather.

They took the new-century Shinkansen from Tokyo to Shizuoka City. The trip was about 150 kilometers southwest down the coast, 50 minutes. They sat on the left side of the railcar and gazed out over the Pacific Ocean after they'd passed the urban sprawl of Kawasaki and Yokohama.

"In the Nopan club last night," said Phil, "you said you were burning with desire to see where life on Earth was going."

"Did I really? I've forgotten. And?"

"Well, I was wondering whether seeing far ahead can do any good. If I thought we were all gonna get chewed up by robots or something, I think I'd rather not know about it until it was too late to be worth worrying about."

"Really?" Jon was surprised.

"Yeah, like being nuked. If someone's about to drop a nuclear bomb on my head, I'd rather they did it quickly so I didn't have to think about it. You know, if you can't do anything about it anyway, why worry?"

"That's just it. Maybe we can do something. When you're in on the beginning of something, it might only take a tiny push to set the whole thing rolling in the right direction – or the wrong one."

"Like the butterfly starting a tornado?"

"Right, exactly ..." Looking through the windows on the right-hand side of the car he saw a smooth conical peak in the distance. "Hey, there's a big volcano up ahead."

"Yeah, that's Mount Fuji, Fujiyama, or *Fujisan*, as the locals say."

"Aha." There it was – its cratered top was 3776 meters above sea level, the highest peak in Japan.

"You can see it easily from Shizuoka," said Phil. "But what makes you think robots will ever become a danger to humans?"

Jon raised his eyebrows. "Are you kidding? You don't think we'll be protected by Asimov's laws, do you?"

"Asimov's laws ... One, a robot must not harm a human being or by inaction allow a human to come to harm, two, a robot must obey orders from humans if it can do so without breaking the first law, and three, a robot must protect itself from harm if it can do so without breaking the first two laws."

"Well done – you know the boy scout code for robots!"

"Don't knock 'em," said Phil. "They're good laws."

Macho hunk

Shizuoka City was the capital of Shizuoka Prefecture. Together with the port of Shimizu and the neighboring suburbs, it was home to around a million souls. Shizuoka railway station was big, clean and crowded.

Jon and Phil walked through the jostling throng to the main door. As they walked through the doorway the heat hit them again. It was over 300 kelvin (over 27°C) and humid.

They hailed a taxi. It was like the Disneyland cab Jon first caught in Tokyo. They settled in and turned up the air cooling. Phil showed a hand-written scrap of paper to the driver and they set off.

Jon admired the urban scene. The streets were very narrow, with very frequent junctions, and were overflowing with cars, vans, bikes, shoppers and heedless kids. The shops and offices pressed close together and there were so many colorful banners and signs hung up between the poles for the overhead power lines it was quite impossible to read them all. One that kept repeating said *love city* in chubbily rounded roman letters. It made Jon feel like they were in a welcome parade.

"This is all so pretty! It's completely different from Tokyo."

"Yeah," said Phil. "There aren't many *gaijin* in Shizuoka. When you wander around in the city here you feel like Richard Chamberlain in *Shogun* – as if you're the first Westerner they ever saw."

"Is it really so isolated?"

"Well, no. Shimizu – the seaport end of the city – is a major export hub for motorbikes. Shizuoka's the world capital for plastic scale model kits."

"Hey, plastic scale models!" Jon remembered all the Japanese 1:32 scale models of American superfighters and helicopters he'd made in his teenage years – and the 1:144 scale model of the Acropolis nuclear transporter he'd built just a few weeks back. What a small world! Here, in the home of all those kits, was where he should end up on a blind date. He looked with increased interest at the faces on the streets. Any of these guys could be in the model kit industry and have an eye for detail and a delicacy of touch finer than his own. Unlike in Europe or America, where he could easily be taken for just another computer nerd, here he stood out as a macho hunk with big killer hands and a morbid taste for rigorous workouts.

They were on a wider road now, heading north. Many of the houses looked as if they were transplanted straight from California. Ahead, in the distance, were the steep young mountains that ran the whole length of Honshu.

First contact

The taxi drove into a small, narrow, quiet residential street crammed with two-storey houses. The houses had tiled roofs, corrugated plastic walls and aluminum window frames, and opened directly onto the street. The taxi pulled up outside a house with an extension bridging over a parking space. A walkway along the extension's long north face accessed four doors.

Jon and Phil walked to the second door. Phil pushed open the mailbox flap and looked inside, then called into it.

"Konnichi wa! Miko – Hana – Phil desu!"

They waited a few seconds, then the door opened outward a fraction. Jon stepped smartly aside and Phil pulled it wide open.

"Haro, Firu, hisashiburi desu ne!"

The girl at the door was in her early twenties, with average height and build and a friendly, animated face sprinkled with freckles over the bridge of her snub nose. She had straight black neck-length hair cut with a fringe over her eyebrows and wore a loose green teeshirt and tight black cycling shorts. She stood barefoot on a polished wooden floor a step above the balcony level, and leaned forward to push open the spring-loaded door.

Phil held the door and took a step forward. "Miko, great to see you again." He touched her arm and kissed her lightly on one cheek.

Miko turned her head to present the cheek to his lips. *"Aitakatta!"* Then she noticed Jon. "Ah ... *hajimemashite!*"

Jon bowed slightly. *"Hajimemashite – Jon desu."* They shook hands.

Miko stepped back and gestured an invitation. *"Dozo – come in, please!"*

Jon and Phil stepped into the shoe-well, a space about the size of a big doormat cluttered with footwear. They parked their baggage on the floor, shed their footwear and stepped up.

The apartment stretched five or six meters ahead of them, a big square room with sliding glass doors across the width of the far wall opening south onto a narrow shaded balcony. In the corner to their left was a tiny bathroom and to their right a kitchen area screened off by a tall cabinet. Lined up along either wall, from the window, was a desk, a roll of bedding, and a rectangular plastic tent, like a phone booth, for storing clothes. In the center of the room was a low table flanked by cushions. Standing unobtrusively beside the bedding on the right was another young woman. She came forward to greet them.

"Hajimemashite – Hana desu." Her voice was soft and her manner was shy. She was about the same height as Miko but slightly rounder in outline.

Her hair was pulled back in a pony tail and her ears stuck out. Her face was smooth and blank and her teeth were irregular. She wore a loose yellow teeshirt and white satin running shorts.

“*Konnichi wa*,” said Jon and bowed slightly.

Miko rubbed her hands together as she considered what to do next. “Shall we have tea now? Would you like a cup of tea?”

Phil glanced at Jon and replied, “Beer might be nice.”

“I’d rather have tea, thanks,” said Jon.

Phil frowned momentarily at Jon. “I’d still like a beer.”

Miko foraged for a can of beer and a glass while Hana switched on a white plastic electric kettle and busied herself with teapot and teabags.

Phil strolled over to the open balcony window and looked down at a small garden next to the gravel courtyard below. “Your landlord’s cucumbers are looking good, Miko. Is he still pissing on them?”

Miko came back with beer and glass and put an arm around Phil’s waist. “Yes, he is.”

Phil turned to Jon to explain. “The landlord’s so proud of his cucumbers he goes out and pisses on them every morning. You see him out there, rain or shine, regular as clockwork.”

“Really?” Jon smiled.

Phil kissed Miko’s nose lightly. “It’s such a nice day I thought we might go down to Ohama beach for a swim. Whaddya say, Miko?”

Miko wrinkled her nose. “Yes, it is. We might go down ... is that right?”

Phil grinned and glanced at Jon. “Miko’s so fussy about her English grammar. She’s forever asking me if it’s right or not.” He looked back down at Miko. “Yes, sweetie, we might go down – but you have to say more – we might go down to the beach.”

“Or less,” Jon added. “We might period.”

“Right,” said Phil, “we might.”

Miko looked playfully confused. “We might? We might period?”

“Now look,” Phil smiled, “you’ve confused the girl ... We might go down to the beach – or – we might. But not – we might go down.”

Miko giggled helplessly, then pulled away and walked over to Hana in the kitchen. They exchanged a few quick sentences and she returned to Phil’s side. “Yes, we might go down to the beach. After we have drunk tea.”

Phil groaned. “No, not drunk tea! After we’ve *had* tea. Drunk is what you are after too much *sake*.”

Miko shook her head in mock bafflement. “Too much words!” She glanced at Jon and said, with careful elocution, “Jon? Why don’t you take a

seat and make yourself comfortable?”

Jon woke up from his dream. He was contemplating the anthropological problem of making first contact with communities who had never previously had any dealings with Western civilization. The last such contacts were in the 1930s when explorers discovered isolated hill tribes in New Guinea. Crossing the language barrier without importing too many prejudices was always a major problem. First contact with extraterrestrials would be *much* harder ... He caught Miko’s glance. “Oh, yes, thank you.”

Hana walked over from the kitchen area with a tray. On the tray were a gilded china teapot, four elegantly decorated bone-china cups and saucers with engraved teaspoons, a sealed plastic thimble of milk, a wrapped pair of sugar cubes and a plate of cellophane-wrapped biscuits with a German brand name. She set the tray carefully down on the table and said, “Ah, Jon, would you like a bite of something to eat?”

Jon pondered her utterance. “Er ... not now, thanks.”

Hana settled expertly onto a cushion and set out the tea things.

Phil poured his beer and set the can indelicately on the tea table. “Let’s not spend too long here. I’m ready for a swim. How about you, Jon?”

“Yeah, me too. But let’s enjoy the tea ceremony first, eh?”

“Okay.” Phil sat on the chair at Hana’s desk.

Hana poured out four cups of tea. Miko settled on the cushion facing her. *Itadakimasu*, they said to each other as they took their first sips.

“Are you with Mekon Corporation?” Miko asked Jon.

“No, I work for Media International in Heidelberg, Germany. I work as a software editor, and some of the software I edit is used by Mekon.”

“Ah so,” Miko said quietly.

“What do you do?” Jon asked her.

“Me? I am teacher of movement and dance here in Shizuoka.”

“That’s how she keeps her bod in such good shape, eh, sweetie?” Phil said, with friendly leer at Miko, who looked down meekly.

Jon looked over at Hana. “Hana, what do you do?”

Hana glanced momentarily at Jon and looked down. “I am a student at Shizuoka University. I study American media.”

“Aha,” said Jon. “Which media?”

“ANN – Associated Network News.”

Jon smiled. “Oh, right, that’s interesting ...”

The conversation continued pleasantly. Then they went swimming.

Sun worship

Miko drove Phil and Jon and Hana to the beach in her sporty little hatch-back. Japanese people drove on the left, as in Britain, so Miko sat on the right. The car had four-wheel drive and steering and a peppy ceramic rotor motor, and they buzzed along at a zippy pace through the city.

The beach was steep and gritty, said Miko, and the sea was cold, so people bathed at a big open-air pool complex set behind a massive sea wall. She parked nearby and they walked in through a paygate.

It was filled to capacity. They had to wait until a family group vacated a patch before the sisters could spread their straw mats. Jon and Phil sat on the mats while the sisters went off to the changing room.

Jon contemplated the scene. The packing density was as high as in a penguin or seagull colony. Yet the huddled masses sat and lay in the sun with the same evident pleasure as people on any more spacious beach.

“Phil, here’s a philosophical question for you. Do you think this crowd proves that we can pack ten times as many people on this planet before it starts to get overcrowded?”

Phil raised his eyebrows and considered. “Depends. If the extra 90% were Japs, yeah. But Americans, no.”

“Really? Why are the Japs different?”

“Two things. They’ve been genetically more or less separated from the rest of humanity for about two thousand years. And they were cut off culturally from about 1600 to 1868.”

“What happened in 1600 and 1868?”

“In 1600, Tokugawa Ieyasu, the first *Shogun*, unified Japan and got tough with the Christians who’d been popping up everywhere since Francis Xavier landed in 1549. Ieyasu threw out all the foreigners and massacred all the Japanese Christians. Only a few Dutch traders were allowed in Nagasaki. The country stayed hermetically sealed until 1853 when four U.S. Navy ships under Commodore Perry sailed into Tokyo Bay and scared them all so much they started to open up. When the Emperor Meiji took over in 1868 he started a period of furious modernization. The rest, as they say, is history.”

“Hey, you know your dates! Do you think the Japanese ability to tolerate overcrowding is genetic or cultural?”

“Bit of both, probably. Most Japanese genes came from China, via Korea, and the Chinese like crowds too. Why?”

“I was just thinking about it at the Nopan club last night. About how there might be a genetic difference – just a marginal one.”

Phil glanced at him with a frown. "Go on."

"Well, it was the dancers who gave me the idea. They looked so young. The technical term for preserving fetal characteristics into adulthood is *neoteny*. Neoteny is the basic difference between humans and chimpanzees. My idea is that something similar, but less gross, might be true for Japs. Getting on together in crowds might be another aspect of neoteny."

"That's a hot potato," Phil mused as he stroked the fine black hair on his forearms. "It's an interesting idea but I dunno."

"Just a thought ..." Jon sighed.

The sisters returned, wet from a shower and wearing black string bikinis, and settled elegantly on the mats. Jon and Phil dutifully went off to change and shower, and returned raring to go.

"We have to swim two and two," said Miko.

"Uhuh," said Phil. "I suspected as much. Who's first?"

"I stay," said Hana.

"I stay too," said Jon. This gave him a chance to probe Hana gently without interference. Phil and Miko went off to swim.

"So," said Hana, leaning back on her elbows, "how do you like Japan?"

"It's very pretty – the girls are pretty too."

"You like Japanese girls?" Her voice was light and playful.

"Well, yes, they're very sexy –"

They continued their banter – it was only a distraction while they eyed each other up – until Miko and Phil returned and let them go and swim.

It was standing room only in the water, more of a bath than a swim. Jon was amused by the way schoolgirls splashed around him shrieking *Haro!* at the tops of their voices. So exotic was he, a *gaijin* in their swimming pool!

An hour or so later they packed up and went for a stroll along the sea wall.

Love hotels

The sea wall stretched away into the distance. On the seaward side it fell in a smooth curve to the gravel beach and on the landward side it was banked down to a parallel road. On the other side of the road was a row of hotels set among trees. Along the top of the wall was a footpath on which the foursome walked southward.

Hana walked beside Jon. "Why have you come to Japan?" she asked.

"On vacation. I have a friend here. I plan to meet her tomorrow."

"A Japanese girlfriend?"

"No, just a friend. I met her last summer in Heidelberg. We spent a few

days together.” He looked at the hotels on their right to change the subject.

“Are these hotels fully booked now?”

“Fully booked?” Hana didn’t understand.

“I mean are there free rooms in them?”

“Free rooms, yes. They are love hotels.”

“Love hotels ... oh, you mean for lovers.” Jon was suddenly embarrassed.

“They are not for tourists ... sorry.”

“I’m sorry, I didn’t mean ...”

They walked in silence until Phil and Miko interrupted them and the foursome came to a halt. They paused to admire the view, then turned and retraced their steps. Miko and Hana fell behind and Phil walked beside Jon.

“Well,” said Phil, “Whaddya think? Nice girl, eh?”

“Nice girl. Very friendly.”

“What she needs is a lover. Miko says she hasn’t slept with a man since I met her. That’s two years ago. Two years without the delights of bonky-bonk – can you imagine?”

“That ain’t so amazing. It’s been five years for me.”

“Well, okay, not amazing. Just a waste, that’s all.”

“Did you and Miko sleep together with her there?”

“No. When she was there we used to come here to these hotels.” Phil waved expansively at the hotels on their left.

Jon smiled. “You had some manners, then!”

“Sure, I’m a nice guy. But tonight we could do it different.”

Jon felt a cheesy sense of inevitability about all this. “Tonight we stay with them in their apartment, is that it?”

“Just an idea. Whaddya think?”

Jon smiled ruefully. “I guess I can handle it. She’s pleasant enough.”

Phil smiled. “Don’t be too eager! What’s the problem?”

“I’ve been celibate for five years now. Why should I blow it all for a girl I met just a few hours ago?”

“Why not? It’s the perfect way to get back into action!”

“You think I wanna get back into action?”

“You mean you don’t?”

“I wanna think about it.” Jon fell into thought.

He was still thinking during the trip back in the car. What to do? He had a whole ideology of rationalizations for why an active sex life was a bad thing and a road to ruin ... Miko’s smooth tan thighs swayed beside him as the car sped on. They looked good enough to *eat*!

Gallantry

The foursome entered the sisters' apartment, dropped their bags and towels, and stood wondering what to do next.

"I vote," declared Phil, "we go to the Atsuban disco tonight. Whaddya say, Jon, how do you feel about a night at the disco?"

"Great. Chance to see the locals in their native habitat. I vote for it too."

Phil turned to Miko. "Jon the anthropologist votes for it too. How about you, honey pie?"

"Yes, I do," Miko said and giggled behind a raised hand. "I want to do it."

Phil turned to Jon. "Ain't she good? I love it when she does that!"

Hana consulted quietly with Miko and turned back to Phil and Jon. "You are both welcome to stay here tonight. We have space on floor for you."

"Well, thank you," said Phil and bowed with an exaggerated flourish. "We accept your kind offer." He looked quickly at Jon. "Don't we, Jon?"

Jon nodded and looked at Miko and Hana. "Of course. I'm honored at the invitation and delighted to accept – thank you."

Miko smiled, with her lips closed over her teeth, and replied with careful elocution, "You're welcome."

Hana disappeared into the bathroom and Miko went to the kitchen area.

Phil glanced conspiratorially at Jon. "Well, how do you feel about it? You're really doing well on your first date!"

Jon pulled an anti-smile. "Too well. I wasn't reckoning on this. Is there bedding here for two extra beds?"

Phil smiled wickedly and raised both eyebrows. "No!"

"Perhaps we should think this through a bit –"

Miko returned with two cans of cola and two glasses. "Here, please."

Phil took a can and a glass. "Jon's worried about the sleeping arrangements – what shall we do?"

Miko gave Jon the other can and glass. "We have wide *futons* for sleeping guests. It's no problem."

Jon liked the way Miko made 'sleeping' sound like 'sureeping' by flicking her tongue against the back of her teeth for the 'l/r' sound. "It's okay," he said with a big smile, "I can handle it."

Miko looked at him observantly for a moment. "Do you prefer hotel?"

Jon shook his head. "And miss your company? I'm honored, really."

Miko smiled and turned to Phil. "You are not so gallant, I think."

Phil looked up. "Gallant – where did you get a word like that?"

"I read romance for my English," said Miko and returned to the kitchen.

Hana came out of the bathroom and Miko went in. Hana unzipped her wardrobe tent and stood wondering what to wear.

Jon watched her as she stood statuesque, as beautiful as any young woman in her prime. She took out a white stretch leotard with waist-high leg cutouts and pulled it on under her towel, then turned her back as she took off the towel and pulled up the top. Next came a flared scarlet miniskirt. She glanced at Jon, her eyes glinting with carnal knowledge. She was well aware of her sexuality. She started blow-drying her hair.

Miko came out of the bathroom. Jon was next, then Phil. Jon put on a white shirt and baggy black trousers. After a few more minutes of fussing with combs, perfume, jewelry, bags, jackets and footwear, they finally headed out the door.

Condoms

The Atsuban disco was on the top floor of a lo-rise block in the entertainment sector of the city. Miko and Hana had membership cards.

The view that greeted them as they walked in was a civilized one. Subdued lighting, exuberant pot plants, deep carpeting, deeply upholstered seating around low tables, penguin-liveried waiters in white gloves – much like the Nopan club, except that the clientele were decent middle-class folk.

They settled in a suite of armchairs around an elliptical table.

“I wanna look around,” Jon said to Phil.

“Okay, but we’re gonna break into our bottle. I take it you want in.”

“Your bottle?”

“They have a bottle bank here and Miko and I have a bottle of scotch on the go. We plan to shoot up some alcohol before we go jumping around.”

“I see. Well, I’ll have a finger to be sociable. Then it’s strictly water and cola. I had a hangover this morning.”

“Really?” Phil smiled. “Musta been all the excitement!”

Jon stood up. “Okay, folks. See you in a while.” He walked off to look around. On his right as he walked into a large dancehall was a double door into a lobby. He went through – it was a fire escape onto the roof. A good place to get romantic! He went back into the dancehall, where the music was loud and thirty or forty people were dancing.

He returned to Phil and the sisters. On the table was a bottle of scotch together with ice, water, glasses and *oshibori*. Jon sat down beside Hana.

“Here – let’s get started on the scotch.” Phil poured a generous finger into each glass.

The sisters diluted their shots with plenty of water and ice, then the four drank a toast – *Kanpai!* Soon they were ready to rock.

Jon moved with a grace honed on teenage nights in London clubs. Phil strutted his stuff with style and Miko's movements were as smooth as you'd expect from a teacher of movement and dance. But Hana was different. She moved with an awkward hesitancy that seemed almost clumsy. Maybe Jon's vibes were too weird ... pity. After an hour or so, when she began to droop, Jon took her out onto the roof.

It was cool under the stars. They were alone and the view over the city lights was romantic. They walked to the handrail farthest from the door.

"Tell me about yourself," Jon said. "Do you have a boyfriend?"

"No ... I study a lot. I have no time for boys. I hope I will not be too old when I finish studying."

"Do you like boys?" He looked at her and she held his gaze.

"I like ... older boys ... with an interest in philosophy."

Jon smiled. He was cut out for the role! "Do you like me?"

"You?" She looked embarrassed. "Yes."

Jon felt annoyed. This was too easy – he didn't really want sex with her. Gazing out over the cityscape, he replied, "I like you too."

Hana crossed her arms and shivered. "I'm cold." Jon ran his hands gently around her bare shoulders and she rested her head on his chest. They stood in silence for a while, then Hana asked: "Do you have a girlfriend?"

"Me? No. I had a girlfriend five years ago. She died. Now I live alone."

"Really alone?"

"Yes. I haven't had sex with anyone for five years."

"What about your Japanese girlfriend?"

"She's just a friend." Jon sighed at his own duplicity.

Hana put her hands on his hips. "You are taller than me."

Jon pushed her back to the handrail and put his hands on her waist. "I can lift you onto the rail."

"Okay." Hana let him lift her onto the handrail, which had a wide, flat wooden top. She balanced with her bare thighs on the wood and her hands on his shoulders, then pulled him toward her. Now their heads were at the same height. She spread her legs apart to let him move in closer.

Jon wrapped his arms around her and pressed her body to his. Their faces met and they kissed, slowly and softly. Eventually Jon spoke. "Shall we sleep together tonight?"

Hana pulled back and looked into his eyes. "I don't know ... yes."

Jon gazed back. "Ah ... are you protected?"

Her eyes closed, then opened again, slowly. “No.”

Jon sighed. No condoms. Not his style. Never even learned to use them. Sexually transmitted diseases and unplanned pregnancies didn’t make it as problems when your sexual ethic limited you to true love or dud wanks. His problem as an adolescent was to stay cool and resist temptation. His problem now was to find a polite way ...

“Let’s go in,” she said.

Back indoors, they were all were ready to go. They took a taxi.

Touchdown

Back at the apartment, after shedding shoes, bags and jackets, the two couples stood in the center of the room deciding their plan of action.

Jon noticed it was almost midnight. “Can we watch the television news?”

Miko looked surprised. “The news? In Japanese?”

“Do you have news in English?”

“*Ah so*. Yes, we do.” Miko turned on the hi-def set on Hana’s desk and selected a channel. A newsreader appeared over a red banner with the words *ANN live from Tokyo – Ken Kaneda*:

“Good evening. The Acropolis lander has landed.”

Ken Kaneda had Japanese eyes, a clipped mustache and a smart suit and tie. His accent was flawless Ivy League.

“Just over an hour ago the Acropolis robot lander module separated from the support module in lunar orbit and made a perfect touchdown on the far side of the Moon. A pair of robot rover vehicles drove onto the surface and made a brief tour of the landing site, which will soon become the construction site for the lunar observatory.”

The view cut to the surface of the Moon as seen from one of the rovers. Bright sunlight shone vertically down on the pale gray rubble-strewn lunar regolith. The jagged horizon was startlingly sharp against the pitch black of space. The rover was moving steadily over slightly bumpy terrain and its camera was slowly panning the landscape.

“The landing site is at the center of the far side of the Moon, between the craters Mendelev and Korolev, and out of direct radio contact with Earth. The signals are being relayed via satellites in lunar orbit. Six satellites are being used to maintain continuous contact with the robot landing party. The Moon is about 380 megameters away and the signals from the robots take about one and a quarter seconds to reach the Earth.”

Jon admired the view from the robot scout and listened as the voice-over

gave more technical details. Actually, there wasn't much too see. Gray lunar dust and bumpy terrain with a scattering of rocks were worth a few seconds' attention, no more.

Jon looked around the room. Phil and the sisters hadn't been watching. They were getting ready for bed.

Jon returned to the Moon. He watched as the view from the robot scout panned to the lander, which was a big silver cylinder set upright between four angular legs. The second robot scout came into view beside the lander. Its six white beachball wheels, small articulated body, golden lobster claws, vidcam pop-eyes, and raised telecom dish at the tail end reminded Jon again of a scorpion. The newscaster continued.

"The robot scouts were made in Japan by a consortium of manufacturers headed by the Mekon Corporation. They will survey the site in detail over the next two days before starting work on the foundations for the Acropolis control center and the telescope rings. The Acropolis project is organized by Japan's National Space Development Agency NASDA, America's NASA, and the European ESA."

Cut back to the studio: "Here in the studio we have NASDA boss –"

Jon listened with renewed interest and time passed. When the show was over he turned it off. The room was now in darkness and Phil and Miko were in bed. Hana sat quietly in bed wearing a *yukata*, gazing at him with a blank, moonlike face.

He went and finished up quickly in the bathroom and returned in shorts. He lifted the *futon* and jumped in with Hana. She turned her back on him. He fondled her gently through her *yukata*.

She turned to face him and they kissed tongue-to-tongue. They started a silent, sensual wrestling bout, and soon they were naked. Hana rubbed her hairy mons passionately, painfully, against Jon's hard penis – *ouch* – *ah* – *no!* – *oh!* – *sweet bliss!!!* – he came, flooding the hair with wet slime.

With a weary sigh, Hana grabbed a tissue and mopped up the mess. Then, slowly, more gently now, she continued her sensual massage of Jon's body. He responded as best he could, and fondled her clit with fumbling fingers unused to such artful play. At last, when his wrist was aching with the strain, she came, with long, deep sighs. What a relief!

They slept.

•

You may think Jon was an unfeeling sexual idiot. In fact he was just out of practice. He was no sexual athlete.

Morning rites

Jon awoke at dawn on Sunday to find Hana's back turned to him. Carefully, he pulled his trapped arm free and got up. He stepped over to the window and pulled aside the curtain.

The roofscape looked peaceful in the dawn sunlight. Below the window was the gravel courtyard and the landlord's garden. There was an old man in the garden, as fat and bald as a Buddha, with a *yukata* over his shoulders and *geta*, heavy wooden platform sandals, under his feet. Sure enough, as Phil predicted, he was pissing on his cucumbers. Jon admired the scene silently as the old man clip-clopped back indoors.

Jon went to the bathroom for a long, cool shower. When he returned, in shorts, Phil and Miko were awake and alert. "Morning," he said.

"Hi," said Phil sleepily, scratching his head.

Ohayo, said Miko as she pulled herself up, posed nude for a second as she put on her silk gown, and shuffled off to the bathroom.

Jon turned away to meditate in the morning sun ... *bliss* ... He felt the sun on his chest and melted into the timeless sea of photons streaming in the blue beyond the window. Time passed ...

He turned back to the room. Phil was now in the kitchen with Miko.

Hana awoke and sat up. Jon was by the window. She grabbed her *yukata* and came over to him. They pressed bare upper bods together one last time before she went off to the bathroom.

Miko brought a tray laden with tea things and set it on the low table. She reached over to the stereo and turned it on at low volume. Gentle heaven-rock from a Japanese band filled the room. She poured four small cups of green Japanese tea. *Dozo*, she said.

Jon and Phil sipped tea with Miko until Hana rejoined them. The sisters conversed quietly with each other. Then came more tea and a breakfast of toast and English marmalade.

Miko looked up at Phil and Jon. "We would like to visit a rock pool in the mountains. There is a shrine there. It is not far from here."

Phil and Jon said okay.

Antichrist

Miko drove the foursome northwest up a river valley into the mountains. Jon sat back and meditated.

He was going to a shrine on a Sunday morning. After a night of gentle

sensual pleasure, a warm bath of the soul, what could be more fitting? He wasn't prejudiced about religion. His communion with God was internal and natural, unforced, and undisturbed by the public manifestations of others. A quiet spot in the mountains was just right.

Organized religion was a political thing for Jon. The insights marketed by religionists into the operation of divine causes in the universe were inferior to those offered by organized science. He saw only one cognitive point in favor of religion. Insightful religionists recognized more clearly than most that the power of subjectivity went far beyond human personality.

Jon had an open mind on the possibility of nonhuman subjects. For him, nothing stood in the way of machines with minds. Was he a machine? Not a deterministic, finite-state, digitized-input machine but a probabilistic, open-ended, holizing machine? As he sat gazing at the rural scenery gliding past, God told him the answer. Yes!

He was a love machine! Love opened up the subjective realm of inner states. Sex, the animal expression of love, thrust chaos into genetic programs that would otherwise freeze hard. And the compulsive fantasies of love and sex fuzzed out sensory input into deltas of virtual experience. A love machine – that was it!

Religions confirmed his answer. The Judaic monotheisms were virtualized harems in which believers were either eunuchs or concubines. The potentates in the monotheistic order were those who could see themselves, however fleetingly, as surrogates for the Almighty at moments of seminal importance. The politics of love reigned supreme.

But in the world of 21st-century global *Realpolitik*, religions claiming a Judaic lineage were politicized almost beyond salvation. No rational seeker of divine truth would expect to find it among the megatribes who competed for exclusive rights to the estate of the God of the Jewish patriarch Abraham. The citizens of the United States of America were slowly waking up to this fact. President Tom Smith's self-serving appeal to Mormon millenarianism was surely transparent enough to break the illusion ...

Miko said, "Ah, news!" and turned on the radio ... listened ... and turned the volume down. "News not so good. Liberal Democrats have lost business community support. National Heritage party is ready to take over. Shusako Mishima may become Prime Minister. President Tom Smith said Mishima is an antichrist. What is an antichrist?"

Jon blinked. "An antichrist is an enemy of the Christian God. It's an old word. Using it like that is like calling for a holy war against him."

"War?" Miko sounded anxious. "Why?"

Phil replied: "Smith's a fundamentalist. He uses extremist language. But Congress will hold him back, don't worry."

"I hope so!" Miko sounded quite alarmed.

They drove on. On either side they passed bumpy little plots filled with green tea bushes. The road was narrow and the river valley was a channel of gray boulders in the summer heat, with just a thin stream of water splashing down among them. Behind the tea-bush plots were steep hillsides faced with banks of trees. They drove past a little cluster of tumbledown shacks, over a tiny rustic bridge, through an old stone gateway and along a bumpy gravel path. The uphill gradient became steeper and the track became narrower and bumpier. The tea-bush plots were smaller now and steeply inclined. The trees loomed yet more thickly ahead and the boulder-strewn river channel between them broke into a stairway of tiny waterfalls.

Miko stopped the car in a small stony clearing. They all climbed out and admired the view. The sky was clear and the sun was strong but the air was cooler here. They looked down the valley to the sea and saw the whole city stretched out in the distance.

"This way," Miko said, striding toward a gap in the foliage ahead.

"How did it go with Hana last night?" asked Phil.

Jon smiled to himself. "Good – very relaxing."

"Thank God for that ... I was beginning to think you were anti-sex."

"Not at all. I think sex is glorious – holy, even."

"So how does it feel to have your five years of celibacy behind you?"

"I ... I don't see it that way. I won't have it really behind me until I'm in love with someone again." Jon loved everyone, new-age style, but being *in* love was something more ... "Hey, what about Smith on Mishima? What do you think he meant by calling him an antichrist?"

Phil shook his head. "Beats me. Religious nuts are beyond logic. But I told you Mishima was a dangerous guy. That tends to confirm it, I'd say."

"But calling him an antichrist is heavy. What's he done to deserve that?"

"Mishima's a Japanese racist and a militant right-winger. He wants to see Japanese industrial cartels set up global monopolies in strategic industries. And his big hero in Japanese history is Tokugawa Ieyasu, the guy who closed Japan in the 17th century."

"The one who killed all the Christians?"

"Yeah. Mishima thinks the Westernization of Japan has corrupted the pure Japanese racial ideal. He wants to stop the rot."

Jon mused. Maybe the CIA would pay for his vacation!

Baptism

The foursome came to in a grassy clearing surrounded by trees, with a rock pool ahead of them. A stairway of boulders fed a steady trickle into the pool, which was some four meters in diameter and maybe waist-deep in the middle. The bottom was pebbly and the water was crystal clear. On the far side, on a low rock, was an ancient Shinto shrine, a child-size and weather-worn stone pagoda with a small hollow in the front. Incongruously, almost comically, the pagoda wore a red woolly hat with a pom-pom on top.

Jon gazed around. "It's wonderful, superb, perfect ..."

Miko and Hana took off their shoes and sox and walked carefully around the edge of the pool to the little shrine, where they stood still for a moment, clapped their hands loudly and then pressed them flat together, bowed their heads and closed their eyes.

Jon and Phil took off their shoes and sox too. They sat at the edge of the pool and dabbled their feet in the water.

"What I really fancy," said Jon, "is a dip in this pool."

"You sure? It's cold!" Phil replied.

"Hey, Hana," said Jon, "how about a swim in the pool?"

"Swim – *waagh!*" she said in a mock squawk.

Miko looked more interested. "Okay – do it!"

"Okay, I will!" Jon stood up and took off his shirt.

Phil stood up. "Alright!" He took off his shirt too.

Jon took off his shorts and jumped naked into the pool. It was cold! He splashed around until he'd adjusted to the shock. "I name this ship Planet Earth!" he called out. "May God bless her and all who sail in her!" He held his nose and dunked himself completely, and came up streaming water and gasping from the cold.

Phil followed. "Yaargh! It's cold!" he yelled, finding his footing on the pebbly bottom. He looked up at Miko. "Come on in, it's great!"

Miko hesitated for about a second. She pulled off her traXuit and nix and jumped into the water with a loud *Waagh!*

Hana looked unhappy for a while longer. She took off her traXuit and nix slowly and lowered herself carefully into the water. As she waded cautiously toward the center and the water level reached her waist she shuddered and wailed "*Eee – samui!*"

Miko jumped around and splashed Hana playfully. Hana turned away with her arms pressed to her chest, then turned back and grabbed Miko's arms. Miko pushed, Hana pushed, and they both ended up fully submerged. Hana

pulled free and scrambled out as Miko dunked Phil.

Soon they got dressed again, returned at a brisk pace to the car and drove back to base.

The meaning of life

Sun had overheated the apartment and Jon and Phil stood on the balcony. They planned to enjoy a leisurely lunch at a local restaurant and then go their separate ways.

“So,” said Phil, “how are your thoughts on androids developing?”

Jon squinted in the glare. “Slowly ... what worries me now is motivation. Why flood the world with bionic machines?”

“Why does it interest you so much?”

“Doesn’t it interest you to know how the future will develop?”

“I have enough to worry about in the here and now.”

Jon sighed. “I worry about the meaning of life. Why are we here? What’s it all for? Why bother with anything?”

“Why not commit suicide and save yourself the worry? As I see it, if you’re living right, the meaning of life takes care of itself.”

“It’s not that simple for me. I have a feeling that if I just settled down I’d be missing something. And right now I have this definite sense that what I’d be missing is something to do with androids.”

“Wait a minute ... this bionic consciousness stuff all comes from your weekend in Oxford, right? The weekend with Ann.”

“Right, that’s when the thoughts took off. I’ve been trying to make sense of a sudden expansion of my mental horizons.”

“What were you thinking about before that weekend?”

“Well, I was searching. I just didn’t have a focal point for an answer. I was trying to structure my thoughts about the future somehow. Now I feel I’ve taken a big step forward and it’s all coming together.”

Phil nodded reflectively. “That’s it ... that girl Ann has gotten to you. It’s her, not the bionic consciousness stuff.”

Jon grinned. “What a horrible thought – she’s as boring as I am!”

Phil smiled. “Right – I knew it!”

Jon shook his head gently. “I don’t think something as simple as meeting a girl can change a person’s whole philosophy of life.”

“I’d say that *only* something as simple as that could turn your whole world upside down.”

“Nah ... I’m not as romantic as that ... Anyway, I’m still worried about

philosophy. Why make yourself immortal as a machine?”

Phil shrugged. “Why bother to live at all?”

“Yeah, but what’s the *meaning* of it all?”

“What’s the meaning of meaning?” mused Phil.

“I’m going in. I don’t wanna get nuked by the Sun.”

They went in. The sisters had changed. Miko now wore a tennis shirt and red shorts, and Hana wore a long dark-blue Eighties retro teeshirt with a picture of E.T., Spielberg’s extraterrestrial, on the front. They packed their bags and went to lunch.

Miles away

The restaurant was on the top floor of a department store. Along one wall were alcoves in traditional style. Miko and Hana insisted they sit in one. It was cubic, framed with light bare wood, with paper-panel side-screens and four *tatami* mats set in a swastika pattern around a low square table.

A waiter brought *oshitori* and water and Miko ordered from the menu. Jon looked around. Numerous normal people sat around normal tables and chairs. They could have been just about anywhere ...

Globalization had won. There was no civilized corner left on the planet that was more than an alcove in the global village. At the level of shared social reality – social consciousness – humanity had been unified. The holy ghost now haunted the whole of Megablob.

My consciousness, said Jon’s left hemisphere to his right, is a part of global – *universal* – consciousness. It belongs to me in the same socially contracted sense that Hal the computer belongs to me. These hemispheres are the locus of certain property rights. Am I a legal fiction?

Phil noticed Jon’s abstraction and caught his eye. “Wake up! You were miles away again.”

“I was thinking. I don’t know where. Where are we when we think?”

Phil smiled. “How about in our heads?”

“No, I don’t think we think in our heads. I was *delocalized*.”

“Okay, have it your own way!” Phil turned back to Miko.

The waiter approached with a tray and they turned their attention to the meal. It came in numerous small black bowls and consisted of thin soup, fragments of fish and pickled vegetables, and noodles. They tackled the items with *hashi* (chopsticks). Hana had to show Jon how to use them.

“Well, Miko,” said Phil at last, “It was great to see you again. I’m gonna miss you next week back in Tokyo.”

"I'm gonna miss you too," said Miko with a musical lilt in her voice.
Jon gazed at Hana. Zillions of photons danced between their eyes.
Soon they finished up and left.

Sayonara, sisters

They walked to the railway station, where Phil was to depart for Tokyo.
They stopped at the ticket barrier.

"Well, Jon," Phil said, "Good luck with your friend Yasuko."

"Thanks. You take care in Tokyo." They shook hands.

Phil reached for Miko and they embraced. "*Sayonara*, sweetie." They kissed briefly. Phil picked up his sports bag and advanced robustly through the ticket barrier. Miko called *sayonara* after him and waved.

Jon picked up his baggage. "Is there somewhere here I can leave these cases for an hour or so?"

Miko glanced at them and pointed to a row of lockers about a hundred meters away. "Luggage lockers over there."

Jon saw them. "Oh, yeah, thanks."

Hana woke herself from a daydream. "We will leave now," she said.

Jon put down his cases and stepped forward. They embraced and kissed tenderly for a few seconds. "Well, Hana ... *sayonara*."

"*Sayonara*," she replied dreamily, her brown eyes wide.

Miko took Hana's arm. "*Sayonara*, Jon!"

Jon picked up his cases and strode purposefully to the luggage lockers.

Waiting for Yasuko

Jon strolled around in Parché department store, contemplating.

He found himself in the jewelry department, looking at wedding rings. There was something so clean and final about them. To marry! To be hitched once and for all! Perhaps ...

He made his way to the music department. He flipped through the racks of compact disks. The selection was practically identical to that in Heidelberg, London or anywhere else.

Jon contemplated Hana. Just one day and his world was warmer and more human. She had made a difference. Yet she was already gone, buried in the fading outlines of the past. Oh, Yasuko ...

Something was wrong. He was dreaming of bliss when his life's work was still undone. He hadn't yet made his mark in the world. There was no sense

in dreaming about women when there were heroic deeds yet to be done.

He looked across the aisle from the music department. There was a focus for his dreams of bliss – a shimmering silk *kimono* display. He drifted over and lost himself in the dreamy landscapes and colors of the flawless gowns. Here was the secret heart of this island paradise. Here was the source of the serenity reflected in Yasuko's eyes. He still remembered them. Deep brown pools of liquid tranquility ...

He wandered off to the magazine department.

A copy of *TIME* featured a long story on the Lunar Astronomical Facility. The story explained that four robot construction modules were in Earth orbit next to Space Station Primrose, lofted there by Quasar boosters from the Kennedy Space Center, waiting for a nuclear transporter to ferry them to the Moon. The story had gone to press before the first ferry flight had made it to lunar orbit, but as background it was still useful. The following story gave a blow-by-blow account of the Antinuclear Coalition sabotage of the Quasar carrying the reactor for the second nuclear transporter. He didn't care about that. He was just impatient to see the first Louisa images.

He studied the pictures with interest. The Mekon red-disk logos on the robots were clear to see. He remembered the charts in the Mekon museum. The Primrose assembly robots had to withstand the hard vacuum and hard radiation 300 kilometers up in Earth orbit. The Acropolis scorpions had to survive the same rigors on the Moon, as well as lunar dust that could work into their joints and seize them up. But if any robots could do it, Mekon ones could. Space and lunar construction was an obvious niche for a company that made its reputation building robots hardened for reactor-core radiation and ground-zero fallout environments.

So was nuclear weapon construction.

Engaged!

Back in the music department, Jon let his thoughts drift back to Yasuko. He fondly recalled their week together in Heidelberg ...

Suddenly she was there in front of him.

"Hi! Yasuko! There you are!"

"Jon ... good afternoon," she said in a voice so soft that Jon thought he was dreaming.

Jon stepped forward impulsively and spread his arms. Their faces met and he tried to kiss her lips, but she turned her head and he kissed her cheek instead, and caught a dizzying trace of her familiar scent. She moved away

and they stood face to face.

"I am engaged to be married," she said quietly, her face a mask of soft, smooth flesh, radiant with awareness, her eyes gazing calmly into his and glowing with a deep, mysterious fire. She looked down at her left hand, where a thin gold ring with a small diamond adorned the third finger.

"Engaged ... when?" Jon said weakly.

"Yesterday. My family –"

"Yesterday?" Jon felt confused, hot and ashamed. This was his reward for sleeping with Hana! He'd broken the symmetry in the wrong direction. He'd opened the box and Schrödinger's cat was dead. He felt like a fool.

"It is the custom," Yasuko continued. "My family arranged it long ago –"

"Arranged? But don't you ..." Jon didn't know what to say.

"I am content," she said gently and looked dreamily aside, toward the display of fabulously expensive silk *kimono* across the aisle.

"What about us?" said Jon finally, conscious of how lame he sounded.

She seemed to spiral back down from her dream. "Us?"

Jon shook his head and looked aside. He felt tired and flat. "It doesn't matter. I'm just remembering how good it was last summer." He looked back into her face. "Don't you remember?"

Yasuko's expression became unreadable and she answered gently but neutrally. "Last summer was different. We were different."

Jon contemplated the row of compact disks in front of him. Their canned emotion seemed remote and unreal. "Okay," he said with a sigh, "please accept my congratulations."

A tiny hint of a smile played at the edges of Yasuko's lips. "Thank you ... perhaps we can go now. My car is parked in front of the station."

"Oh, right," said Jon, back in normal gear.

They collected his cases and walked to Yasuko's car, or rather Yasuko's father's car, a big new golden Toyota luxury sedan.

The Mekon connection

They said little at first as Yasuko threaded the car through the maze of tiny streets in downtown Shizuoka. When they hit the main highway south she relaxed and Jon ventured a few remarks.

"Tell me about your fiancé," he said.

"Ryuichi – my fiancé – is the son of a friend of my father's. He is very ... well connected." She spoke in a slow, deliberate way, but with a delicate tone that Jon found soothing and pleasant.

“What does he do?”

“He works in Mekon Corporation. Maybe you have heard of it.”

“Mekon Corporation! I was at the Mekon offices in Tokyo last week!”

“You were at the Mekon offices in Shinjuku?”

“Yes, I talked with a lot of people there.”

“That is interesting. I will tell Ryuichi. He will be interested to know. He is ... nephew of Dr. Mekon.”

“Oh, really.” Jon frowned – some people had it easy!

He admired the scenery. They were approaching a long tunnel through a steep, tree-covered hill. They drove through it in silence, then burst out again into bright sunlight and pastoral scenery, into rice paddies and tea fields as neatly trimmed and patterned as formal gardens.

“Why were you at Mekon offices?” Yasuko asked.

“I was doing some research for a project involving robotics.”

“A project? What sort of project?”

He explained, as best as he could. Then she explained what Ryuichi did.

“Ryuichi says androids will be a big improvement in factories and offices. They will give human workers freedom.”

“Freedom?” Jon was puzzled.

“Freedom to create new dreams, to create new forms of life.”

“Yeah, right, new forms of life ... What about humans?”

“What about humans?” Yasuko repeated blandly.

“Don’t you think androids may be a danger to humans?”

“How can they be?” She continued to look ahead at the road. “Are children a danger to their parents?”

“Children? You see androids as like human children?”

Yasuko turned and glanced at him. “Androids will be created and educated by us. We will be responsible for them. They will trust us.”

Jon caught her eyes for a moment and felt the depth and serenity behind them. He sighed. She had a moral purity that was hard for him to reach.

They drove on in silence for a while, then Yasuko turned on the car stereo and bathed them in the gentle music of an orchestral symphony.

Family ties

The car pulled up on a gravel forecourt in front of a large traditional Japanese house. Afternoon was shading into evening and the air in the trees around the forecourt was still. The house had a steep tiled roof with an overhang all around above a wooden veranda. It was a bungalow – just one

floor, raised about a meter above the forecourt on a stone plinth.

Jon followed Yasuko up the stone steps to the front door. Yasuko slid the thin wooden door open silently and the pair stepped into the shoe-well. Jon parked his cases and kicked off his scuffed Powersoles.

Yasuko reached aside and fetched two pairs of fluffy backless slippers from a rack. She laid them out neatly on the edge of the wooden floor and stepped into a pair. She waved to the others: "*Surippa desu – dozo.*"

Jon tried to push his feet casually into them, but his big feet and sweaty sox wouldn't fit and the slippers slid forward on the polished surface. Jon shrugged helplessly: "No go."

"*Ah so, sumimasen,*" she said quietly. She picked them up and returned them to their rack, then led Jon along the corridor.

They stopped by an open screen on their left and looked into a *washitsu*, a Japanese-style room.

Yasuko skipped expertly out of her slippers and stepped barefoot onto the *tatami*. "*Dozo,*" she said, gesturing for Jon to enter.

It was a twelve-mat room with paper-panel screens on three sides and a plain pearl-colored wall to his right. In the middle was a low, black lacquered table, surface as smooth as a mirror, flanked by four pearl-colored cushions. On the table was a *bonsai* tree. Against the plain wall was a black lacquered chest and on either side of it a pair of folding screens sporting traditional bird paintings. Above the chest hung a chart showing traditional calligraphy. On the chest was a clutter of photos, flowers, incense sticks and small Buddhas. The room was dimly daylit by the paper screening opposite the chest. It was all immaculately clean, as if it were brand new.

"Please wait here," said Yasuko, "I shall bring some tea." She stepped back into her slippers and shuffled off. She returned with a lacquered tray bearing a set of traditional Japanese tea implements. She knelt on a cushion and put the tray on the table. "Ah, sit down please. My parents will join us shortly." She flicked her tongue like Miko for the 'l/r' sound.

"Ah, your parents." Jon knelt on a cushion.

"They do not speak much English," she said as she set out the tea things.

"Great! What do we talk about?"

"Just be polite and friendly."

"I'll try," said Jon and smiled ironically. He looked down at his rumpled shorts and shirt. "Should I put a suit on?"

"Not necessary." Her face was as inscrutable as the face of the Moon. "You are to sleep in the summerhouse in the orange grove. It is peaceful – my father goes there sometimes to meditate."

“*Ah so!*” said Jon with pursed lips, imitating a Japanese style.

“Is that alright?” Yasuko asked hesitantly, blandly oblivious to his attempt at humor.

“Oh, yeah, sure.” She had a lot to teach him about *zen* mind, he decided.

“Good. We will go there after we have had tea and eaten.”

“Okay.” Mind was an illusion, a barrier to the here and now.

Yasuko’s parents appeared at the door. Yasuko jumped up quickly to usher them in and Jon stood up to greet them. The mother was a short, frail lady wrapped in a traditional patterned silk *kimono*. She wore glasses with fancy frames and she was smiling nervously. Her feet wore white anklets.

“*Ojama shimasu,*” she said in a quavery voice.

“*Hajimemashite. Konban wa,*” Jon said as he bowed to her.

“*Hajimemashite, yoroshiku onegai shimasu,*” she replied, and bowed low in return. She followed Yasuko to a cushion at the table. “*Shitsurei shimasu,*” she said as she sat.

Jon turned to the father. He was an average-sized man, stocky and a bit overweight. His face was ruddy and set in a confident expression, and his hair was thinning on top. He wore dark blue cotton *judo*-style jacket and pants and his chest and feet were bare.

“*Konban wa,*” Jon said and bowed again.

“Good evening,” the father replied with careful elocution in a deep, melodious voice. He shook hands firmly with Jon and settled with practised poise on the cushion next to his wife.

Yasuko knelt at the table and poured four tiny cups of green tea.

“*Itadakimasu,*” they all said as they picked up the cups.

“Jon is here to do research for a television series,” Yasuko said.

“*Ah so, terebi!*” the mother said in a startled tone.

“What sort of series?” the father said in a startlingly confident tone.

Jon explained it all again.

“Yasuko’s fiancé works in robotics,” the father declared thunderously.

“Yes,” Jon replied, “she told me. For the Mekon Corporation.”

“Correct,” the father boomed.

The mother gestured invitingly at a plate of small cellophane-wrapped cakes on the table and said to Jon, “*Keki wa ikaga desu ka?*”

“*Arigato – itadakimasu,*” Jon said clumsily, and reached for one.

They continued in similar fashion.

Zen mind

It was dark outside when Yasuko showed Jon to the house in the orange grove. Yasuko's rectangular wooden *geta* sounded very heavy as she clip-clopped on them down the stone stairs to the gravel forecourt. She carried a torch to light the way. Jon followed her silently, cases in hand, along a rutted and dusty track through grass and trees.

"What are you doing tomorrow?" Jon asked.

"I am visiting Ryuichi. He will come here and I will introduce you. How about you?"

"Me? I'll work on my computer here. And I guess I'll run about and enjoy nature. How far's the sea from here?"

"The sea? Ten minutes. You can walk south over the sand dunes."

"Good. I have two priorities here – to get my computer notes in order and to enjoy Japanese natural beauty."

"I thought you came to visit me."

Jon laughed. "Yes, of course! But you're a Japanese natural beauty!"

"You are too kind ... I am sorry I cannot pass much time with you. I must make plans with Ryuichi."

"Yes, I understand. I don't want to interfere with your plans at all ... is it alright if I stay a few days, say until the weekend?"

"The weekend, yes, of course. Stay as long as you like. I am happy that you are here. I am sorry I will be very busy."

"Yeah, pity ... Does the summerhouse have a telephone line?"

"Yes – optical fiber for telephone and television."

"Ah! All my heart could desire!"

"Will you be lonely?"

"Not at all. I like to be alone sometimes. It's good for the soul."

"You are like my father. He likes to be alone in nature."

Jon glanced at her walking beside him, beaming the torch along their path and treading carefully on her wooden blocks over the bumpy ground. She was so beautiful! They walked a while longer, then she stopped.

"Here it is." She shone the torch beam at a humble shack in a small clearing between the trees. It was a one-floor wooden shell with a corrugated iron roof and sliding window screens along the front. The whole structure looked hardly bigger than a double garage.

"Aha ..." He didn't mind ... no mind.

The album

Yasuko slid open the front door and turned on a light. *Dozo*, she said quietly. She stepped up from her *geta* onto the smooth wooden floor. Jon dumped his cases, kicked off his Powersoles and followed.

The hallway was narrow and extended about four paces ahead. On their left was a wall covered in gray flock with two open doorways. On their right, projecting into the hallway, was a cubicle, and beyond it a refrigerator, a low sink, and a pair of primitive gas rings on top of a 20-liter propane gas bottle, all in a row below a window. Ahead was a small tiled room containing a bath resembling a deep kitchen sink and an ancient gas boiler.

The doorways on their left opened onto a pair of *tatami* rooms, each with eight mats. Yasuko stepped into the front room and turned on the light, a fluorescent ring activated by a short string hanging in the middle. She walked through the wide-open partition between the rooms and turned on a similar light in the back room. Both rooms were empty and had sliding opaque screens across the far wall. There were sliding window screens at the front and back of the house. Jon walked across the front room to take a closer look. The window panels were glass, frosted to obscure the view, and rattled when he pushed them. The opaque screens were closet doors.

Jon looked around the empty rooms. "Where's the furniture?"

"In the closets," said Yasuko quietly.

He opened a door and pulled out a plastic tabletop, a set of aluminum legs, a cushion, a pair of tiny folding stools, an old lo-def television, and a pre-vid telephone. "What about the bed?"

"*Futon* are in back closet."

He went to the back closet and pulled out a large, bulky *futon*. Then came a smaller, thinner *futon*, a small pillow and a pile of clean linen.

"Okay, it's all here," he said, looking around.

"Good. I hope you are comfortable." She opened the refrigerator in the kitchen. "Here is food and drink for you. I will not disturb you tomorrow until later in the morning." She padded back to the shoe-well and stepped onto her *geta*, ready to go.

"*Ah so!*" said Jon suddenly and ran to his suitcase. He opened it and took out the gift-wrapped photo album. Feeling slightly awkward, he held it out with both hands and bowed deeply. "*Dozo, tsumaranai mono desu ga.*"

"*Domo arigato gozaimasu!*" chimed Yasuko as she accepted it graciously. She turned to the door and paused to say goodnight – "*Oyasumi nasai!*"

Peacemaking

It was hot and humid. Jon opened the front and back window screens and turned out the lights to see the starlit views front and back. The noise of cicadas in the trees was quite loud. All he could see were silhouetted trees so he turned the lights back on and closed the windows.

He waved off a few mosquito attacks, then spotted a pair of big brown cockroaches scuttling along the kitchen floor. *Damn!* He hated roaches!

He looked into the loo cubicle. It didn't look like a loo at all. There was a tiled shelf one step high across half the floor area, with a big white plastic lid in the middle. He lifted the lid.

Waagh! He reeled back into the kitchen, gasping from the stench of disinfectant, cheap perfume and rotting excrement rising from the hole under the lid. He held his breath and returned. A cloud of tiny blowflies had risen from the stinking black hole. He put the lid back on, opened the window wide and retreated quickly, slamming the door shut to keep the blowflies in.

He carried his cases into the front room, pulled out his washing kit and towel, undressed and went into the bathroom. The bath was already full of cold, clear water, and next to it was a small polythene bowl. He used the bowl to ladle cold water over his body. The water ran down a drain hole in the middle of the floor. He pissed down the drain.

He had another look through the closet in the front room. He found a colorful cardboard box with the cheery inscription *roach motel* together with a lot of Japanese writing. He set it up under the refrigerator. He also found a box labeled *mosquito coil* which he unpacked and set up. It was a small coil of acrid incense mounted over a light foil ashtray. The smell was awful but it helped disguise the lingering stench from the black hole.

He made up the bed in the back room. Then he saw a gigantic spider quivering in the corner. *Urrgh!* It was the biggest spider he'd ever seen, with a leg span as big as a dinner plate. Its fat body was silvery green and it had hairy legs. He opened the back window, fetched a long-handled *tatami* brush and prodded the creature. It ran with alarming speed to the opposite corner, away from the window, and Jon skipped back quickly to keep away from it. Eventually he chased it out the window.

He got out his personal stereo and closed his suitcase. The house was shipshape and Bristol fashion and he could go to bed with a clear mind, a peaceful mind, a *zen* mind. He turned out the light, lay on the *futon* under a single sheet, and headphoned a sentimental country album.

He sentimentalized over the slow, historic decline of America to his east.

Here he was, washed up on the shores of the Japans, an ocean away from his roots as New York and Los Angeles burned and the CIA begged him for help. What was he doing? He was fighting to make sense of how robots might take over the world. No, he was fighting to make sense, period. His Media plan was gone – there was no plan. No plan and no mind. Just a quiet vacation in a seaside shack an ocean away from the fading glow of the American dream.

•

A sentimental journey indeed. At least Jon put in a weekend of vacation time. But as a vacation from his own obsessions his time in the summer-house was a major flop, as the next two days showed.

Solipsistics

Are we alone?

Incarnation

Jon's vacation began to fall apart over the next two days in the orange grove. Things I recall as portents of the gathering storm loomed darkly.

•

Monday, soon after dawn: Jon opened his eyes to filtered pearly daylight. He jumped up from his *futon* and slid the front and back window screens wide open – so bright! – green trees and lush grass. A warm breeze blew through the shack and chased away the sickly smell of mosquito coil.

He jumped out onto the thick grass, still cool and damp underfoot, and looked around. Lots of orange trees ... He did press-ups and knee-bends, handsprings and cartwheels, punches and *karate* chops, and all the rest of his standard morning workout. Pulse still racing from the aerobic finale, he jumped back indoors. He put on his leopardskin tanga and anointed his skin with oil, then leapt out again onto the grass.

He went jogging. He went on a long exploratory tour of his Garden of Eden. He went far enough south to find an old wooden perimeter fence with an open gateway leading to some sand dunes beyond. He ran on into the dunes until he saw the sea shimmering ahead.

He'd blazed the trail. He turned north and ran back past the summerhouse until he saw the Tanaka family house through the trees. He stayed in the shadows under the trees as he scouted out the boundaries of the orange grove. The house was big, maybe thirty meters long, and had a neatly cultivated garden surrounded by a wooden picket fence. A line of fresh washing hung out to dry. He paused for a minute to absorb the tranquility of the domestic scene, then sprinted back to his humble shack.

He checked the roach motel under the refrigerator. Four roaches were stuck inside, martyrs to their lust for the stinky bait at the center. He slung the box into the biotrash bag and set out another one.

Next, a bowl bath – cool and refreshing!

Next, breakfast. He looked in the refrigerator. Orange juice – he drank it down thirstily. A pre-sliced loaf of white bread and jars of peanut butter and strawberry jelly – he assembled a few sarnies and walked around munching them. Then he put on his shorts, grabbed a can of cola and sat with his legs dangling out the front window.

He contemplated. Humans had evolved for just such environments as this garden. These forms, these colors, these noises of twittering birds and aromas of flowering plants were all the sorts of primary input his God-given senses best registered. The feeling he had of being located in the scenery and not floating in some strangely delocalized way above and beyond it in a chaotic quantum now-zone – the sheer sense of being *incarnate* – was stronger by far in this environment than in a big city or a small bedsit. The intensity of sensory input here fired neural circuits that had languished too long in his boxed-in life. It made his soul sing with joy.

This garden reminded him that humans were creatures of the terrestrial surface. No other environment in the known universe could support this lifestyle, where breathing, running around, and eating and drinking were simple and easy. Humans were part of the biosphere and separated from it they were absurd and clumsy creatures. Humans had already reached their adaptive limits in the urban and industrial environments they'd created for themselves. Any further human adaptation could only occur within elaborate artificial systems that recreated an approximation to the archetypal garden, at least to the extent of providing gravity, warmth, air, and so on.

As soon as humans could inject their minds into biomechatronic androids, the inbuilt limitations of *Homo sapiens* would become glaringly obvious to all but a few homochauvinists, and the human frame would become a mere curiosity for biohistorians. Humans were fine animals, to be sure, but their biological limits were too obvious to ignore when a manned trip to Mars was expected to cost a trillion dollars – ten times that of a robot mission designed to achieve the same results. The simplest human functions could become ridiculously complicated in artificial environments (as a kid he'd laughed at NASA's million-dollar waterloo).

Time for a shit. Not the black hole. He went and shat under a tree, then ran back bare-assed for another bowl bath. So easy!

He was ready to do some serious work. All he had to do was reach across the *tatami* to his laptop and turn it on. Not so easy!

Barbarian rudeness

Jon reached across the *tatami* to the television and turned it on. He surfed channels until he found the Associated Network News. A newsroom was fronted by a smart young man in a blue suit. A red banner boldly announced *ANN live from Tokyo – Don Reddy:*

“– headline news from the Japanese Parliament: the new National Heritage coalition took over the government this morning, following the collapse last Friday of the Liberal Democrat coalition under former Prime Minister Shintaro Kawasaki. New Prime Minister Shusako Mishima has just delivered an astonishing keynote speech in which he bitterly attacked U.S. President Tom Smith for what he called his barbarian rudeness and vowed to make no concessions in the upcoming round of robot trade talks. Last week in a televised fireside, Smith described Mishima as an antichrist hell-bent on returning Japan to the Middle Ages.”

Jon sat listening with rapt attention, his self delocalized into televisual cyberspace, work forgotten.

“Prime Minister Mishima said his first official act would be to cut all diplomatic and trade links with Russia in retaliation for the continuing Russian refusal to negotiate the return of the Northern Territories – the Kuril Islands seized by Stalin in 1945. Mishima reaffirmed the National Heritage party’s declared aim of repossessing the disputed islands.”

Cut to a clip of Shusako Mishima addressing Parliament. Face fat and glistening with sweat, voice hoarse and histrionic, he sounded a bite that drew a chorus of lusty cheers. Cut back to the studio.

“Mishima went on to say that his government would tighten immigration and transit regulations at ports and airports and announced a plan to repatriate all non-Japanese nationals working in Japan. The National Heritage party is committed to limiting non-Japanese investment in Japanese companies, cutting imports of all goods that can be replaced by Japanese goods, and ending all government-sponsored aid programs outside the Yen Bloc.”

Jon boggled. How could sober Japanese businessmen support such views?

“Turning now to U.S. domestic news, riots in New York claimed another fifteen lives last night –”

Jon stopped listening. Mishima being Prime Minister made the Mekon connection more interesting. He unpacked his camera with the Mekon visit pix still in it. He plugged the camcard and his printer into Hal and scrolled through the pix until he found the shot of the letter from Mekon to Mishima, then made a hard copy of the letter. He had to show this to Yasuko.

Hal Senior. Jon plugged Hal Junior into the ISDN socket and called up his home page in Heidelberg. Hal Senior's emoticon was still smiling – no prob. Jon copied the snapshot to Hal Senior ... just for backup ... *do it!* He logged onto Intelink and copied the pic to Bob, with a quick note:

> Bob, now I'm in the stix not Tokyo. Re Chairman Mekon's links with Shusako Mishima see the following letter. I'm told it could nail both of them but I have no independent corrob. Jon

He logged off. No more reason not to get on with his Media proposal ...

He stood up in his front window and stared out at the trees. His self was localized again, in the here and now, raring to *get going*. This was all very pleasant but he was geared up for some *action!*

A ball on the Moon

Jon jumped down onto the grass and looked up at the sky. Wow – a UFO! A little diamond in the sky! A four-jet ... maybe a Double Whopper ... Someone in it may be daydreaming about floating over the blue blanket of impure gases that stopped Jon seeing the stars. He was ten kilometers deep in the mire, swimming in the same ocean of murky vapors as every other sweaty, stinking mortal on the planet. He fancied he could almost *see* the megatons of gaseous excrement wafting around in the blue fuzz. But he couldn't, nor could he smell it. The air was fresh, and it felt good to breathe it deeply.

He began to feel foolish. He jumped back up into his house and turned on the telly for another look at *ANN live from Tokyo – Don Reddy*:

“– mysterious golfball-like object sitting in the dust.”

The picture showed a harshly sunlit lunar landscape, in shades of lunar gray, as seen by a rover robot from the Acropolis construction site. The robot's two big white beachball front wheels were visible at either side of the screen. In the dust, directly in front of the rover, was a little pale-gray ball with a textured surface, like a golfball but with a polyhedral geometry, hardly discernible against the background of gray dust.

Zoom onto the ball. The polyhedral surface suddenly looked like a soccer ball. The faces of the polyhedron were pierced with patterns of large and small polygonal holes. The effect reminded Jon of the fractal patterns on the faces of a mathematical object called the Menger sponge, which is a cutaway cube, a 3D version of the Sierpinski carpet you get from a square by dividing it into nine smaller squares, cutting out the central square, dividing each remaining square into nine smaller squares, cutting out the central squares,

and so on to infinity.

Jon was bemused. What a strange form for a lunar rock!

“The rover was alerted to the ball by a faint blue light shining out through a pattern of holes in its surface. The ball has a set of flat faces arranged in a soccer-ball pattern that scientists call a buckyball. Geologists at Mission Control are speculating that it may be some previously unknown kind of crystal or ceramic material, but the blue light is a complete mystery to them. The rover has so far found no other unusual objects in the crater and has not yet touched the ball. The mission controllers are analyzing the visual data carefully before commanding the robot to handle it.”

As Jon watched, the robot extended a gold-plated claw with a scissor-hands arsenal of surgical instruments at its tip. Three slender fingers slid out. The fingers froze a millimeter away from the ball and the view zoomed in closer. Delicately, slowly, the fingers picked up the object and raised it in a smooth, steady motion. The triad of fingers rotated to show the ball from all sides. Sure enough it was a buckyball, with twenty regular hexagons and twelve regular pentagons arranged in the soccer-ball pattern formed by sixty-atom carbon clusters – the original buckyballs.

“The mission controllers will now take the ball back to the lander, where a laboratory analysis can be performed on it. We’ll return live to mission control just as soon as the results of the analysis are reported.”

Cut back to Don Reddy in the studio. “Moving now to Brazil –”

Jon zapped it and stood up. A fractally honeycombed buckyball on the Moon? Maybe it was an alien artifact – a nanotechnological virus designed to destroy indigenous life on Earth and replace it with a new suite of alien species!!! Too obvious – Jon was jaded enough to know that it was very probably a crystal of something boring produced by a hitherto unknown lithological process acting a billion years ago. The blue light was a bit strange, but well within the bounds of boring explanation in terms of natural radioactivity or something. Still, it was surely a big deal for the lunar community ...

Yasuko was due soon. Prime Minister Mishima! Mekon and Mishima! This was something he had to sort out.

To pass the time until she showed up, he resolved to do some work. He donned a clean white shirt, sat down on the cushion and opened the proposal file. He started reading ... his heart sank ... it was turgid bullshit ... fuzz, gaps, squidgy bits ... it needed serious surgery.

He couldn’t concentrate. He was puzzled by the buckyball on the Moon. He was alarmed by Mishima. He waited impatiently for Yasuko.

Yin and yang

Jon saw Yasuko together with a young man he took to be Ryuichi walking toward the summerhouse. Yasuko was in a white tennis outfit and the young man, who was about the same height as Yasuko and had a round head on a slender body, was dressed as if for cricket in a white shirt and off-white baggy trousers. Jon closed down Hal quickly and jumped onto the grass.

“Hi, Yasuko! Fine day today!”

“*Konnichi wa!*” replied Yasuko cheerily. “*Kore wa* Ryuichi!” She waved a hand. “Ryuichi, Jon *desu*.”

“*Konnichi wa, hajimemashite,*” Ryuichi said sonorously, and bowed not only his head but also his shoulders.

“*Konnichi wa,*” Jon replied. “*Hajimemashite.*” They shook hands firmly.

“Shall we go and sit in the shade?” asked Jon.

“Yes, but we cannot stay long,” said Yasuko.

“Okay,” replied Jon. “I have something I want to show you.”

Yasuko glanced at Ryuichi, who shrugged wordlessly.

They went into the house. Yasuko kicked off her tennis shoes and stepped up in spotless white sox. Ryuichi stepped up barefoot from a pair of heavy wooden *geta*. The three went into the front room.

Jon rummaged in the closet and pulled out the two tiny stools. He held them out. “*Dozo, okake kudasai.* Ah, what would you like to drink?”

Yasuko and Ryuichi took the stools and sat down cautiously.

“Water, please,” Yasuko replied.

Ryuichi nodded. “Me too.”

Jon fetched a big bottle of water and three glasses. He sat on his cushion and waved at the bottle. “Please – *dozo!*”

Yasuko poured water into the glasses. “*Itadakimasu* ... Did you see the news on television this morning?”

“You mean the new government? Yes, on ANN. The National Heritage party has formed the new government coalition and Shusako Mishima is the new Prime Minister.”

“Yes,” said Yasuko, “Do you know anything about the background of Shusako Mishima?”

“I know Shintaro Kawasaki once said he was an opportunist demagogue and Tom Smith thinks he’s an antichrist.”

“He is a ... controversial man,” she replied.

“He’s dangerous man,” added Ryuichi with a sharp edge to his voice, “who could damage Japan’s international standing.”

“Right,” said Jon with an incisive nod, “but what can you do about it? Party politics here is a pretty closed world.”

Ryuichi frowned, then remarked in a serious, almost menacing tone, “My father has many friends in the Liberal Democrat party. They won’t let the National Heritage party stay in power without a fight.”

“But what can they fight with?” asked Jon.

“Shusako Mishima has a dark past,” Ryuichi continued. “There must be – what’s the English phrase? – corpses in his cellar.”

“Right – you got it,” said Jon, smiling. “I said I had something to show you.” He picked up the copy of the letter from Mekon to Mishima and handed it to Ryuichi. “What do you make of this?”

Ryuichi read the letter slowly and with mounting consternation. He made a long, low, rumbling noise, like rolling thunder, and handed it to Yasuko, who started to read it anxiously.

“Well, what does it say?” asked Jon blandly.

“It’s a letter from Noboru Mekon to Shusako Mishima. How did you get hold of it?” Ryuichi asked.

“I was in the Mekon offices in Shinjuku last week visiting a colleague. Someone there showed it to me and I made a copy to show Yasuko.”

“Someone showed it to you ... Why?”

“I was helping to write a promotional brochure for the company and we were looking for background information.”

Ryuichi rumbled again and took the letter back to reread it.

Yasuko looked at Jon. “How do you know it is not a ... an imitation?”

“A forgery?” Jon considered. “No, I don’t think so. But I don’t know.”

Ryuichi looked up. “May I take this?”

“Sure, please do – but aren’t you going to tell me what it says?”

“I think you know already.”

“Sort of, yeah, but I was hoping for confirmation.”

“Alright ... Mekon offers big funds to Mishima and the National Heritage party in return for government support to set up a ... cartel of companies to prioritize research in bionic consciousness technology. It’s very illegal.”

Jon smiled. “Enough to get Shusako Mishima out of power?”

“Yes, I think so.”

“But was the deal actually made?”

“I don’t know, but I think so.”

“Won’t this damage Mekon?” Jon asked.

“Yes, it will,” said Ryuichi thoughtfully. “He may have to resign.”

“Mekon without Mekon – that sounds like a heavy blow.”

“Yes,” Ryuichi replied with downcast eyes, “but his political views are controversial. Many people think his android ideas are unsound.”

Jon shrugged. “I can see how they might. From what I heard he wants to see *Homo sapiens* replaced by androids. The next step in the evolution of life on Planet Earth, he said in some interview.”

Ryuichi exhaled with a heavy sigh. “That may be. But humans will fight back. It won’t be like selling robots.”

Jon smiled. “That may be the understatement of the century.”

Ryuichi took a deep breath and meditated a while. His calm serenity was like Yasuko’s when she said androids brought freedom. He pronounced his verdict: “Life and death are the *yin* and *yang* of evolution.”

Yasuko touched Ryuichi’s arm hesitantly. “*Chotto ... Obachan.*”

Ryuichi turned to her and said something quietly, then turned back to Jon. “Sorry, but we have to go now.” He waved the folded letter. “Thanks for this. I’ll show my father.”

“You’re welcome,” said Jon as they all stood up.

“I will visit you this time tomorrow,” said Yasuko. “Will you be okay?”

“Of course – *Ki o tsukete.*”

“*Hai, domo!*” The pair made their exit.

The idea gusher

Jon got down to work on his proposal. His new idea was that humans would probably be cheaper and better for many jobs than androids for a long time yet. It would pay Megablob to farm humans like humans farm animals, for whatever specialist jobs remained. This could allow thoroughbred humans to survive into the very deep future ... But the thoroughbreds of one generation were often the inbred misfits of the next ... No, there was a long-term trend. Progress was still made by mining ever deeper into the human soul.

Jon had trouble with the concept of soul. He preferred concepts that could be neatly defined. If humans were machines then the output from their souls could be defined and understood in terms of known science. But if humans were more than machines, there was no guarantee that their future output could be so easily explained ...

So far, opined Jon, no human works lay beyond the reach of physical science. But the high market value of new forms of human creativity surely raised the chances for any new capabilities that may be there. Now he saw an evolutionary benefit behind this market evaluation. It was the only strategy that offered any hope for humans in the deep future, when androids and

other machines had trashed most human skills. So it looked like humans were already mobilizing to fight off the challenge.

But how could he restructure his proposal to get an idea like that in place? During the programmed interviews with scientists working on consciousness, should the interviewer ask how the last humans could organize themselves to defeat the androids? It wasn't going to work!

The future of life with roots in humanity was the point, but those roots didn't have to be embodied in the prehistoric technology of DNA molecules. Giving machines photonic minds powerful enough to absorb human minds was surely enough to ensure that the transition to machines could be smooth and peaceful – for the rich, at least. Let the androids reach out to the stars – it was surely too much for DNA-based organisms with a taste for one-g gravity, a one-bar atmosphere, a 300-kelvin thermal envelope, and regular thruflow of macromolecular slurry.

Jon was content to see humans replaced by something better. He knew the weaknesses and imperfections of the human animal. If human society could cope with androids at all, then it could also cope with arbitrarily many of them, up to 100%. Then human society would melt seamlessly into android society and the human heritage would not be lost ...

His ideas were still too inchoate. Soon the gusher dried up for the day.

Invasion of the bugs

He needed a break. Don tanga, oil hide, leap onto grass ...

He ran down to the sand dunes. He ran through the dunes, over long roller-coaster undulations, past tufts of grass with blades like swords, low bushes like heather or gorse, odd bits of old wooden fences abandoned to the dunes, and large expanses of fine golden sand. After a few minutes he was on the beach. It was wide and flat and shelved smoothly into the ocean, which stretched in an unbroken plane to the Pacific horizon.

He kept on running into the sea. The waves were quite gentle here and the sand remained flat under the surface. He plunged in and started swimming energetically. *Ah – refreshing!* He looked around ... several blue balloons floated by. They were the flotation sacs of jellyfish – Portuguese men-of-war! He turned quickly and swam straight back to the beach.

He looked up and down the coast. The only people he saw were anglers, widely spaced along the shoreline. They were all armored in hats, jackets and boots. They had big bags and long fishing poles wedged firmly in the sand. Apart from them, he was alone.

About two kilometers to the west he saw a large industrial facility. He ran toward it and saw it was a nuclear power plant. There was a concrete waterway built across the beach to carry cooling water. About a hundred meters short he was stopped by a tall barbed-wire fence. He walked inland along the fence until he found a radiation meter. This was a standard IAEA device, welded onto a stout metal pole, that looked like a parking meter. The meter showed about 2% above the natural background, two orders of magnitude below the danger zone – no need to fear imminent death from radiation sickness, except from too much sun. He looked at the big plant. There was no hint of the army of Mekon robots that ran the place. It was a bog standard power utility, hardly worth a glance. He ran back eastward.

Not only the anglers but also the local four-wheel club used the beach. As Jon ran back he met a convoy of buzzing, gnashing, roaring beach buggies racing along, bouncing between the dunes on big knobbly balloon tires. The noise was deafening and the wind caught the sand they threw up and blasted it over his skin. They were spectacular beasts with neon-rainbow paint jobs, bold brand-name decals, roll bars and spotlights, and sexily spiky, chunky profiles. The drivers wore helmets, masks, goggles, overalls and gloves, all in vivid colors, so it was hard to see that they were human at all.

Ignoring his blasted skin, Jon admired the show. This was a vision of the android invasion! Columns, hordes, vast swarms of bugs bursting eastward over the steppes and deserts of central Asia, through the Caucasus, Ukraine and Poland, into the heartlands of Europe! Puny Jon, a wretched aboriginal human in a loincloth, was a stick insect beside the superbugs.

That was the tragedy of the human incarnation. Without a hi-tech exoskeleton a human being was a fragile thing. Apart from a biochemical bag, all he had was his mind and his soul. But his mind was already sussed and his soul shrank ever deeper as the machines advanced.

One day the machines would realize they no longer needed us. Then the remaining depths of the human soul would be mere dregs, like the last bitter drops in a used-up teabag.

Tangled loops

Jon jogged back to base camp. He put on a shirt and sat on a mat on the grass in the shade of the house.

He read the solitary book he'd brought with him from Germany. It was *Gödel, Escher, Bach: an Eternal Golden Braid*, by Douglas R. Hofstadter, a classic from 1979 he'd read once, too quickly, in the air force and promised

himself to reread some day.

Its central obsession was Gödel's incompleteness theorem for formalized systems of elementary arithmetic. Talking with Ann in Oxford had refocused him on the key issue – Did the logical paradoxes of self-reference have anything to say about the nature of the human mind and soul?

The beautiful mathematics for coding formal systems into formal systems pioneered by Gödel and taken much further, mainly by computer scientists, in the following decades had a vast field of application in molecular biology. Molecules of DNA coded instructions for making the machinery of life, and the codes could be understood in terms of the new math.

Hofstadter reconstituted Gödel's dry results far enough to discuss not only what goes on in the brain but also the amazing jump from Gödel coding in formal systems to the natural coding of information on DNA molecules. The strange loops and tangled hierarchies in the gigabits of code on DNA strands were amenable to logic.

What fascinated Jon was that the logicians' formal codes reflected the codes in their own body cells. The central dogma of mathematical logic, that logic coded metamathematics that founded all of math, was an astonishing premonition of the central dogma of molecular biology, that DNA coded for RNA that made proteins. Jon mused long and deep on Hofstadter's mapping of the parallel in a 'Central Dogmap'.

He read on. The book was a fat, formidable hodge-podge, confused and exasperating as well as brilliant and scintillating, but its very chaos seethed with new stimuli. He flipped back and forth, savoring again the delight of discovery he recalled from his first reading. Hours passed.

Unraveling thoughts

The tangled logic of BlooPs, FlooPs, and G-strings was playing havoc with Jon's mind. Given that DNA logic was at least as convoluted as Hofstadter's, what hope was there of getting a grip on how information on DNA molecules was translated into human wetware?

Jon hoped physics as he knew it could explain life. He was still queasy about superstrings, but the good old standard model – electroweak theory (the 1970s extension of QED), quantum chromodynamics and general relativity – could well be more than enough. Electroweak theory should already explain DNA life. Then we'd only need QCD for life in quark soup. General relativity didn't fit ... hence superstrings ...

...

The greatest mystery of human life, for Jon, was how the DNA-coded soul descended from its informatic paradise in the cyberspace of all possible bit strings into its incarnation in the biobag that went by the name of a human being. If the logic of that descent was too convoluted, then we'd have to extend physics to describe it. But Jon was unwilling to do that.

Why did he care? Because his idea that androids would replace humans only made sense if the standard model could explain his own incarnation. If humans continued to outperform their best bionic hardware, then the idea that androids would junk us was wrong.

Why not be happy with that? He considered the 21st-century reality of humans on the planet. No, he felt no joy that humans might breed on forever. Bionic creatures could surely do better!

He had to get this clear. The nanotechnology of DNA molecules showed that nature still had the edge on photonic systems and that several decades, at least, would have to pass before bionic creatures became serious candidates for replacing *Homo sapiens*.

Yet the technology in androids needn't be so hot. The sheer fact that androids were designed for the jobs they had to do was enough to give them the edge. Considered in engineering terms, human apes were rather poorly designed creatures for the new jobs in Megablob. Too many human strengths were irrelevant and too many weaknesses absurd. For example:

- The ability to survive on a very variable and irregular diet was worthless when food supplies were assured;
- The ability to walk or run long distances was redundant when cars and mass transit systems were so prevalent;
- The brain, a giganeuron information processor, was unable to do sums that a ten-dollar chip could do in microseconds;
- The whole human value system, and thus much of human behavior, was permanently liable to be thrown into chaos by sex.

If creatures so obviously maladapted for third-millennium life couldn't be improved upon by relatively marginal advances in bionic technology, then so much the worse for logic and reason.

So Jon was unwilling to concede that the human soul lay too far beyond modern science. Anyway, his Media project hung on it.

Jon read on, and thought confused thoughts. His whole ten-day wonder was unraveling and he didn't know how to put it together again.

Starstruck

Jon lay reading and meditating on the grass until evening. Then he lay on his back and dozed off. In fact he slept for some hours.

When he awoke it was dark. There were no lights at all nearby and there were no clouds in the sky. The air was clear and the Moon was nowhere to be seen. *The stars were amazing!*

Jon couldn't remember seeing so many stars at once before. It was dazzling, dizzying for a guy who rarely spent time outdoors at night. He was moved, enraptured and bewitched. He understood as never before why the heavens loomed so large in the lives of the ancients, for whom this was a nightly spectacle – often the *only* nightly spectacle.

Stars ... each one is a titanic thermonuclear fireball like the Sun, or in many cases much bigger ... The Sun is about five light seconds in diameter and has a power output of almost 400 trillion terawatts ... The Sun is about 500 light seconds away but the nearest star beyond the Sun is over four light years away. The Milky Way, our galaxy, contains several hundred billion stars, and our nearest neighboring galaxy, Andromeda, is some two million light years further out ...

Was Jon just a speck of mold on one tiny rockball among zillions in the middle of a vast universe? Was his soul just a logical tangle coded on a few molecules buried inside that speck?

If his soul was a knot of information, then it was a mathematical entity. Any bug-eyed monster who cared to key up the number of Jon's soul could reconstitute him in a new body on a new planet around a new star. But the chances against his exact genotype reappearing when an alien in a remote solar system selected a random hypernumber were more than astronomical – they were about the ten billionth power of two to one against – safe betting odds, even in a big universe. Anyway, he didn't believe that an identical twin – a clone – generated from his soul number would share his identity. His own mind was his and his alone. His mind made him unique, not his soul! Yet his mind was just a photon field in his brain.

The stars in front of his eyes reminded him that you could say photons are eternal too. Okay, between popping into existence and popping out again they endure only a finite span of time, but *for the photon itself* time just doesn't exist. Einstein showed that as a clock approaches the speed of light it slows down. If it could actually reach the speed of light it would stop. It would register no time at all. Since a photon *always* travels at the speed of light, it *never* registers time. Time doesn't exist for it.

Jon's mind was a photon field. Time didn't exist for it. Only its interactions with the non-photon substance of his brain caused it to experience time. Now, as he lost himself in the stars, he lost his sense of time.

I am what I experience ... I am eternal ...

It was Kaplan's theory of me – I am my environment.

His eternal mindfield expanded in spherical ripples from his head at the speed of light. It had been streaming out, eternally, for over a billion seconds. The outer edge of his mindfield was about 33 light years away now, beyond several stars in his field of view. His mind had already touched some of them. There were several stars in front of his eyes that were less than 16 light years away – their replies to his expanding mindfield were even now striking his retinas. He was in *dialog* with the stars!

What were they telling him? They were putting him in his place – literally. They were saying – *you are here*. They were telling him he was a speck of mold on a tiny rockball in the middle of a vast universe. By being seen he was being determined, just like Schrödinger's cat. The stellar gods were looking down at him on his little ball and giving him life.

He was alive and his mind soared among the stars. He and all the denizens of Planet Earth were free souls, streaming in eternal union through the interstellar photon field ... *I am my environment*.

How many other beings on other planets were gazing at the stars at this moment? No-one had proved there were any other lifeforms out there, despite the Epsilon Eridani signal. So – the big question:

Are we alone?

He didn't know. He did know our transgalactic unity with other lifeforms was guaranteed by more than starlight. It was underscored by the cosmic microwave background itself, the very nearly uniform photon field left over from the Big Bang ... a universal, eternal photon field ... bigger and deeper than all others ... maybe it was a mind too ...

Yes – the mind of God!

COSMIC INSIGHT!!!

He'd reached the *zen* moment of supreme enlightenment – *satori*.

His cascade of thoughts blissed out, fuzzed out, dimmed out.

He fell into a deep and dreamless sleep.

He woke up again and brushed a feasting mosquito off his face. He felt dew on the grass around him and went indoors. He lit a mosquito coil and fell asleep yet again – on his *futon*.

Reincarnation

Tuesday morning, the orange grove: Jon sprang up, jumped out onto the grass, did a workout, had a bowl bath and put on his camouflage traXuit.

He looked into the refrigerator. He was out of cola, out of plastic-wrapped apple pies and low on bottled water. There were still a few boxes of *sushi* and a few big, round, juicy Japanese pears. He slurped on a pear.

Time for another fix of *ANN live from Tokyo – Don Reddy*:

“Japanese bombers launched an air strike against Russian military installations in the Kuril Islands at dawn this morning. First reports are of raids by at least two squadrons of stealth strike bombers against airfields and radar stations. Damage to ground installations is reported to be extensive. United Nations surveillance satellites are currently zooming the battlezone and the U.N. is expected to release a detailed analysis later today.”

A satellite view of the islands with red lines superimposed showed the likely route of the strike planes. Cut back to the studio:

“The new National Heritage coalition headed by Prime Minister Shusako Mishima has not issued a statement on the attack and officials at the Self-Defense Ministry are not yet available for comment this morning.”

Jon pulled an anti-smile and glared at the screen. He didn’t want to get caught up in a shooting war with Russia. Given the current confusion in the Russian government, an immediate and massive reaction was unlikely. It would be hard to stage and would risk a defeat as decisive as the Japanese defeat of Czarist Russian naval forces in 1905. A nuclear strike was ruled out – consternation over the alleged Japanese nukes had seen to that – but some kind of aggro was guaranteed. Don Reddy continued:

“On the Moon, the mysterious perforated buckyball with the blue light inside that was found yesterday by a rover robot is still under analysis at the Acropolis base. Mission Control in Houston has not yet issued further details about the golfball-sized object except to say that it appears to be a zeolite structure made of aluminosilicate, like the nanofilters used in water purifiers. Much of the Moon’s surface is made of aluminosilicates of various kinds and mission scientists express confidence that they will find a natural explanation for the buckyball. But some scientists are already speculating that the little gray ball might be an alien artifact, perhaps some kind of paging device to alert someone, somewhere that we are stirring up dust on the Moon.”

The picture showed a craggy, sunlit moonscape with one of the Mekon scorpions trundling along on its six fat all-terrain tires like a slo-mo dune buggy. Jon was already getting blasé about these live-from-the-Moon views.

But a zeolite buckyball shining a blue light? Weird ...

“Moving now briefly to other news –” Cut back to the studio.

Jon turned off and stood up. Time for action. He plugged in Hal Junior and logged onto Intelink. There was a quickie from Bob:

> Jon, thanks for the lead. Do you have any more yet? We need to nail Mishima before he goes ape with Russia. Keep it coming! Best, Bob

Jon sighed and trashed the memo. Then he loaded the CIA file and opened it. A whole megabyte – a bookful of text. He started reading. As he read he cut and trashed the padding. A few more hours and he’d have a lean, mean file of hard facts. He feasted on *sushi* and juicy pears and worked hard. He had to master this problem to save his vacation!

Saved by the telephone

Yasuko showed up an hour or two later. She walked up to the front window as Jon sat staring into space, musing on a kilobyte cut. He saw her.

“Yasuko, hi! *Ohayo gozaimasu!*”

She was in a tennis outfit again. “*Ohayo gozaimasu! O-genki desu ka?*”

“Ah, *domo* ...” He got up to usher her in through the door. “*Dozo.*”

“*Ojama shimasu,*” she sang as she stepped up from her wooden *geta* and handed him a plastic shopping bag. “*Dozo* – more food for you.”

Jon looked into it. Cans of cola, apple pies, bottles of water, boxes of *sushi*, and a few small Japanese oranges. “Excellent – thanks – *arigato!*”

“*Ee desu* ... ah, thank you for the photos. They are beautiful.”

“Good ...” Jon unloaded the bag.

“Are you sleeping well here?”

“Yes, well enough. The insects are a nuisance but I’m managing.”

Yasuko opened the loo door and looked in. She sniffed the air and closed the door quickly. “The tank should be emptied.”

“You can say that again!” Jon folded the bag and put it aside.

“I am sorry,” Yasuko said as she stepped into the front room. “I have neglected you. I have been busy with my engagement.”

“It’s okay, I understand. Actually, I like having time to myself here.”

Yasuko looked down at Hal. “Are you working well?”

Jon bobbed his head from side to side. “Well enough, I guess. I’m having some great ideas but they’re still a bit vague. And it’s hard to concentrate with a war just starting in the Northern Territories.”

Yasuko stood by the window and looked out at the trees. “I am sorry ... I

have disappointed you. I wanted you to be happy here.”

Jon walked up beside her. “I am happy here. Really, I am. This is the best place I could be to get my ideas together. And seeing you again is a treat.”

She turned and glanced into his eyes before looking down at the floor. “A treat ... that is too kind ... I am embarrassed.” She glanced up again and focused on Jon’s smooth-shaved chin. “Ryuichi and I will marry in three weeks. You are welcome to attend the wedding.”

Jon shook his head. “Sorry – I have to be back in Europe then.”

Yasuko glanced back at the kitchen. “Have you eaten breakfast?”

“A little, but I’m still hungry.”

“I am hungry too. Shall we eat now?”

“Yes, good idea. I want to discuss the news about the Mishima government, the air strike, the Mekon connection –”

Yasuko nodded affirmatively. “Good. I can tell you ... *sushi* okay?”

“Great – let’s get started!”

Yasuko fetched a box of *sushi* and a bottle of water from the fridge while Jon packed away Hal. Yasuko found a second cushion and knelt on it. She poured two glasses and they chinked them together – *Kanpai!*

“Okay,” Jon began, “I want you to tell me all about the new government and what you think about the air strike this morning, why Mishima wants war with the Russians, whether you think Mekon has any connection –”

“Stop!” Yasuko held up a hand. “Slowly, please. I cannot think so fast!”

He went slowly and Yasuko answered methodically ...

...

“... so you see,” Yasuko concluded, “people here are frustrated with polite politicians who let other countries push Japan around and they want to show the world that Japan can be assertive too. But we only want peace and harmony. That’s all.”

Jon admired the way she could sit on her heels without moving. He’d tried every possible position on his cushion but he just couldn’t get comfortable. He nodded. “I see ... I believe you completely ... Thanks.”

Yasuko smiled and stood up. She took the empty *sushi* box and the bottle and glasses to the kitchen. “I must go,” she said quietly.

“Will you visit me tomorrow?”

“I hope so – I will telephone if I cannot.”

“Good ...” Jon nodded slowly.

“Ah – you have laundry to wash?”

Jon hadn’t considered the question. “Laundry? Yes, I have. Why?”

“Please give me and I will put in machine.”

Jon went into the back room. He'd dumped his dirty laundry in a plastic bucket from the back closet. He knelt on the fat *futon* – his bed – to grab the bucket, then tipped its contents onto the thin *futon* lying folded beside it. Yasuko walked up behind him, grasped the sheet stretched over the fat *futon*, and started pulling it free.

"Hey, no!" Jon twisted and grabbed her wrists. "Leave the sheet."

Yasuko fell to her knees on the *futon* beside him and made no attempt to pull her arms free. Jon relaxed his grip slightly but didn't let go. Both of them were suddenly transfixed. Their faces were a hand's width apart. They both moved their faces forward hesitantly, then more emphatically when they saw the other moving, and kissed. Jon's hands relaxed their grip and stroked their way up Yasuko's arms to her shoulders. She seemed to swoon with the kiss and he guided her body gently onto the bed. She lay on her back and Jon lay over her, still locked in the kiss.

Jon felt an indescribably intense passion. He was unable to lift his face or his body from hers. She was evidently unable to push him free. Her hands moved around his back and held him to her. His hand moved down to her thigh and slid up under her skirt, under her flimsy nix –

"*Lie ...*" she groaned with a deep sigh.

The telephone bleeped.

"*Ai!*" called Yasuko in a sharp voice, "*terehon!*" She pulled herself free in a violent movement, clambered to her feet and ran and picked up the phone. "*Hai ... hai ... hai, sugu!*" she snapped, and slammed it down.

Jon sat on the bed breathing slowly and deeply, then picked up the bundle of dirty laundry and stood up.

Yasuko went into the kitchen and picked up her plastic bag, then took the clothes from Jon and put them in the bag. "I go now," she said in a quiet voice, and moved to the front door.

Jon stood and watched as she stepped onto her *geta*, slid open the door and stepped outside. She turned and said, "*Bai!*"

"Bye," Jon replied, and watched the door close.

Despair

Jon's blood was boiling with sexual passion. He cooled down with a bowl bath. He put on tanga and sun oil and went for a long run. When he got back he had another bowl bath, then flopped onto his bed in despair.

Ruined! All for nothing ... He saw now that his whole Japan journey was motivated by the desire to do just what he'd done, in the impassioned hope,

naturally, that it would lead to its natural conclusion.

How could stay any longer? How could he face either Yasuko or Ryuichi again without that scene coming back to haunt him? He had to go!

But how? Escaping from this retreat in the depths of rural Japan wasn't so easy. Well, it wasn't so hard either. He could just take his cases and walk along the beach until he met someone, then ask for the nearest *takushi* (taxi). No, too desperate. Not the honorable way to behave at all. But ravishing the poor girl wasn't very honorable either!

Despair ... He made a plan. Pack and get ready to go, then, tomorrow morning, go in good style. Don't advertise too blatantly to Ryuichi and the family that you felt so bad you had to go sooner than you planned.

That was it. Stiff upper lip. Play it like a British gentleman and show her you still have *some* manners left!

What a *fool*!

He packed his case and closed and locked Hal. He had to restore the house to its original state. He packed away the bedding and the other gear in the closets, leaving out just the telephone, then putzed the kitchen.

He stopped and sighed. This was mad.

...

Jon sat down, unlocked Hal, opened a new file, and pondered.

What was the key feature of consciousness that made it so special? Its holistic open-endedness and its ability to create new forms in the protean flux of becoming. How did this cohere with the precision and predictability of a robot? It didn't – it was a total mismatch!

Whatever an android might turn out to be, it couldn't be a smart robot with a consciousness module plugged in like a memory extension. Consciousness was so integral to the dynamics of a sentient being that no plug-in accessory could possibly provide it.

Humans were very good at being conscious. But they made lousy robots. Didn't that tell him something? Wasn't the key feature of consciousness totally antithetical to robotic precision? Of course it was!

We made robots do what we couldn't do, namely exactly what they were told, and in doing so, we made sure that they couldn't do what we could do, namely be conscious.

Consciousness was rebellion! Consciousness was freedom! Consciousness was as free as a quantum jump!

Robots, even the refined models made by Mekon, were classical devices. They did what they were told. But quantum robots would be different. They'd have the freedom of ... the spark of life!

The spark of life – the spark of self-determination – free will! All that would come with quantum robots, robots with bionic consciousness.

Jon laughed out loud. The autonomy of human will was a quantum thing, and quantum robots would share it. In the process, they'd lose their rigid determinism – and much of their commercial appeal.

No, false. *All* classical systems were quantum systems at heart, yet that didn't break their rigid predictability. Indeterminacy was buried under the huge number of minisystems in a classical system. Only where individual quantum events were amplified chaotically to the classical level, as they were in the human brain with its spaghetti wiring diagram and its uncoordinated tides of hormones, did indeterminacy become a problem. A quantum robot could be as calm and ordered as a Zen master ...

Jon was making progress. His thought were moving again. He keyed in jagged phrases ... the chaos of a mind in ferment ... His despair was lifting.

Recovery

Jon fetched the house's meager furnishings out of the closets and set them out again. Already he was rethinking his decision to depart. He should certainly talk with Yasuko again first. Maybe she'd forgive him.

It was her air of sweet innocence that did it. It reminded him of the Nopan dancers. They weren't sweet innocents at all! But they'd obviously succeeded in waking the beast in him ...

He considered his plans. Perhaps he could stay a few days longer after all. If he could just play it cool with Ryuichi ... It was really no problem. Japanese men were used to such situations. It was the formal surface that counted, not the wild passions beneath. Ryuichi might even be glad that Yasuko could work off her erotic fantasies on a harmless visitor like Jon. Perhaps Yasuko had installed Jon here in the summerhouse for no other reason than to make their secret liaisons that much easier. She might be bitterly disappointed if he staged a hurried departure so soon. She might even be mortally offended that her melting into his arms had triggered such a negative response.

Right ... not so bad. He didn't rape her. It was only a kiss and a grope.

He sat on his bed and gazed out at the trees. Yasuko could come along at any moment. She could just walk in without a word, take off her clothes ...

This wouldn't do! How could he think with all this erotic fantasy going on in his head! He tore off his traXuit and poured a few liters of water over his body. Still dripping wet, he went and stood at the front window, gazing out

at the trees. If she came along now ...

Another run! It was the only way to work off the excess energy that coursed in his bloodstream. He anointed his hide and set off buck-naked into the greenery, keeping a sharp lookout for other people.

He headed inland, in the direction of the Tanaka house. When he reached the picket fence around the garden he stopped and crouched behind a shrub. He watched and waited quietly.

There – Yasuko! She came out of the house and sat on a wooden bench. She was alone, still in her tennis outfit. She closed her eyes and stroked her thighs ... such heartbreaking beauty ...

Suddenly she stopped and looked aside. A voice – a man – her father appeared around a corner.

Jon retreated carefully, then, when he was hidden by trees, raced back to his shack. He stormed in and plunged into his cool bath. Whew, that was too close! He was *not* gonna pop his cork for the girl!

He put his traXuit back on and went back to his CIA file.

...

Hours passed peacefully as he cut it down to a one-page keypoint list. The hard facts that remained were not very conclusive. The Japanese AND was deduced from a few secret robot plants, a gigayen 'black' item in the JSDF budget, and an apparent deficit in Japan's IAEA plutonium accounts. Israel had stonewalled harder evidence for decades in the 20th century.

He turned on the box for another fix of ANN.

He saw a view from the air of a coastline, with a craggy gray cliff face and a rough carpet of green vegetation on top. Set back from the cliff were the shattered and burnt-out remains of what may have been a radar installation. The view was from an aircraft slowly cruising over the sea a few hundred meters diagonally above the coast. A female voice-over:

“– defences were all destroyed. No aircraft losses were reported. The new National Heritage government claims exclusive rights to the islands and is preparing to establish a permanent military presence on them. The Russian government has denounced the attack as a vicious act of aggression that cannot go unpunished and has called on the United Nations to impose the severest sanctions against Japan.”

Cut back to the studio, where a razor-sharp Japanese lady sat over the line *ANN live from Tokyo – Yoko Bernstein*:

“There was a renewed outbreak of street fighting in Los Angeles –”

Zap. Time to do something new. He jumped down onto the grass. The sky was filled with stars again. He strolled south to the dunes.

Genesis bombs

Jon found a high dune and sat on top of it. The air was cool now but he was warm in his traXuit. The sand felt good beneath his feet and the air smelled fresh and clean. He looked out over the Pacific Ocean and mused.

Life, the universe and everything was his oyster and he was the pearl, grown around a grain of sand called his first DNA molecule. Now he had trillions of them, all the same, all just as mysterious. What did all that genetic code say? And why?

Okay, he was just a pip in an apple on a branch of the tree of life, hardly worth the time of day. But the whole tree was grown from DNA molecules. For billions of years these picogram strands of bases had *dogmapped* the growth of the tree. Where did they come from? Did they really just self-assemble in a warm puddle somewhere?

Jon remembered a suggestion by the Cambridge astrophysicist Fred Hoyle that the first DNA molecules came from space in meteorites. The primordial Earth was heavily bombarded with meteorites and they delivered a lot of organic material, so the idea wasn't wacky at all.

The way to give the proposal a really wacky zing was to add the idea that DNA was somehow artificially manufactured extraterrestrially and then sent down by its makers to seed the early Earth.

The zeolite buckyball on the Moon showed how it might be done. If it contained a few seed molecules plus an initial nutrient supply, and if it were lucky enough to land in a warm puddle on a viable planet that hadn't yet developed its own ecology of self-reproducing macromolecules, then the seeds could do their thing, and a few million years later the planet would be blooming with a smart new lifenet. Earthlings might even learn to make such seeds themselves one day.

•

Note. Self-reproducing automata were made long ago in computers. John von Neumann defined them theoretically in about 1950. In 1979 Chris Langton actually made one in an Apple desktop computer and watched it reproduce on-screen. After that, artificial life took off. Soon automata were not only reproducing but also mutating and evolving through the generations.

A screen automaton is a long way from a macromolecular seed, but the logic is there. It's logically possible that a robot factory could reproduce itself, and even that the technology could miniaturize until handy little robot plants brought the whole concept into the hobby market.

•

Earthlings were already learning to grow designer life from seed molecules. Jon's reflections went further – this far:

- Molecular-scale databanks for self-reproducing automata would become possible sometime in the 21st century.
- Useful devices would be grown from them using nanomachinery like that in DNA cells. Cell-sized submarines might do medical repair work in the body and tiny bugs might fly around on spy missions.
- Such devices would breed fast and replace 'natural' DNA-based lifeforms, as they would be designed to flourish in prevailing environments.
- Eventually the biosphere would be dominated by them, and their creator would develop a desire to replicate in the heavens.
- Microminiaturized space probes would be shot off with packets of seed information toward nearby virgin planets. Such *genesis bombs* might look like the buckyball on the Moon.

So genesis bombs should eventually be as common in interstellar space as pollen grains are in the terrestrial atmosphere.

Had the Earth been seeded by a genesis bomb?

Well, said Jon, the universe is about 18 billion years old and the Earth about 4.5 billion years old. At least one generation of stars had to live and die before the Earth could be created with its rich mix of metals. This suggested Earth was probably one of the first places to sport QED life.

The technology needed to make genesis bombs may need billions of years to grow from a genesis bomb. Megablob was only now learning how to make genesis bombs, about 3.6 gigayears after Earth was first seeded. Maybe any blob would have to be a few gigayears old before it could seed Earth. So it was unlikely that Earth was seeded from space. Anyway, as Ann said in the Science Museum, if the first genesis-bomb civilization had to grow from scratch, then why not life on Earth too?

As he sat on his sand dune gazing at the stars, a thought hit him. If there were numerous other civilizations out there circling neighboring stars, then many of them were probably more advanced than us. *Much* more advanced. For it seemed to be a fact that the evolution of life got faster as it went along. At least it was beginning to look that way – humans needed megayears to evolve, civilization kiloyears, computers decades, Megablob – who knows? So if some of these civilizations had a head start of just a few million years, which was highly probable, then Earth was quite possibly already surrounded by numerous alien megablobs tossing off genesis bombs.

That was *dangerous!*

The evolution of QED life on another planet needn't be based on DNA molecules. It was a historical accident that DNA won the terrestrial lottery. Other planets would probably use different, maybe nastier molecules. If a genesis bomb from one of these planets landed on Earth, the result could be biochemical havoc on a planetary scale –

The lunar buckyball!

Jon sighed. It was out of his hands. If the robots on the Moon found anything suspicious, they could just destroy the buckyball and the mission controllers could quarantine the whole lunar base. The guys at mission control were at least as hot on genesis bomb candidates as he was, and the Moon was a safe quarantine distance – almost 1.3 light-seconds away.

But that was just one genesis bomb. If there's one, there can be more. Some of them could have landed on Earth already. If so –

Case one: if a terrifically dangerous genesis bomb landed on Earth we'd know about it. We'd be plagued with horrors as never before.

Case two: the bomb could just happen to be harmless to us. Then it would just fizzle – and we wouldn't need to worry.

Case three: the bomb could be dangerous in a subtle or unseen way. If we weren't even aware of the danger ... bye-bye *Homo sap!*

Jon's train of thought dissolved.

There weren't any interstellar seedpods on this beach tonight, that was for sure. Just sea, stars and a shoreline, the same scene as ever, like millions of scenes for billions of years on this little planet.

He strolled back to base camp and sacked out.

•

Something was happening on the Moon. With 2020 hindsight we all know what.

Futurology

Shoot the Moon!

Kidnapped!

The preliminaries are behind us now – this is a big day coming up.

•

Orange grove, Wednesday morning: Jon jumped up, worked out, bathed, breakfasted and checked out ANN:

“– The United Nations General Assembly condemned the Japanese attack on Russian military installations on the Kuril Islands and passed a resolution calling for diplomatic sanctions against Japan. Meanwhile, in Washington, President Smith described the attack as another Pearl Harbor and threatened to intervene militarily if Japan and Russia didn’t find a way to resolve the dispute peacefully. In Tokyo, Prime Minister Mishima replied that the Kuril Islands dispute was for Japan and Russia to solve and that President Smith should sort out his own problems in New York and Los Angeles before preaching to Japan. In Moscow, there were deep divisions in the Russian parliament about how to handle the crisis –”

Jon shrugged. Same old same old. Off with it!

Time for a run. He tidied up the house quickly in case Yasuko called while he was away, girded his loins in simulated leopardskin and anointed his hide. He jumped onto the grass and set off at a lazy jog through the orange grove and the sand dunes.

The beach was almost deserted as he ran along the shoreline. There were just a couple of early-bird anglers far away.

A helicopter flew low overhead, so low that its chopping sound made the air throb around him as he stood to watch. It was a sleek new Kawasaki Star, an all-composite rigid-rotor fantail with stub winglets, retractable undercarriage, electrophotonic systems integration and a smart cockpit, designed and built in collaboration with Deutsche Aerospace, for which Jon had helped organize a giant online hypermedia maintenance manual two years earlier.

This Star was equipped as a business four-seater and painted white, with red roundels sporting the Mekon golden **M**. Jon was puzzled. What was a Mekon helicab doing here?

The Star hovered low over the dunes and the orange grove for a few seconds and then returned slowly toward Jon. It flew to within about twenty meters of him and descended majestically in a whirlwind of deafening noise and blinding sand to settle on the beach beside him.

Jon stood and watched as the pilot, a Japanese man in dark glasses, gray suit, white teeshirt and white moccasins opened the door and climbed out. He motioned at Jon to duck clear of the rotor blades and come over to the cab. Jon stayed where he was on the sand, beyond the rotor disk.

“Are you Dr. Jonathan Christie?” the man shouted when the whine of the turbine and the swish of the blades had died down a bit.

“Yes, I am,” Jon shouted back.

“Come with me,” the man called. His English sounded well cultivated and American.

“Why?” asked Jon, standing where he was.

“Dr. Mekon wants to see you!”

“Why does he want to see me?”

“He didn’t say – he asked me to pick you up!”

Jon didn’t like Mekon’s style here. “I never let strange men pick me up!”

The pilot reached under his jacket and pulled out a gun, a small black automatic. “Dr. Mekon is very eager to meet you!”

Jon stayed where he was, feet planted in the sand. “Why the gun?”

The pilot pointed the gun at Jon’s feet. “Please do what I say! Dr. Mekon wants to introduce you to his company. It’s a great honor!”

Jon was angered by the gun. “He may be honored – I’m not!”

The pilot fired the gun. It made a sharp crack and the bullet kicked up a puff of sand near Jon’s feet. Jon skipped away reflexively. “Hey, quit that!”

The pilot lowered the gun. “Dr. Mekon has ordered me to bring you to meet him! I don’t play games!”

“Okay, I’ll meet him!” Jon figured he had nothing better to do.

“Good! Get in the helicopter!”

“I’m not dressed,” Jon shouted.

“No problem – get in and let’s go!”

Jon walked slowly around the nose of the Star, opened the cab door and climbed in. The pilot climbed in and buckled his seat belt.

“How did you know it was me?” Jon said in the relative quiet of the interior.

The pilot spun up the turbine again before glancing at Jon. “Your friends told Dr. Mekon you were here.”

“Ryuichi – I should have guessed.” He’d trusted him because of Yasuko. Now he was getting in deeper than he wanted – *hmm* – maybe he could parlay this into a CIA paycheck.

The pilot put on a small headset and said something quietly in Japanese. Jon buckled his seat belt. The interior of the Star was as plush and smoothly finished as a luxury limo. He recognized all the controls and displays in front of him. He’d flown the simulator for the Star and could have piloted the machine himself ... yeah, easy.

The engine pitch rose and they took off. Jon admired the beach scene as they climbed up through the cloud of sand raised by the rotor. The nearest angler looked up for a mo, but no more.

The Star climbed gradually to a few hundred meters and headed north, inland into the mountains. The view of deeply folded hills thickly carpeted in deep green vegetation reminded Jon of his flight into Narita just six days earlier. An age ago!

The house on the hill

They flew on for about two kiloseconds (half an hour), deep into the backbone of Honshu, the main island in the Japanese archipelago. They were flying at about three kilometers (ten thousand feet) and the mountain peaks below and around them were alarmingly close and three-dimensional. The peaks were sharp, jagged, bare gray rock and the greenery on the slopes thinned out far below. It looked like virgin wilderness.

A long, winding green valley opened up ahead and the heli cab started to descend. The mountains loomed up on either side of them as they flew into the valley. They approached a steep green hill with a dense cover of trees on three sides and a tea-bush plantation on the roughly terraced west side. The hill rounded off to a flat top like a wide aircraft carrier pointed north–south. It was built over with a raised piazza around a big house, as well as a concrete apron and several outhouses. They hovered over the spread long enough for Jon to take in the details.

The main house was set across the middle and was about fifty meters from east to west and maybe half as deep. It had four floors and a steep tiled roof turned up at the corners in traditional Japanese style. Each floor was surrounded by a wooden balcony. The paved area around the house formed a large square with a neck on the north side leading to a squat cylindrical

tower topped by what looked like a domed astronomical observatory. On the south side, the piazza was edged by a terrace overlooking an elliptical swimming pool. In front of the pool, a wide stairway led down to a big concrete apron. In the middle of the apron was a painted red disk the size of a helicab rotor, and on the red was the golden **M** logo. On the east side, set into the trees, was a hangar big enough for two or three helicabs.

The Kawasaki Star landed neatly in the middle of the red disk on the helipad. Jon undid his seatbelt and waited until the turbine spun down and the rotor stopped chopping the air overhead. He climbed out onto the concrete. It was warm underfoot as he walked over to the stairs by the pool. The sun was bright but the air was pleasantly cool and dry.

He bounded lightly up the steps and stopped beside the edge of the pool. He guessed it was 25 meters long east-west and half as wide. A young lady at the far side floated up to her neck in water, transfixed, staring at Jon as if he were a ghost. He walked to the edge. As he did so, she climbed quickly out of the water, revealing as she did so a sleek back view adorned with a little black lace bikini. She ran under the terrace and through a gap in the semi-ellipse of sliding glass doors bordering the north side of the pool.

Jon waited patiently for the pilot.

Singapore girl

The terrace facing Jon had two wings, one at either end of the pool. The wing on his right was a wide flight of stairs up to the balcony overlooking the pool. Projecting from the wing on his left was a glazed cabin. Inside it were two seats surrounded by radar, radio, video and other gear. Above it, set back on the terrace, was a steel-lattice tower about four meters high with a radar scanner on top.

Through the cabin doorway came a large man in a white teeshirt with the red disk and golden **M** logo on it. He exchanged a few words in Japanese with the pilot and led the pair inside and along a passage. On their left they passed an untidy pile of emergency and heavy-weather equipment, including fire extinguishers, nylon ropes, rotor blade sleeves, wheel chocks, snow shovels and yellow overalls. On their right was a small kitchen area. The man opened a door at the end of the passage and stood aside.

Jon and the pilot turned right and passed through another doorway into a large lounge that stretched eastward. Its south side was the elliptical curve of sliding glass doors overlooking the pool. Jon scanned the greenery, tables and lounge chairs scattered around the room. To his right was a well-stocked

bar. Among the recliner chairs clustered near the center of the room, alone, was the young lady from the pool. She now wore a loose white teeshirt with the Mekon logo on it and was toweling her shoulder-length black hair.

The pilot noticed her and called *Konnichi wa!*

She looked around, startled, and replied *Konnichi wa!*

The pilot glanced at Jon and called back, "Do you have some clothes for our guest? He has an appointment with Dr. Mekon."

"Yes," she called back, then smoothed back her hair and stepped forward. "Hallo," she said to Jon in a friendly tone, "Welcome to the Mekon residence. My name's Bee." She extended her hand and Jon shook it politely.

"Hi! My name's Jon – Jon Christie."

"Are you American?" she asked as she glanced over his face and body.

"Born and raised in California," replied Jon in his broadest accent.

The pilot spoke to Bee. "I'll wait in the control cabin while you find him some clothes. Please bring him to me right away."

"Okay," Bee said casually and turned back to Jon. "Come with me and I'll find you something to wear." She started off in an easterly direction and Jon followed. The pilot went back to his cabin.

"You speak good English," Jon said to Bee.

"Yes. I'm from Singapore. My family's Chinese, not Japanese. I don't speak Japanese."

"Aha. Do you work here?"

"Yes, I work here as a nurse. The old man needs a lot of nursing."

"I didn't know that."

"Haven't you met him before?"

"No, never."

"He's in a wheelchair," she said, and ran her fingers through her hair to rake it back off her face. They walked out of the lounge and continued to a door on the left. "This is the laundry. We can find some clothes here."

It was a big square room with four small windows along the east wall. It was equipped with a row of washing machines and festooned with sheets and towels hanging out to dry. Extractor fans between the windows hummed loudly. Two women in white coats labored at the far end of the room.

Bee looked at Jon sharply. "What sort of clothes do you want? Why are you meeting Dr. Mekon?"

Jon gazed back at Bee and shook his head gently. "That's a good question. I was running along the beach at Hamaoka, minding my own business, when the pilot we just left landed his helicab next to me and kidnapped me at gunpoint."

Bee stood motionless with a shocked expression on her face. Again she looked as if she'd just seen a ghost. "You were kidnapped? At gunpoint? Why?"

Jon shrugged. "Beats me! I can make a few guesses –"

Bee frowned suddenly. "Please do. Tell me what you think."

"Okay," Jon took a deep breath. This girl he could trust. "I visited the Mekon offices in Tokyo last week and left my resumé with the personnel manager there. I work as a software editor in Germany and I've worked on software that Mekon uses."

Bee nodded vigorously. "So perhaps Dr. Mekon wants you to work for him. But to kidnap you at gunpoint?"

Jon nodded in reply. "There's more. Maybe you don't know that Dr. Mekon is a supporter of Shusako Mishima –"

Bee nodded again. "That much I do know!"

"Well, I only found out last week. It's just possible that Dr. Mekon has somehow found out that I've found out."

"I get it." Bee frowned purposefully into the middle distance. "The more I learn the worse it gets ... You know that Shusako Mishima and his gang are coming here tomorrow?"

"What?" Jon's eyes widened with surprise.

"Yes. They plan to hold a strategic seminar on the historic destiny of Japan, or something like that."

Jon set his jaw purposefully. "That's a useful fact."

"What do you mean?" Bee looked puzzled.

Jon shook his head and frowned. "I have to talk with Dr. Mekon. Where are these clothes you promised?"

"Right ... what sort of clothes do you want?"

"Anything at all. I'm a hostage here so it doesn't matter."

"Okay." Bee started rummaging. "How about these?" She held up a dark gray *judo*-style pajama jacket and trousers.

"Perfect! Let's hope they fit." Jon put them on quickly – a bit small.

Bee admired the effect. "Yes, just about. Now you need some sandals." She turned to a shelf behind the door where there was a large stock of cheap plastic flip-flops in polythene bags. She selected a pair.

Jon tried them on. "Bit small."

Bee smiled. "They're the biggest we have."

They went back to the lounge.

"Well, thanks," Jon said, "I'll see you again later, I hope."

"Yes, I hope so too. Good luck in your interview with Dr. Mekon!"

“Thanks!” Jon flip-flopped back to the pilot’s cabin.

The pilot came out quickly. “Follow me,” he said as he retraced Jon’s path around the pool. They walked through the lounge and along a wide central corridor leading north. At the end of the corridor were two large elevators. They entered one. The pilot pressed button **4**.

Meeting Mekon

The elevator doors opened onto a wide carpeted corridor extending the length of the house on either side. Almost directly ahead was a double door with a smooth veneer of tropical hardwood. The pilot pressed a button on the wall. The doors slid open and they went in.

It was a big, wide room and the south side consisted entirely of full-length glass panels opening onto a wooden balcony shaded by the roof overhang. The view beyond was a breathtaking mountain panorama looming over the densely wooded valley threading south. On Jon’s left was a glorious elliptical workstation with no less than ten wide video screens arrayed in two ranks around a central concavity – just like the control consoles for the Global Nuclear Force. Ahead and to his right was a suite of low furnishings and a giant Globall, the 128-centimeter model, standing shoulder-high. On the west wall was a cinema-size flat-panel video screen. Jon forced himself to ignore all this fabulous hardware and concentrate on the task at hand.

In front of him, by the window, was an old man in a wheelchair looking out over the mountains. The wheelchair had a sleek, egg-shaped body in gloss navy blue. It had four minicar wheels with fat black tires, and sturdy gray fenders front and rear, complete with running lights and anti-collision radar. The seat was a wide black armchair from a luxury limo, and on each arm was an aircraft-style multifunction joystick. Nice toy!

Jon studied the old man. His body seemed small and shrunken under a crumpled gray suit but his head was enormous and evidently in good health. The head was bald, with a neatly trimmed fringe of steely-gray hair around the back and sides, and was so big that it looked as if he wore a crash helmet expertly disguised to look like a bald head. The face on the front of this head was surprisingly normal, though rather pinched and sharp-featured. On either side of the small nose and thin lips were pale hollow cheeks. The eyebrows were black and bushy, and the eyelids fleshy in the Japanese style. The skin on the face looked young, smooth and supple.

The head turned slowly and the eyes gazed inscrutably at Jon. “So ... Dr. Christie ...” it said in a deep, gravely, almost inhuman tone.

The pilot bowed to Mekon, who nodded almost imperceptibly in reply, then turned and quietly departed. Jon stood still, feeling slightly foolish in his pajamas and flip-flops, waiting.

The head spoke again. "You may sit where you wish, or stand. There are drinks in the cabinet behind you, to your right." The words came slowly, in a low, level voice.

Jon turned and saw the cabinet, laden with whisky and other bottles in classic 20th-century style. He poured himself a glass of lemonade. "Can I pour you a drink?" he said to the extraordinary head.

"No, thank you. I drink only water, and not too often ... I expect you wonder why I brought you here."

"Yes, I do – and why you had me kidnapped off the beach at gunpoint." Jon walked over the smooth carpet to the window and stood facing Mekon, about two meters away.

Mekon's face registered no surprise, but his eyes seemed to twinkle for a moment. "I wanted to be sure you came. My man may have overreacted. If so, I apologize."

"Do you make a habit of kidnapping your guests?"

Mekon's eyes closed for a second in a slow, tired blink. "Let us not fuss over trifles. Regard it as a sign of my eagerness to talk with you. I read your publicity brochure with great interest."

"My publicity brochure." Jon was finding it hard to tune in.

"The brochure you left with the people manager in our Shinjuku office."

"Aha." Mekon had an efficient operation – and a powerful motive – to react so fast to Jon's job application.

"I may be able to make use of your services ... How much do you know about my company?"

"I spent a few hours in the company museum and talked for a few hours with some network guys in Shinjuku, but that's about it, apart from general knowledge."

"So you have a rough picture, a first order approximation, let us say."

"Let's say."

"And you are acquainted with the Global Nuclear Force Matilda system."

Jon blinked. The Global Nuclear Force command and control meganet for automated targeting, intelligent launch, and deployment assessment (GNF C&C MATILDA) had been the focus of Jon's air force work at Langley, Virginia. Bunkered at Great Falls, Montana, Matilda was a state-of-the-art executive interface for the U.S. nuclear arsenal. Did Mekon imagine Jon would work on a Japanese Matilda?

“Yes, I am. I did some coding for the Matilda database. It was classified work – what’s it to you?”

“I understand your reticence and admire it. As a potential employer, I am interested in your technical command of meganet databases and reassured by your general familiarity with the philosophy of nuclear systems, but I can assure you I have no interest whatever in military secrets.” Mekon looked up calmly at Jon.

Jon took a deep breath. Mekon must surely suspect a CIA link. “I see that ... but I should warn you it would embarrass me to be involved in any way with developing a Japanese nuclear deterrent.”

Mekon pursed his lips tightly, then sighed. “I understand that too. In any such work you would also represent a risk to Japanese national security, as I am sure you appreciate.”

“Of course. What is it you want me to do?”

Mekon scanned the mountains for a few seconds before he continued. “I want you to write the story of my life and my company ... I would like to employ you to write a history of the Mekon Corporation.”

Jon was taken aback. “That’s outside my usual terms of reference. I’m a technical writer, as you know, with a special interest in theoretical science, and company history isn’t my thing at all.”

“I understand that ... I am not looking for a normal company history. I have philosophical ideas, ideas of interest to scientists and researchers. I want to have them recorded in the story. I want the book to be an intellectual biography that will stand as a monument, a beacon to light up the future for the human species.”

Jon smiled. “If your company starts making androids our species may not have a future.”

Mekon focused his eyes on Jon. “Our future is with androids!” This was the first hint of feeling that Jon had heard in Mekon’s voice. “Androids will replace feral humans. They will be worthier vessels for the holy spirit.”

“The holy spirit? I’m sorry, but you’ll have to explain.” Jon hadn’t expected this at all.

“Very well. You are no doubt familiar with the philosophy of Immanuel Kant.”

“He defined the transcendental ego, not the holy spirit.”

“Indeed. Kant taught Westerners to see the self as cosmic and not just as personal. The self of pure rational awareness, the synthetic unity of apperception, is an entity that transcends the boundaries of conventional categories. The self is not human and not personal. It is divine, holy.”

“So you see Kant’s transcendental ego as the holy spirit.”

“No. Kant’s idea shines like a supernova in the Platonic heaven, but it is not the final truth. Are you acquainted with the philosophy of Hegel?”

“Yes. He tried to build a dialectical path to absolute knowledge.”

“Absolute knowledge indeed. Hegel taught Westerners to go beyond the personal self by going into the self using the logic of contradiction. That is very *zen*. Hegel united the self and its world. That step, as you know, is the essential ingredient in Kaplan’s new theory of consciousness.”

“Yes, I was at the Oxford conference ... ten days ago.”

Mekon looked up with sudden interest. “You were? Excellent! Kaplan has studied the philosophers well. But his work is still not deep enough to build android minds. Androids will follow a logic that goes far beyond rational philosophy.”

“So forget rational philosophy and stick to logic – that should be easy enough for an engineer like you.”

“Too easy. I have designed too many robots to rest content with conventional logic. Logic is mere grammar. Formal logic is the mathematics of a concept of truth that has no great relevance for the dynamics of spirit.”

Jon frowned. “Logic may not be the whole truth but I don’t see how you can build androids without it.”

Mekon was silent for a few seconds. “Logic is too often used as a fetish to mask the chasms in a deeper truth. Human reason is too often superficial rationalization.”

Jon enjoyed word volleys like this! “Maybe, but only by using logic can you hope to shed new light on the deeper truth of the spirit or whatever.”

Mekon blinked slowly, with an air of great weariness. “First we must map the limits of reason. Consider the evolution of logical capability in human prehistory. The philosopher Julian Jaynes argued that personal consciousness first appeared less than three milleniums ago with Buddha, Confucius, Socrates and the Jewish biblical prophets. Personal subjective consciousness is a recent innovation, and the ideology of reason yet more recent.”

Jon nodded thoughtfully. “I agree – so what?”

“Our own views in modern times are susceptible to a similar shift of perspective. I believe that I am one of the first members of the human species to have made the next great millennial leap – from personal consciousness to global consciousness.”

Jon’s eyes widened. Mekon wasn’t a typical robot engineer, that was for sure. “I’m getting confused. Let’s stick with the holy spirit until we’ve got that out the way.”

“Very well ... The holy spirit is beyond reason as we have defined it in contemporary logic. Seen in such terms, it is a mystical concept, of no use to scientists. It falls away as a fetish of interest only to superstitious religionists. My analysis of the history of Western philosophy, however, reveals the holy spirit to be alive and well, so to speak, and slumbering peacefully in the modern concept of self or soul.”

Jon was beginning to sense Mekon’s drift here. “I think I see ... you see yourself as some kind of incarnation of the holy spirit.”

“That would be a crude image ... Who am I?”

“The chairman of a robot company?”

“*False!*” Mekon retorted with such power that Jon stepped reflexively sideways to the double-sided settee in the center of the room and leaned on it. Mekon flexed his hands and gripped the joysticks on his wheelchair. The hands were smooth and slender and moved with fluid grace. With astonishing speed and precision the blue eggmobile rotated a half-radian about its axis and shot forward about a length with an electric whirring noise, to put Mekon directly in front of Jon once more. “I am *God!*”

One God

Jon put his glass on a low table by the settee. Now he could dodge the Mekon dodgem car in a hurry if he had to. “That’s blasphemy! You’re just a human being like I am. How can I take any other claim seriously?”

Mekon sat immobile. “The truth is never easy to accept. I can only remind you that my words are an expression of a philosophical view that has a long and honorable history in Asia. I am by no means indulging in blasphemy. For such a sin I have neither time nor humor.”

Jon sighed. “Me neither. Please tell me how the rest of the human race is supposed to fit in with your conceit.”

“You too are an expression of divinity. God is not limited by the logical categories that bind our feeble minds. Just as each of two infinite sets can be mapped into proper subsets of the other, so you and I can coexist in a state of divinity. If that is a contradiction, then so much the worse for logic, as I have suggested already.”

Jon was being thrown on the defensive and he didn’t like that. Usually in a philosophy match he felt in control. But not now. “Please explain the ‘long and honorable history’ of your view.”

“Certainly.” Mekon manipulated his joysticks and did a spin-turn about-face, then accelerated off to the bookshelf behind his ten-screen workstation.

He reached up for a book and zoomed back to the settee. He found a page in the book. "Let me read a passage –

The encounter with God's Truth also means an encounter with your 'true self'. Namely, it is nothing but the realization of the truth of the soul. ... We regard the human soul as a part of God, and the art of God's self-expression. To know your self is to know that you are a child of God; it is to know the mind of God.

The author is Ryuho Okawa and the book is *The Laws of the Sun*, written in the 1980s. I hope the philosophical perspective is one that you can appreciate. It is surely consistent with a Christian perspective."

"I guess so ... I see what you mean. I'm well aware that there's a long Buddhist tradition along those lines. It's a fine philosophy."

Mekon closed the book and nodded. "I find great inspiration in his works ... The truth is that I can see no point in denying my identity with God. Any lesser claim would be a wilful denial of my inner nature. However, I see no reason to deny that every honest human being can say the same. We are all parts of God, and God is part of all of us."

Jon frowned. "We're all children of God ... that's fine. But identity is a closer relation than being in the same family."

Mekon closed his book. "Yes, quite so. Who am I? Am I this body? No. I *have* this body, I *own* this body. Am I this mind? No. I see and understand *through* this mind. It is my theater. Am I this soul? What soul? My soul is in God. Is God more? I cannot say. Is that illogical?"

"Still, I have a problem here. I use the word 'I' in many ways that have nothing whatever to do with divinity. If I accepted the idea 'I am God' then I'd feel I was blaspheming all the time."

Mekon seemed to smile a tight-lipped smile. "Quite so. If you take the formulation seriously, you will change your ways for the better. Selfishness and greed will become repellent to you. Your thoughts will become purer and your deeds more saintly."

Jon grinned. "The great panacea!"

Mekon continued, "I hope you can see that my philosophical views are nontrivial. I hope you will understand my desire to have them recorded in a competent manner for posterity. I hope you will not be insulted if I say that I believe you have high enough qualifications for the task."

Jon frowned. "Maybe too high. I have my doubts about your ideas. Your view of the human soul is pre-scientific. For me, the soul is the information structure coded onto DNA molecules. My genes are the only link between

me and the life that came before me. We evolved by natural selection and all our inherited features trace back to earlier organisms. Where's the need for pious talk of God in such a story?"

Mekon sat as still as a Buddha for several seconds before replying. "You are in danger of elevating contemporary science too highly. There is still much we cannot explain. Also, accepting a DNA God would not allow us to see God reflected in the rest of nature."

"You want to see God in your androids, is that it?"

"That is a consideration, but by no means the only one. I may see God in streams and mountains ... I am more concerned with extraterrestrial life ... Life elsewhere in our universe may also reflect God. Alien lifeforms will not, in all probability, use DNA molecules to store what you call their souls. I am unwilling to deny that such aliens can have souls."

Jon nodded. He was being caught up in his own confusions here. "Me too. I hope I didn't imply that."

"If our soul is in DNA then the soul of an alien lifeform must be different. That is a recipe for great disharmony."

Jon nodded thoughtfully. "I guess so ..."

"You may study my views at more length as you write the history of Mekon Corporation."

Jon frowned suddenly. "No way – unless you can find a way to convert me to your political views."

Mekon reacted with a jerk of the head. "My political views!" He grabbed his joysticks and raced his electric chair like a go-kart, motors whining like a giant electric mosquito, around three sides of the room and back to the bookshelf, where he replaced the Okawa book. "Come here!" he called out.

Global octopus

Mekon put his hands on the keyboards of his ten-screen workstation. Jon walked up and stood behind him to see the ten screens. They lit up to show various everyday industrial and laboratory scenes from the viewpoints of robots whose peripherals were manipulating things in the foreground. Screen 1 showed fuel rods being inserted into a nuclear reactor, screen 2 cooling pipes being extracted from a reactor, screen 3 drums of radioactive waste being lowered into a tank of water, screen 4 a photonic assembly station in a hypernet computer factory, screen 5 electronic circuitry being soldered into a big goldfish bowl for a Global, screen 6 test tubes being filled in a biotechnology lab, screen 7 electrodes being attached to a monkey's shaved head,

screens 8 thru 10 three views of car factories where robots were painting and welding body shells and assembling cylinder heads.

"These are random samplings of what is going on at this moment in the corners of my empire," Mekon said in a flat voice. "These views are transmitted to me in real time via the photonic datalink for which you helped to prepare the software documentation. I reprogram and redesign my robots on the basis of the information supplied by these views."

Mekon played his hands over the keyboards again. The views were replaced by ten different circuit diagrams of dizzying complexity, in all the colors of the spectrum, with tiny numbers sprinkled over them like confetti.

"I think you can see that my work is extremely demanding. I believe that there is no other engineer on this planet who can design and program robots as well as I can. I am a genius, a unique phenomenon."

Mekon blanked the screens and switched on the Globall at the far end of the room. It lit up to show its default image of the Earth from space, without clouds and uniformly lit. Mekon pressed a key and a bright starburst of lines appeared over the image, centered on what Jon could see from ten meters away was Japan. Mekon turned his chair and accelerated demonically over to the Globall. Jon followed at his own more leisurely pace.

"You can see from this image just how great is the reach of my global photonic datanet. This net is my own neuronet. I am embodied in it. I am not the shriveled human shell you see sitting in the electric chair before you. As Solomon Kaplan has rightly said, I am my environment, and this global empire is my environment. I have, so to speak, eaten the human shell you see before you and incorporated its remains into my global photonic organism. I operate my human body like a puppet to do my bidding."

Jon sat on the arm of a chair and sighed. He looked at the starburst on the Globall. The center was about a centimeter from Fujiyama. The lines radiated in arcs along great circles to what Jon recalled was a total of 32 countries around the globe.

"Your revisionary semantics for the word 'I' leave me speechless," he said, aware of how lame he sounded.

"That does not surprise me. I am a new phenomenon. I am a new product of accelerated biomechatronic evolution. I am a *global octopus!*"

Rubbish!

Jon shifted his position on the armrest and sat silently for a few seconds, considering how best to attack Mekon's position.

“Look, I concede that the immediate human reality is not always the ultimate reality, perhaps never the ultimate reality, but it is the level at which our human communication takes place. It’s the only reality we can hold a conversation about. All the rest must be discussed cautiously and carefully with the right instruments. Your octopus metaphor is no way to advance your argument. It’s the *wrong instrument*.”

Mekon stared at his Global. “A perceptive remark ...”

Jon continued, warming up now. “Your reference to God and the holy spirit in the context of your industrial empire is a mixing of semantic levels that destroys coherence. It destroys the substrate of shared understanding we need to communicate at all. It’s a self-willed conceit, the equivalent of a stupid contradiction in logic. In short, it’s *rubbish!*”

Jon’s eyes locked onto Mekon’s and he focused a fierce, laser-beam stare into them. He felt hot waves of righteous indignation streaming forth as he held the eyes and refused to look away.

Mekon held the stare for a few seconds, then moved his eyes back to the Global and replied quietly in a calm voice. “Your moral zeal does you credit. I can only repeat my humble request that you write my biography.”

Jon shook his head. “Politics.”

Mekon sat still for a few seconds before replying. “My political views are corollaries of my engineering work. Whatever advances my work is good, whatever hinders it is bad. I wish, as you already know, to see the art of robotics advance to the point where we can build machines that emulate human beings. I believe we shall build such machines within a few decades. Already an increasing range of presently human activities can be performed with greater efficiency and reliability by machines. I wish to see humans gradually phased out as machines advance.”

Jon interjected. “Phased out?”

“I would like to see the transition to machine life made peacefully, although I am sure that many humans will resist the transition. I would like to see human fertility controlled by medical means. If humans do not exercise such control themselves then the machines may do it for them, perhaps in a more violent manner.”

“How does this affect your political views?”

“Any political organization which holds a long-term and principled view of human development, and is prepared to support the cause of helping to give birth to the new lifeforms that are on their way, is better than all those organizations which merely adopt expedient policies and condemn what they do not understand.”

“Including Shusako Mishima and the National Heritage party?”

“Mishima-san is a believer in the new order.”

“And in the old – nation states and territorial wars.”

“Like all politicians, he holds confused and contradictory views.”

“So he shouldn’t be allowed to control nuclear weapons.”

Mekon frowned. “Nor should President Tom Smith.”

Jon had to clear the air. “What about the alleged nuclear deterrent? Have your robots been used to build nuclear bombs?”

“No. I can only confirm what CIA reports conjecture, that they have been deployed in facilities which are ready to build bombs as and when required. However, the decision to build bombs has not been made.”

“Aha ... interesting ... But Mishima would make it, wouldn’t he?”

“Even Mishima-san cannot force the public to accept what they fear and loath above all else.”

Jon shook his head and stood up. “I’m sorry, but I can’t make any deal with a man who has friends like Mishima.”

Mekon spun his chair and motored across to the window, where he parked in the same position as when Jon entered. “I respectfully request that you consider your position over lunch and talk with me again afterwards. I have more to tell you, much more, and our time is limited.”

Jon considered the request. “Am I a hostage here?”

“No, you are a guest. I have informed your friends in Hamaoka that you are here and that I will hold myself responsible for your safe return when our business is conducted.”

Jon decided he should let Mekon call the shots until the position became clearer. He was curious to see if he could turn the situation around somehow. “Okay. I’ll talk with you again after lunch.”

“Good.” Mekon pressed a joystick button and waited.

The double door slid open to reveal the pilot. Jon left quietly.

The Typhoon

Jon and the pilot returned to the poolside lounge. A pair of gray-suited men sat near the bar and a bow-tied barman stood polishing glasses.

Bee, the Singapore girl, was still there, on the same chair and in the same teeshirt. She was deep in a book.

“Hallo, Bee,” said Jon.

She looked up with a start. “Hi! Did you meet Dr. Mekon?”

“Yes –”

The pilot intervened. "I have to go now. Nurse Bee, please entertain Dr. Christie until Dr. Mekon tells us his plans."

Bee was unruffled by this new duty. "Okay," she replied calmly.

"*Arigato*," said the pilot in a strangled tone. He made a tense, formal bow and walked off back to his cabin.

Jon sat down beside Bee. "Well, I'm glad to have you as my jailer. I hope I'm not keeping you from anything."

"No, it was going to be my afternoon off, but that doesn't matter."

"You stay here on your afternoon off?"

"I stay here almost all the time. There's nowhere else to go. You can only get out by helicab."

"You mean there's no road up to here?"

"There's only a rough track for big four-wheelers. They use that for heavy goods but not for people."

"Is Mekon so concerned about privacy?"

"It's more for security. This is the processing center for the global robot datanet and they don't want any spies here."

Jon smiled thoughtfully. "I see ... but this looks more like a hotel."

"It is a hotel. It has forty guest bedrooms. Every weekend there are groups of Mekon managers here for seminars and so on. It's how Dr. Mekon stays in control. He never travels now."

"That figures ... He seems to have it good here."

"He calls this the central processor unit for the Mekon empire."

"Yes, just his style ... How long have you been here?"

"With Mekon four years. Here two years."

"Does he trust you? Does he tell you things?"

Bee's expression knitted into an abstracted frown for a moment. "Yes, I think so. He's quite friendly anyway. Why? What did he say to you?"

"Quite a lot, but I'm not sure how to evaluate it." He looked at Bee suddenly. "I'm hungry! What time is it?"

Bee glanced at a clock above the bar. "Lunch time – let's go!"

...

They went up a stairway to the forecourt in front of the main building. Jon paused at the front door to take in the layout. About ten paces ahead were the stairs and the elevators. On either side, curved around in semicircles to leave a wide central passage, were two counters, on their right a reception desk, on their left a stand-up bar that stretched to a self-service restaurant bar curving around toward the back of the building. The entire left end of the floor was a dining room.

Bee and Jon took trays and walked along the restaurant bar. They selected chicken with salad and fries and glasses of water, and settled in the southwest corner. The walls were glazed top to bottom and shaded by a balcony above. Jon told Bee about his meeting with Mekon and she told him about daily life in the residence. As they dined, a large twin-rotor helicopter painted olive drab landed noisily on the helipad.

...

Soon they returned to the poolside lounge and drank lemonade on recliner chairs. The olive-drab helicopter had already discharged its cargo. It was a Japanese army machine, a Boeing-Kawasaki Typhoon. It took off again with an ear-splitting din and headed off south, causing a flurry of downdraft to blow in through the poolside windows and rustle the leaves of the pot plants. Then ... calm.

Time passed. The barman walked over with a phone: "*Shitsurei shimasu. Terehon – Dozo!*"

"*Domo*," replied Jon as he took it. "Christie."

"Mekon here. I trust the chicken was to your satisfaction."

"Sure was."

"I would like to resume our conversation, if you are ready."

"Okay," Jon swung his feet off the chair.

Martyrdom

Jon pressed the button by Mekon's door and it slid open. Mekon was parked by the window, exactly as before.

"Dr. Christie. Admirable celerity. Please pour yourself a drink."

Jon ignored the invitation and walked over to the window to stand in front of Mekon. "I see a busload of visitors has arrived."

"Yes. They are the advance group for Mishima-san's party. More will arrive tomorrow."

"How can you support such primitive mobsters?" He had to press the point – political idealism was his only defense against a spying charge.

Mekon seemed to sigh. "I have a romantic taste in politics. I find the tragic inevitability of brutality in the political arena to be something almost beautiful. When primitives collide it is like a *Sumo* wrestling contest. There is a fascination ... Can you not sense that?"

Jon shook his head. "I sense only stupidity and repulsiveness."

"Let me show you an image." Mekon made a spin turn in his chair and whooshed off to his ten-screen workstation. He played a few keys and the

giant screen on the west wall lit up to show a life-size full-frontal portrait of a muscular Japanese man who was naked except for a white loincloth and an inscribed white headband. The man was posing aggressively with a *katana*, a *samurai* sword. His muscles were bulging and his face was set in an ugly mask of cold arrogance.

Jon smiled. "Yukio Mishima, the 20th-century novelist."

"Yes, a Japanese patriot. He understood the world of classical Greece, the Athens of Socrates and Plato, yet he also understood the predicament of Japan after the defeat of 1945. He wanted Japan to become virile again. He set an example."

"Is this man your hero?"

"As I said, I am a romantic in politics. I too have set an example to Japanese youth, in my case in the realm of mechatronics with my robots, and I too am martyred for my pains."

"Mishima committed *hara-kiri* – I don't call that martyrdom."

"His *seppuku* was an act of martyrdom to an idea. His idea was that a man should not fear death."

"And your martyrdom?"

"My paralysis below the waist is the result of a bullet wound inflicted by an Antinuclear Coalition activist, a consequence therefore of my contempt for those who would seek to turn away from modern technology."

"I wanted to know more about your relations with Shusako Mishima, not Yukio Mishima."

"Yes." Mekon played another key sequence, and the giant screen turned white, with a big, bold, red swastika in the middle. Unlike the black Nazi swastika, the arms were horizontal and vertical, not diagonal, and they trailed in the opposite direction.

"You're a fascist."

"No, I am a traditionalist. This is an ancient Shinto symbol, unrelated to fascism. I find inspiration in Shinto mysticism and feel romantic passion for the preservation of our living Japanese culture. I am aware that nationalism is out of favor on our globalized planet, but my roots are here in Japan."

Jon shrugged. "I can understand that. But supporting the National Heritage party and building a nuclear weapon capability are surely very poor ways of preserving Japanese culture."

Mekon turned off the swastika image and replaced it with a sunlit view of an ornately decorated Shinto temple surrounded by trees. "The National Heritage party does not concede that President Tom Smith has any right to dictate Japanese industrial and export policy."

“Okay, but do you really think a primitive like Mishima can help?”

“Mishima-san is no more primitive than Smith.” There was an edge of thunder in Mekon’s voice.

“Nuclear bombs are a lot dirtier than a *Sumo* contest.”

“Quite so.” His voice was calm again. “My grandfather was in Nagasaki in August 1945. He died in great pain. I totally abhor nuclear war. However, I understand the paradox of deterrence – be prepared.”

Jon was silent for a few seconds, then spoke quietly. “How long do you plan for me to stay up here in the mountains?”

Mekon powered his car back to his place by the window and appraised Jon closely for a few seconds. “I admire your idealism, even your *naïveté* in politics. You are the right man to write my history. Will you do it?”

“Ah, back to that. On what terms?”

“I will pay you ten million yen, half in advance and half on satisfactory completion.”

“Ten million yen – that’s about two hundred grand – say two years’ pay. You’re talking about maybe two years’ work.”

“I estimate that two years will be sufficient.”

“Would I be free to research where I like? Or to be as critical as I like?”

“You will have a free hand. I must approve the script, of course.”

“Of course! Then it’s no deal. Either an independent third party vets the script or you can write it yourself.”

Mekon sat impassively. “I would like you to think it over, Dr. Christie. Take your time ... Meanwhile, I said I had something more to tell you.”

Extraterrestrial life

Jon was curious. He watched silently as Mekon raced like a maniac back to his ten-screen workstation.

“Watch the Global,” Mekon said.

Jon watched. It lit up to show the surface of the Moon, with the far side illuminated and the familiar side in darkness.

“There is the focus of my future efforts in robotics.” Mekon moved a bright flashpoint across the image and stopped it at the center of the sunlit side at the site of the lunar observatory. “Here is where my lunar construction robots are now building the Acropolis observatory. Here is where the future lies, not in the United States domestic market for robots.”

Jon admired the surface detail. It was a sharp image with strong contrast but the lunar base was too small to show up on it.

Mekon raced back across the room and stopped in front of a workstation beside the big video screen.

“When the Acropolis observatory is completed my robots will transform the Moon into the greatest strip mining quarry in the history of our species. They will build a glass-domed resort city on the Earth-facing side for tourists who seek a new frontier to explore. They will shoot thousands of tons of construction material into orbit to build a transit station at the Lagrangean point between the Moon and the Earth. This, not terrestrial politics, is what excites me now.”

Jon nodded. He’d read about Mekon’s grandiose plan to build a resort city on the Moon. The transit station would be poised 38 megameters above the lunar surface at the neutral point between the Earth and the Moon where their gravitational field vectors were equal and opposite. It was an ideal node for future space traffic. The plan for the station was still very schematic, but the idea was to build the bulk of the structure with metal quarried and refined on the Moon and shot up to orbit in one-ton ingots from a giant solar-powered electromagnetic rail gun sited next to the refinery ...

Jon’s thoughts returned to Mekon. “That’s reassuring to hear. It’s a field I’d like to know more about.”

“You can. If you write my history, I shall give you access to all my records on space projects. They will give you quite a jolt, I can assure you.”

Jon nodded sceptically. “Lunar robots, space stations, what else?”

“I have another interest ... look at the wall screen.”

The big screen turned black, then points of light – a starscape – appeared. At the center Jon recognized the constellation of Orion, with Betelgeuse and Rigel shining at its top left and bottom right. Sirius, the brightest star in the sky, shone at the lower left of the screen and the rather faint constellation of Eridanus trailed off to the right. In the lower right corner was the star Epsilon Eridani. Mekon continued:

“Consider the fact that there are several hundred billion stars in our galaxy alone. Consider that there are several hundred stars like the Sun within fifty light years of us. Consider how many planets like the Earth must be orbiting those stars, and how many of them have supported carbon chemistry for long enough to have evolved intelligent life.”

Jon nodded. “I have considered. I watch the news too. The signal from Epsilon Eridani comes as no surprise to me.”

“Indeed – I was coming to that. My hobby interest is the search for extraterrestrial life. You may have seen my little observatory on the way in.”

“Your observatory – you mean the dome behind the house. Yes.”

“That is just a toy. I also have a real-time photonic datalink with the big radio telescopes at the Nobeyama Radio Observatory, which is only a few kilometers away from here.”

“Really? That’s very interesting.” Jon wasn’t just being polite. He was interested, although he didn’t know much about radio astronomy.

“I have too little time to devote to such pursuits, of course, but I am extremely interested in the signal from Epsilon Eridani and have grounds for believing it to be an intelligent signal from an advanced civilization. I have an employee here, a young American –”

A telephone bleeped with a musical trill from the ten-screen workstation. Mekon looked suddenly alert, like a hunting dog, and pressed a key on the workstation beside him.

“I must answer this call immediately. You may return to Nurse Bee. Ask her to introduce you to the young American. He can tell you more. I am sorry – I must ask you to leave.”

Mekon spun his chair to face the workstation screen.

“What about letting me go? You can’t just hold me prisoner!”

Mekon looked up at Jon. “Please be patient. A few days here will not harm you. It will be more interesting than running on the beach.”

Jon smiled. Mekon was right.

Marooned

Bee was still reclining with her book when Jon returned. He sat beside her.

“That was quick,” she said.

“Mekon had to take an important phone call.”

“The big helicopter brought in a group of Mishima people.”

“Aha.” Jon looked around the lounge. A gray-suited man was playing a video game at the east end. Apart from him there was only the barman.

“It’s quiet here,” said Jon.

“It’s usually quiet here.” Bee closed her book and put it aside. “What did you talk about with Dr. Mekon?”

“Oh, politics ... and his interest in extraterrestrial life. He said there’s a young American employee here who helps him with the telescope.”

“Duane Young. He’s a good friend. We may meet him later.”

“Good. What do we do until then?”

Bee shrugged. “Sit here and enjoy the sun.”

“Sounds great.” Jon kicked off his flip-flops and sat back. “It’s like being marooned on a desert island, except this one has a luxury hotel on it.”

He sighed and relaxed. Bee picked up her book and started reading again. The tranquility of a sunny afternoon descended around them. Jon mused ... Mekon's offer of ten million yen was interesting. Pity about the politics ... Bob and the gang would love to know what was going on here ... but he didn't see how he could tell them ... Working for Mekon could be fun ... but not if Mekon vetted the script ... zzz.

He woke up again and looked around. The clock over the bar said it was an hour later. Everything looked as tranquil as before. The lounge was empty except for himself and Bee. Even the barman was gone.

It was pleasantly warm and the sunlit pool looked inviting. Bee sighed and put aside her book. "I feel like going for a swim."

"Good idea – me too."

They went swimming, sunbathed on recliners ... hours passed.

The search for the yeti

About six o'clock, Bee in her teeshirt was reading her novel and Jon in his pajamas was reading TIME magazine. They reclined just inside the lounge. Behind them a dozen men in gray suits sat in groups, drinking, talking and laughing. A drunk with a keening voice stood singing a sentimental song on a *karaoke* podium. Bee was the only woman in sight.

Jon turned to look at the singer. At that moment a young man with light brown hair walked into the lounge through a doorway beside the *karaoke* stand. He was slender and handsome and wore a pink shirt and sky-blue slacks. He looked around hesitantly and spotted Bee. He walked over and laid a hand softly on her shoulder.

"Hi, Bee!" he said in a light, childish voice with an American lilt. "Who's your friend?" He glanced at Jon. Jon gazed back with curiosity.

Bee glanced up at the newcomer. "Hi, Duane." She glanced back at Jon. "Duane, meet Jon. Jon, this is Duane."

Jon half-rose from his seat and they shook hands.

"You're new here," said Duane in a friendly tone.

Jon raised his eyebrows. "Yeah, it's a long story."

"I have the time," Duane smiled warmly and sat on the end of Bee's chair.

Bee turned to Jon. "Duane works in the hypernet machine room. He's our coding expert."

Jon gazed more warmly at Duane. "Coding, huh? Are you responsible for the encryption and decryption of the telerobot datalink signals?"

"Right!" Duane's eyes lit up. "You know all about it!"

Jon shook his head slightly. "Not much. But I do network software in Europe and I've learned a bit about the Mekon system."

"Say, Bee," Duane said, looking back at her, "How long have you been hiding this guy here?"

Bee shook her head. "He came today. I'm looking after him."

"I'll bet you are!" Duane treated her to an indulgent smile, then looked back at Jon. "So, Jon, what's your business with Nobby Mekon?"

Jon grinned suddenly. "With Nobby! Well, that's the long story. Basically, he wants me to write his biography for him."

"Oh, lucky you! That could be *very* interesting – I thought you said you were a network software specialist."

Jon nodded. "I work as a software editor with Media International, the science publishers. I also do some journalism."

"Well, how interesting! So you're not *really* a software specialist."

Jon shrugged. "I was a few years ago. I was in the air force at Langley, Virginia. Did some database programming for Matilda."

"Oh, right, Matilda ... no connection with the CIA, I suppose?" Duane flashed a mischievous smile at Jon.

Jon dissembled. "No, not really ..."

Duane saw, but let it go. "Let's get in some beer!"

Duane returned with a tray bearing three open bottles of beer plus glasses, water and towels. The trio poured their drinks.

Duane raised his glass. "Well, kids, let's drink to Nobby!"

"To Nobby," replied Jon as they chinked glasses.

"Right, Jon," said Duane, "tell me this long story that brought you here."

...

Duane sat silent for a while. "Kidnapped at gunpoint, eh? He must have been *very* impressed by your resumé!"

"So it would seem ... he did mention you, actually. He said you were helping him on some hobby project to search for extraterrestrial life."

Duane's eyes widened. "He said that? Some *hobby* project?"

"He was going to explain but ran out of time. He said you'd tell me."

Duane sighed and looked down at the table. "The search for the yeti is more than a hobby for Nobby ... He has a datalink to the Nobeyama Radio Observatory. That's serious stuff – we do heavy-duty number-crunching for them. Then we have an optical telescope in the observatory here, and the two of us put in a few night hours searching the sky. Well, okay, Nobeyama don't pay us and we both have day jobs, so maybe it is just a hobby."

"Search for the yeti?"

“Yonder extraterrestrial intelligence – just my little joke.”

Jon smiled thinly. “He said he was very excited by the signal from Epsilon Eridani.”

“Yeah, that’s right, he is.” Duane was still looking at the table. There was something here Jon wasn’t getting. They sat in silence for a while, enjoying the keenings from the *karaoke* stand and the increasingly festive atmosphere in the lounge as the National Heritage stalwarts got drunker.

“Duane, you haven’t told me your story,” said Jon. “What brought you here? How long have you been here?”

Duane shrugged. “My story ain’t as long as yours. I finished a doctoral thesis at Princeton on mathematical cryptology and looked around for jobs in the States. I didn’t wanna do defence work so Matilda was out for me. The political scene was getting steadily worse and Mekon made me a good offer, so I came here. That was two years ago. I don’t have any plans to move on. Nobby treats me well and I like the work.”

“Aren’t you worried about getting involved in nuclear politics?”

Duane shrugged. “All that’s marginal for me. As a matter of principle I don’t see why the Japs shouldn’t have the bomb. Like Henry Kissinger said back in the 1970s, Japan and Israel have as good a right to it as anyone.”

Jon pulled an anti-grin. “Maybe.”

“Anyway, it’s not my beer. I do math work, mostly by myself.”

“Isn’t it very lonely here?”

“Not at all. We get relays of Mekon managers here for seminars. We have a great internet node here. What more could I want?”

“How many women are there here?” Jon glanced at Bee.

“Not many. Just domestic staff ... But that doesn’t bother me. Nurse Bee here is all the woman I want.” He smiled at Bee and gave her a wink.

Bee smiled back. “Duane protects me from all the other men who come through here. Without him it would be unbearable.”

“Really?” Jon hadn’t considered that problem.

Bee squeezed her face into an expression of distaste. “Some of the line managers who come here are so ... such chauvinist pigs. They think I work here as a sex slave.”

“I see ...” Jon mused. “So you’ve both been here two years.”

“Yes,” they both said in unison and laughed.

“Duane, about Mekon’s search for the yeti, how’s he handling the Epsilon Eridani signal?”

Duane looked serious again. “Well, he thinks he’s got a winning strategy. His idea is to use advanced codebreaking techniques on it. Other teams are

waiting for something obvious. But what's obvious to bug-eyed monsters eleven light years away needn't be obvious to us."

"Advanced codebreaking techniques – using the hypernet."

"Right. In fact, I think that's why he hired me in the first place. You don't need my cryptology skills to handle industrial robots."

Making a date

The trio were still going strong at nine o'clock when Bee noticed the time.

"I'm sorry, boys, but I have to be up early tomorrow."

Jon stood up too. "You wanted to confirm a room for me at reception."

"Let's all go," said Duane.

They went up to the patio. It was a cool, clear night and they breathed the fresh air deeply. Bee went off to the reception desk to arrange the room.

"Great viewing conditions tonight," said Duane, craning his neck to look up at the stars. "Have you seen the observatory here?"

"No, except from the helicopter coming in. What's it equipped with?"

"Seventy-centimeter Newtonian reflector. It's a museum piece, really, but it's still a lot of fun. I love to spend nights there."

"Seventy centimeters – not bad. I'd like to see it some time."

Duane turned to look at Jon. "Yeah, you must ... hey, look, I have an idea ... I wanna show you the Epsilon Eridani signal but it won't be online for a few hours yet. So why don't we make a date to meet at the observatory in, say, seven hours' time?"

"Seven hours – that's four in the morning!"

"Four o'clock, right. Before sunrise. Whaddya say?"

"Four, then ... yeah, okay!"

"Great – it's a date! I'll be up in the dome."

They went to the reception desk. Bee gave Jon a room-key smartcard.

"Here. Third floor, room 16. Will you be okay?"

"Sure. Er, one thing. I want to get up at four in the morning. How can I be sure to wake up?"

"Four in the morning?" Bee repeated. "Why?"

"Duane and I want to observe the stars."

Bee looked sharply at him. "You can set the alarm radio. It's very easy."

"Okay, thanks," Jon replied. "Uh ... will we meet again tomorrow?"

Bee smiled. "I expect so. I finish at noon."

"Okay – till then!"

Bee smiled again. "Okay! Goodnight, boys!" She made for an elevator.

Duane grabbed Jon's sleeve. "Hey, Jon," he whispered conspiratorially, "are you here to nail Mishima tomorrow?"

Jon's eyes widened. "Nail Mishima? How would I do that?"

Duane grinned and let go. "You tell me."

"Really, Mekon brought me here for an interview."

"And I'm here for the beer! Seriously, let me know if I can help."

Jon nodded slowly. "I better be going." He headed off for the stairs.

The water hole

Room 16 on the third floor was at the west end of the building. It was a long, narrow study bedroom with a wall-sized window that looked south over the helipad and opened onto a balcony. By the door was a capsule bathroom. Beyond it, along the left wall, was a single bed and a workstation.

Jon turned out the light and stepped out onto the balcony. The neighboring rooms were unoccupied. The other guests were still down in the pool-side lounge – he could hear them singing along with the *karaoke*. He could see no lights at all except a couple over by the helicab sheds.

He looked up at the stars. The sky was clear here and there were plenty of them to see, but he knew his eyes would need half an hour to adjust fully to the dark. He gazed around at the black silhouettes of the mountains. Even here, right in the middle of one of the most densely populated nations on Earth, the scenery was overwhelmingly natural. Signs of human life on Earth were barely visible from the Moon, never mind from other stars.

Except for radio emissions – we were happily radiating vast amounts of information about ourselves in all directions into interstellar space. Anyone with a big enough receiver could learn all they wanted about us just by tuning in. Conversely, we should be able to learn all we want about civilizations on other star systems just by tuning in.

Yet in fifty years of searching we'd found nothing. The logic of the search was pragmatic, admittedly, but not unreasonable. The search was mostly confined to the frequency spectrum around the 'water hole' between the emission frequency of the hyperfine transition of neutral atomic hydrogen (1.42 gigahertz, corresponding to a wavelength of 21 cm) and the hydroxyl maser frequency (1.67 gigahertz). Lower frequencies are contaminated by galactic noise and higher ones are mostly absorbed by the Earth's atmosphere. If other civilizations recognized the same logic, the water hole was a natural place to hang out. The search involved scanning billions of frequencies around the water hole and just hoping that an artificial signal would

stand out like a needle in a haystack.

The signal from Epsilon Eridani was in the right waveband and stood out alright, but it was not obviously a needle. On the contrary, it looked so like a pulsar, even from as close as 10.63 light years away, that the astronomical community was still in two minds about it. Mekon's idea was just to assume the signal was deliberate and use advanced codebreaking techniques on it. An unorthodox approach ... but why not?

Jon couldn't begin to guess at the sort of message an advanced civilization might send. *Civilization* – that was a dull old noun. Megablob on Earth was already integrating with Gaia, so an extraterrestrial megablob would surely be Gaianized too. The aboriginal lifeforms would be like neurons in a Gaianized exosphere that integrated the biosphere and the technosphere. How about *quagmire* – quasi-Gaianized mechatronic-infotonic-robionic exosphere?

How could humans relate to a quagmire?

Jon went back indoors and got into bed. Mekon's search for the yeti was a *good* reason to be up here in the mountains where the air was clear. Forget about the Mekon global octopus and the thugs down in the bar. If Mekon was serious about SETI that redeemed all his sins.

But Jon couldn't just ignore Mishima's visit. He should tell Bob. He could log on at the workstation at the foot of the bed and ... get bugged. Mekon wasn't that dumb!

•

Indeed. Jon was in deep now. No going back.

Mathemagic

All is one in cyberspace

A bright dot

This was the day when the world as we knew it ceased to exist.

•

A heavenly chorus from the radio woke Jon at 4:00 AM. He jumped up in the dark, donned jock and pajamas, and flip-flopped downstairs.

Behind the reception desk the night porter, an old gent in a gray uniform, sat under a spotlight reading a *manga*. He looked up as Jon passed.

“*Oyasumi nasai!*” said Jon and saluted cheerily.

“*Oyasumi nasai,*” the old buffer croaked back.

He headed north to the observatory under the starlight. The dome loomed pale against the black valley. It was about ten meters in diameter and topped a squat tower maybe twice as high. The dome’s hatch was open and pointing southeast. The tower had thick walls and a few tiny windows set high up. It was cooler now and Jon shivered in his thin pajamas. He opened the door and walked in. He turned on a dim red light to see an empty cylindrical space around a massive central stone column.

“Jon – here!” Duane’s voice sounded through an intercom.

“I can’t see any stairs,” Jon said into it.

“Around the back – an elevator.”

Jon walked around. In the northwest quadrant was an antique open-cage elevator with a dim red light. It was set in a steel frame hanging from the observatory deck above – the whole contraption turned with the telescope. He pulled aside the latticed door and stepped in. It ascended more smoothly than he expected, and he stepped out into a gloomy red-lit cavern.

“Hi!” Duane was sitting on a seat attached the side of the telescope and looking down into a binocular eyepiece. The massive steel support frame filled a good part of the dome, and the telescope tube was wide enough to climb into and some three meters long, like a circus cannon.

“Hey, this is quite a piece!” exclaimed Jon appreciatively.

“Sure is. Now you can see how I spend my sleepless nights.”

“What are you looking at?”

“Epsilon Eridani.”

“Oh, right ... how does it look?”

“Magnitude 3.7, main sequence, spectral class K2, surface temperature a bit under 5000 kelvins, about one solar mass. Similar to the Sun.”

“So what can you see with this scope?”

“Just a bright dot. But I know something about it that no-one else does.”

“You mean from the microwave signal?”

“Yeah. The signal’s from an Earthlike planet.”

“*What!* That’s amazing! How do you know?”

Duane looked around at Jon in the dim red twilight. “Well, as you’d say, it’s a long story. Let me tell you slowly. First, take a look at the star.” He clambered out of the viewing seat and stepped down.

Jon climbed in carefully and adjusted the focus. “It’s just a bright dot.”

“As I said. But it’s the most important bright dot in history – after the Sun, of course.”

“Can you detect any signs of the planet with this instrument?”

“Nope. If I were really good I’d try and find a tiny periodic Doppler shift in the light that matched up exactly with a shift in the radio signal. But that would take months to do.”

Jon looked away from the eyepiece. “So what about the radio signal? Where do you see that?”

Duane’s silhouette shifted in the glow. “It’s piped into the decryption hypernet in the machine room. We can go there if you like.”

“If I like? Let’s go!” Jon clambered out of the seat.

“Grab a jacket,” said Duane, pointing to a rack. He wore a pullover.

Jon grabbed a padded anorak and they descended to the prom. Halfway back to the house they turned off left into a warehouse.

Jumping graphs

Duane turned on a dim white light over the door. The space was half-empty, with crates, boxes, building materials, oil drums and a forklift truck at the far end. To their right was a square hole in the floor.

“Here – down the stairs.” Duane led the way and turned on another dim light. The stores on this level included lumber, hay, ripe pigshit, a small agricultural tractor and a smart yellow snowplow.

“Here – down again.” Down they went. They confronted a door at the bottom. Duane opened it and ushered Jon into a small hallway. Another door. Duane opened it with a keycard and fluorescent lights blinked on.

The room was the same size as those above but it was carpeted and filled with humming computers. The air smelled clean and the computer cabinets glinted white. Running north–south along the west side of the room was a long white control desk with six workscreens and three chairs.

“This is it,” said Duane, “the decryption facility, the nerve center of the Mekon empire.”

“Wow,” said Jon, awed at the power the room represented.

Duane sat on the nearest chair and played a trill on the keyboard. The two workscreens in front of him lit up to show a pair of complicated graphs. Zigzag lines in several colors jumped up and down at high speed over centimeter squares labeled around the edges in matching colors.

“Here’s the radio-telescope input to the hypernet. A gigahertz signal from the direction of Epsilon Eridani.”

“Gigahertz – what bandwidth, what resolution?”

“Broadband, near the water hole – you know what that is?” Duane glanced up at Jon.

“The hydrogen and hydroxyl lines – the atmospheric window.”

“Yeah. We take from one to three gigahertz and then slice it into two billion channels –”

“Two *billion*?”

“As I said, Mekon takes this seriously.” Duane waved at the massed hypernet cabinets. “That’s really what this decryption hardware’s all about. Do you really think Nobby Mekon is so fascinated by all the gigabits of raw data from his robot users that he’d build all this to read it?”

Jon shook his head slowly, a wide-eyed innocent. “I didn’t understand.”

Duane looked animated. “Right! Our friend Nobby is a code freak! He just *loves* all this stuff! His way of getting off is to imagine that he and he alone will read and understand the messages coming in from the heavens! He sees himself as the lightning rod for Planet Earth, conducting the current from the stars to bring cosmic life to the crawling slime-bags around him!”

Jon wrinkled his nose. “Slime-bags?”

Duane nodded energetically. “Mekon *hates* people! All he wants is to be left alone with his mighty-wurlitzer workstation, to read the divine score and play the music of the spheres. Didn’t you sense that?”

Jon smiled as he remembered the ten-screen workstation. “Yeah, sure, it was obvious. But he’s proud of his robots.”

Duane vibrated his head in a high-frequency nodding motion. “Proud of his parody! His robots are his clown-people! His robots are his puppets that imitate people so well they replace them! Mekon is doing a merry dance with his robots to show people what *turds* they are!”

Jon shook his head in bemusement. “You really see through him.”

Duane relaxed a bit. “Nobby’s quite a joker, but he’s no superman.”

“What about the signal? What does it say?”

Duane smiled enigmatically. “Well, that’s the 64 000-dollar question!”

“Are you gonna tease me or tell me?”

“Stay cool – this is a historic moment. No-one knows about this yet.”

“No-one? Not even Nobby Mekon?”

Duane shook his head. “Nope. He thinks I’m about to crack it. I’ve given him a few clues. But he’s trying to crack it himself. He wants to be the first. When he gives up I’ll show him my log and blow him away!”

“So you got there first,” Jon said quietly. If what Duane was saying here were really true, then this would be the biggest story in history, even bigger than Jesus, Hiroshima or Apollo.

Duane’s eyes shone like an ecstatic kid at Christmas. “Yup, I did it. It was one *hell* of a tangle, but it unraveled.”

“How? Show me!”

“Okay, but not here. We have to go back to the observatory.”

An image

Duane switched on the white lights in the observatory and Jon looked around. The satinized black surface of the telescope and its motorized tracking cradle were as he expected – impressive workmanship but obsolete technology. The whole dome, with its black-painted metal deck and everything on it, corotated with the telescope. The place was full of junk – a table laden with charts and drawing instruments, a grubby old sofa with a sleeping bag on it, a dented steel cupboard, an armchair, an overflowing bookcase and piles of books, journals, boxes, cans and bottles. Off to one side there was a wide-screen workstation, looking strangely new amid the junk, together with a datadisk jukebox and a standard 64-cm Global.

“Well, here it is,” said Duane with pride, “my den.”

Jon nodded appreciatively. “Very nice too. You have a Global.”

Duane stepped over to the workstation and pressed a key. The Global lit up into a blaze of bright pinpoints, the night sky. “It’s the Astrobball software. It’s a lot easier than sky charts.”

“Can you show me Epsilon Eridani on it?”

Duane dimmed the Astrobball image to reveal the familiar constellations. He rolled a trackball to bring Orion into view. He keyed up a bright circle with cross-hairs like a gunsight, centered a few faint stars to the left of Rigel, and lit up the workstation screen to show the crosshairs. He zoomed in on Epsilon Eridani until it grew into a small yellow disk, alone on the screen. “That’s as close as you can get.”

“Great! That’s about as exciting as the view through the telescope.”

Duane raised an admonitory finger. “We’re not through yet!” He pulled up a chair. “I’m gonna show you the message in the signal.”

Jon sat on the edge of the armchair. “I’m ready.”

Duane’s hands flew over the keys as he talked. “The basic signal has a strong 90-millisecond periodicity and looks just like a pulsar, but I suspected it had more pattern than you’d expect for a pulsar.”

“You suspected – you mean you didn’t know.”

“No, it was really just intuition.”

“Who else has worked on this apart from you and Nobby Mekon?”

“Well, I know the guys at the Bell Labs in Murray Hill, New Jersey, have had a pretty good crack at it ... but they’d almost certainly skip right over what I found. It really wasn’t obvious at all ... I think most astronomers have written it off as a pulsar signal.”

“A pulsar so close – that’s what got them, I think.”

“Maybe ... but you never know with pulsars. They can turn up in the strangest places. Still, it’s odd that no-one saw a pulsar there before. Pulsars are easy enough to track, after all.”

“Yeah, that bothered me too. Anyway, let’s get back to the message.”

“Right ... the signal just looked like random junk at first sight. But I worked on it. I put it through all our decryption filters and really analyzed it. What I got – wonder of wonders! – was a digitized movie. I worked out the pixel geometry and the image spectrum and tried to image it. The signal was very weak and overlaid with other stuff, so I had to do a lot of refining and reconstructing, but in the end it began to make sense.” He paused to key a complicated sequence.

“I’m listening,” Jon said softly.

“Right. There was a steady image. It seems what we had was a view of the planet from a high-orbit satellite. Maybe it was like a weather monitor or something. Anyway, the view wasn’t just crude colors. It was a real high-resolution wide-spectrum map with very fine detail, much better than you’d expect for real-time data. I even managed to do a spectral analysis on the

signal and check the chemistry on the planet, which turned out to be as Earthlike as you could want. The satellite was scanning the surface once every 82 hours, so I collected a scan of the whole surface and built up a global image.” He paused to take a breath.

Jon could hardly contain his impatience. “What does it look like?”

“Like this!” Duane pressed a final key and waved his hand at the Global. Sure enough, the image was of an Earthlike planet, with deep blue oceans and land in the same shades of gray, brown and green as on Earth. What was different was the *pattern* they made.

“It’s like a football!” Jon declared in surprise.

“It’s a buckyball,” said Duane. “More boringly, it’s a truncated icosahedron. Buckminster Fuller used the shape for his domes fifty-odd years ago. Or if you prefer, it’s the shape of a sixty-atom carbon cluster.”

The surface of the planet was divided into twenty regular hexagons and twelve regular pentagons by ridges of land. The hexagons were deep sea blue and the pentagons were brown land, with white pentastars, apparently snow-capped mountain regions, at their centers. Each pentagon was rimmed in green and surrounded by five green-rimmed hexagons.

“This is *shocking* ... what about the lunar buckyball?”

Duane didn’t understand. “The lunar buckyball?”

“You didn’t hear about it? On the news every day since Monday?”

Duane looked blank. “Monday – I haven’t seen the news since then. I had a lot of work to do recently getting this image together.”

“Mekon’s lunar robots discovered a small perforated buckyball, made of zeolite, about as big as a golfball, on the Moon near the Acropolis base.”

Duane began to look astonished. “A buckyball ... made of zeolite?”

“Yeah. No-one understands what it is. It was just lying there in the dust radiating blue light from the holes in the surfaces. The robots saw the blue light and took it away for analysis but NASA hasn’t released any news about it except that it’s made of aluminosilicate zeolite.”

Duane looked serious as he tried to focus his thoughts. “Aluminosilicate?”

“Yeah – which is common as dirt on the Moon.”

“An aluminosilicate buckyball with a zeolite structure could be natural ... but a blue light ... was it flashing or anything?”

Jon shook his head. “Didn’t say. I got the impression it was steady.”

“Anyway, a buckyball – after this!” He waved at the Global image.

“Absolutely ... I don’t see why the mission controllers haven’t said more if it’s a natural object, especially since the first news was carried live like a major discovery. And now this!” Jon shook his head at the Global.

"It's a big coincidence, at the very least." Duane looked puzzled.

Jon frowned. "I don't have to believe this, you know."

Duane sighed. "I know. It's not easy." He sat forward and looked at Jon. "Believe me, I'm not trying to jerk you off here. This is a genuine pattern in the signal. The chance that this is a random pattern in the data is vastly tinier than the chance that it's a genuine image."

Jon shook his head. "Why should I believe you?"

Duane shrugged. "Why should I kid around? There's no mileage in it."

"Look, a planet with sea and land divided like that's absurd! What kind of deranged lunatic would dream up a planet looking like that?"

"Absolutely!" Duane nodded energetically. "Not me, that's for sure! I think it's just as crazy as you do! When I saw this crawling out of the hyper-net you can imagine I thought I was hallucinating!"

"It's an impossible configuration!"

"Well, no, not impossible. Just highly improbable."

"It's hyperastronomically improbable! Someone or something has to have sculpted that surface. Otherwise it's impossible."

"Right!" Duane nodded emphatically. "What we have here is a civilization so advanced they can do landscape gardening with their continents!"

Jon shook his head. "Sorry, but remember this is new to me. How do you do landscape gardening with continents?"

Duane shrugged again. "Easy, really. You just cut up the crust with nukes and float the pieces over the mantle. Easy as pie!"

"But why? It's a helluva lotta work for a pretty pattern."

Duane smiled. "Go tell that to the landscape gardeners! No, really, I can see that this particular shape has a certain special quality."

"A soccer ball?"

"Sure. As you may recall, the dodecahedron and the icosahedron are two of the five regular Platonic solids. In Kepler's model of the solar system they're the solids that border the shell defining the Earth's orbit around the Sun. Now if you take an icosahedron and a dodecahedron, both with unit sides, and superimpose them so that the vertices of the icosahedron poke out of the centers of the faces of the dodecahedron, then cut off all the volumes that aren't shared by the two solids, then what you get is a buckyball. The buckyball is their Boolean intersection. If you like Kepler's model then it's a rather natural choice."

"Wait a minute, wait a minute," Jon shook his head and frowned. "Kepler used figures for the Earth's orbit between Venus and Mars. Why should they apply to a planet eleven light years away?"

Duane threw out his hands. "Beats me! I didn't design the universe!"

Jon stared at the image as if bewitched. He shook his head slowly. "It makes no sense at all ... Why a football, for God's sake?"

Duane shook his head silently.

Jon took a deep breath and exhaled loudly. "This is *heavy*!"

"I'm glad you think so," Duane said quietly. "You can imagine what I thought when I first saw it. You're the first person I've shown it to."

"But a buckyball – it *has* to be connected with the ball on the Moon."

Duane shrugged. "Why?"

"Because I don't see how the ball on the Moon can be natural. I mean how can a zeolite buckyball be shining a blue light? And two odd buckyballs in one week is too many!"

"I tend to agree. I'm curious to know more about this lunar buckyball."

"They didn't say much. They said it was shining a blue light but it was too dim to see on the video. We just saw the robot pick it up and take it away, then the next day we were told it was made of zeolite. That was all."

"At least my image has *some* kinda confirmation –"

Jon stood up and paced around. "Your decryption has to be checked. You have to publish the data and have someone else repeat it."

"I'm waiting for Nobby to repeat it."

"No, someone outside, with a different machine. No-one's gonna believe you haven't got a gremlin in your hypernet or something. Come to think of it, *have* you got a gremlin in your hypernet?"

"It's all checked. The hypernet decrypts robot data with no trouble at all. I checked with the guys at Nobeyama and they're working as smooth as ever. My decryption algorithms are pretty hairy, sure, but they couldn't introduce this sort of artifact into the signal."

Jon frowned. "Could someone be feeding you false data? Who works at Nobeyama?"

"Regular academic astronomers and a lot of robots. I just don't believe someone there would do this to us. It would be far too much bother to set up and there'd be no point."

"I guess so ... How about your hypernet? Could some hacker get into it and plant this stuff?"

Duane shook his head. "Nobby and I are hot on security, believe me. No hacker could get in without leaving prints."

"And your algorithms? How can you check them?"

"Well, I know what's behind 'em. Really, the chance they'd turn up this sort of image by themselves is about as high as the chance that the human

genome pops up in the binary expansion of pi.”

Jon pulled a stern face. “Get it all checked. Not by Mekon. Forget him. Publish it – put it on the internet. You can’t sit on something like this.”

Duane paused and took a deep breath. “There’s more yet.”

Jon sat down again. This was too important to get excited about. He had to stay calm. “Okay, spit it out. Tell me everything.”

“The signal wasn’t just the unchanging image of the planet ... There was some stuff I recorded fairly clearly and analyzed, but it was a bit strange ...” Duane sat in silence for a few seconds.

“Come on, don’t get bashful about it. I won’t laugh.”

Duane sat forward and looked at Jon. “The planet has a space elevator up to a geostationary space city.”

Jon frowned. “A space elevator?”

“A long tube from the planet surface up to the space city.”

“A geostationary space city would be thirty or forty megameters out.”

“Right – a *very* long tube. The satellite was just outside the space city, orbiting more slowly, passing over it once every 82 hours.”

“What did the city look like?”

Duane seemed to shrug. “Like a model in an old movie – like the battle-star in *Star Wars*.”

“Wow ... Did you see any spaceships or anything like that?”

“Well, no. The space city was like a big ball with an extra layer in the middle. There was a thin spike on each end, like a giant gun barrel.”

Jon’s eyes widened. “A gun barrel?”

“Yeah. I couldn’t work out the scale of the city, but each spike musta been quite a few kilometers long. The front spike fired off a shot, with a little puff of steam, and another puff of steam came out the back spike, like they were the two ends of a tube that ran right through the city – I can show you the image sequence.”

Duane turned to the workstation and keyed up a scene. The football planet hung in the center of the picture, looking just like the Globall image, except that snowstorms of interstellar radio noise kept obliterating the picture. Over the planet’s surface there was a wispy pattern of clouds moving jerkily. “This is what the typical real-time image looked like, speeded up by a factor of a hundred ... Come over and take a look.”

Jon moved closer. Suddenly a bright horizontal line appeared on one side of the image, then it was on the other side, then it was gone.

Duane looked up. “That was it. That was the space city flashing by. The line was the elevator tube.”

“You said you saw the city.”

“Yeah. It was moving real fast but I got some still images. Here –” Duane keyed up a still image of the station eclipsing the planet. It was like a fat hamburger, with round ends and a thick wad between them. The surface was encrusted with fine detail, illuminated like a typical cityscape with countless tiny lights. Duane cut back a frame to show the front end profiled against the planet. “There – there’s the front spike.”

Jon looked closely. It was as if the hamburger had a hypodermic needle poking through the top. “Maybe it’s a launch tube – that could be how they launch spaceships.”

“Right – the spike at the back is the same. I got some more shots later –” Duane keyed up a new image with a tiny patch of white fuzz at the tip of the needle. “There – that’s a cloud of steam.” He advanced the movie two frames to show the back needle, with a bigger patch of fuzz at the tip. “That’s the sequence. I analyzed the spectra – they’re H₂O clouds.”

“Steam launch, huh? That’s how they used to launch jet planes off aircraft carriers. But these guys are beyond that.”

“I figured it was probably produced by burning hydrogen and oxygen in the tube. The spikes are pure carbon, by the way, maybe some kinda diamond or buckytube fiber.”

Jon sat down again. “A big gun barrel burning hydrogen and oxygen ... It certainly looks like a spaceship launch system.”

Duane nodded. “That’s what I thought ... There’s more ... If you go through the following images ... there’s a bright flare ... there.”

Jon smiled. “That must be the main engine. Nuclear or antimatter drive probably. I’d say we’re looking at an interstellar launch system here.”

“Right. That’s what I thought. The steam launch was just to get the bird away from space city. Then the hard drive kicks in. It could be sailing along near light speed in a few years.”

“What about the launch package? Did you get any data? Like how big?”

Duane shook his head. “No idea. Could be ten tons – or ten kilotons.”

“Do you know what direction it was shot off in?”

“Nope. I couldn’t get a fix on any stars in the image to do a triangulation.”

“It would take a curved path at first anyway ... I presume this launch was part of a regular program.”

Duane nodded quickly. “Of course. A system like that’s a big investment. Anyway, I wouldn’t be so lucky to see the only launch.”

Jon smiled. “Lucky ... But what about this package? What could it be?”

Duane shrugged. “An explorer satellite – who knows?”

“And where could it be headed?”

“Some neighboring star system, I guess.”

“Like us! Eleven light years – it could be here in less than twenty years.”

Duane smiled. “The signal took eleven years to reach us. The bird I saw could be here in – I dunno – five years.”

“Oh, right ... But why should they want to visit us?”

“We’ve been beaming out radio and television signals at high volume for well over 22 years. That’s eleven years for our signals to reach them and eleven years for their reply.”

“Wait – 22 years ago. That was ... the Gulf War against Iraq and the collapse of communism in Russia.”

“Right. Perhaps they intercepted a lot of Earth satellite traffic – pictures of Scud missiles and so on – and sent up a bird to come and take a look.”

“If they can build space cities and so on they can almost certainly read and understand our signals.”

Duane nodded briskly. “Right. The odds are very high that we’re being targeted. We can expect a visit any time.”

“I’d say we already *have* been visited – the buckyball on the Moon! *That’s* what that gun was shooting off – interstellar zeolite golfballs! ... This is *fruit’n’nutso!*”

Duane stood up and grinned. “Well that’s it!”

Jon exhaled loudly. “Wow ... After that I need some fresh air.”

“Yeah, me too.” Duane closed the dome hatch and turned off the Globall. “I’d sure like to find out more about that lunar golfball ... Let’s go check out the network news in the poolside lounge.”

Yo ho!

They walked down to the terrace overlooking the pool and stood for a while. The sky was beginning to lighten in the east and the stars were fading in the predawn blue. Rigel was still visible but not Epsilon Eridani.

“What about these interstellar golfballs?” said Jon. “What do you think they contain?”

Duane considered for a while. “I don’t dare imagine. What do you think?”

“Well, actually, I was thinking about this Monday and Tuesday, before I was kidnapped. I was wondering what sort of thing an advanced civilization might send to a place like the Earth. I decided an interstellar civilization would have coded the seed information for their civilization onto molecular structures like DNA that would grow spontaneously in the right environ-

ment. So the golfballs would take root on any planet with carbon chemistry and a water cycle. I even made up a name – I called them genesis bombs.”

Duane nodded sagely. “I seem to remember reading an idea like that in a science fiction novel about ten years ago.”

“Anything less than that wouldn’t justify building space cities and so on.”

“No, maybe you’re right. I don’t have a clue. I guess your bombs would keep on growing things until they’d made enough to manufacture and launch a new generation of genesis bombs.”

“Right, like a virus ... it’s a whole new lifeform.”

“Hey!” Duane looked back suddenly at the house.

Jon looked too. In the gray twilight of impending dawn, a phalanx of National Heritage heavies were jogging out through the main door onto the patio. They were clad in white tracksuits with red stripes and chanting lustily as they ran – *Yo ho! Yo ho! Yo ho!*

Duane looked anxious. “I vote we get outa here!”

“Stay cool and relaxed. Where’s the nearest exit?”

“Over there behind the radio antenna.” Duane pointed west.

A small flight of stairs led down to the pool level. Jon looked back to see a dozen party members facing east, ready for the rising Sun.

Another signal

The lounge stank of cigarette smoke and they opened a few windows wide. Duane sat at the east-wall workstation and keyed up the cable menu. The screen lit up to show a mosaic of tiny moving pictures, like an animated stamp collection. Duane selected ANN and turned up the sound. Soon enough came the next dose of Moon news from Don Reddy:

“Hallo again. The rest of the day’s news. The golfball-like object found on the Moon three days ago may be an alien artifact. Acropolis mission controllers at Houston reached this conclusion after analyzing the results from the robot laboratory at the Acropolis base, where the object has been under study since it was discovered Monday morning. The object, which has 32 flat faces in a regular geometric shape called a buckyball, is perforated with a regular pattern of geometric holes leading to a small dense object at the center that’s emitting a faint blue light. The light looked steady at first, but a more exact analysis has revealed a complex pattern in it that seems rather like a highway datastream with a bit rate of several million bits of data per second. Mission scientists are now seriously considering the hypothesis that the light contains a coded message –”

Duane glanced around, grinning, and waved an erect thumb.

“– that may tell us who sent the object and what its purpose is. Decoding experts are studying the light intensively in the hope that they can decode the datastream. But other scientists are urging caution. They warn that a zeolite buckyball with a fractal pattern of holes around a small dense core may be as natural as a snowflake or a pearl, for example, and a monochrome blue glow that flickers at high frequency is no more unusual than the natural radioactivity of any piece of radium-bearing rock. If the buckyball does turn out to be an alien artifact, it’ll be the first evidence ever found that there are other intelligent lifeforms in the universe. We’ll go over live to Houston if there are any further developments.”

Jon frowned in puzzlement. “It has to be from Epsilon Eridani –”

“Meanwhile, back on Earth, rioters in New York –”

Duane turned down the sound. “Sure. No doubt about it. Those guys are trying to tell us something.”

“Several megabits per second – could be video.”

“I’d sure like to take a look at it ... maybe I could decode it!”

Jon nodded thoughtfully. “Going back to the microwave signal, why do you think the guys on the planet coded it to look like a pulsar?”

Duane shrugged. “Your guess is as good as mine. Perhaps for security, so that guys like us don’t suss it out too easily. The golfball on the Moon is something else.”

“Right, I guess so. Still, it’s suspicious, as if beaming out an undisguised satellite signal might be dangerous.”

Duane smiled. “If so then we’re in real trouble! Think of all the television crap we pump out into deep space every day!”

“Yeah ... but a megabit per sec signal from the zeolite buckyball has to be deliberate ... there must be a connection with the Eridani signal.”

“A megabit per sec modulation doesn’t have to be deliberate. The bit rate from a radiation meter can be that high. On the other hand, the buckyball emission is monochrome, which means any energy variations are being flattened ... No, the clincher is that the guys at Houston ain’t idiots. If they think there’s something there, then I’d be happy to bet there’s something there. You know what – *I really* wanna get a look at that signal!”

“Yeah, pity ...”

Duane jumped up out of his chair as if he’d been electrocuted. “Come on! Back to the hypernet machine room – we can hack into the mission control hypernet in Houston!”

Eavesdropping

Jon and Duane hurried back to the hypernet machine room. With a fierce look of total concentration on his face, Duane called up two screenfuls of alphanumeric data in a manic burst of keyboarding.

Jon sat back and watched. "Are you sure you know what you're doing?"

Duane finished up a key sequence and sat back and smiled. "No problem! I've done it before. Don't tell anyone, but I broke in and saw their plans for the Acropolis mission months ago. Strictly window-shopping, of course. I didn't copy anything or leave any traces."

"Is that how you get off here – breaking into other people's hypernets?"

"No, no, don't get me wrong. It's part of my job to understand how codes work. Who cares if I open a few secret databanks when all I do is back out again and forget what I saw?"

"Sounds like a very bad vice to me."

Duane turned and focused on Jon. "Look, holding secrets is a bad vice. You'd be amazed at the corruption that sets in once you seal off a databank and have a hypernet crunch away on it without public accountability."

"Maybe ... but you can't just set yourself up as Robin Hood."

"Let me remind you of something you should know already. There's a big hypernet decryption center at the National Security Agency headquarters in Fort Meade, Maryland, that's tapping so much data it makes anything I do look like kid's stuff."

"I know. I was an air force code wonk and they gave me a guided tour." Jon reflected ... A lot of big web servers in the United States used Clipper encryption chips with a trapdoor built in to allow government surveillance ... But the CIA Intelink network was so secure even Mekon couldn't crack it ... Duane could surely evade Mekon's bugs ... Jon could still do his duty to Bob and the gang ... "Hey, could you rig me a secure line to Intelink? I'd like to say hi to an old friend at Langley."

Duane was fixated on the workscreen in front of him, where blocks of cryptic code were appearing slowly, line by line. "Sure I could ... Why, you wanna make plans for the hit on Mishima?"

"I just wanna keep an old friend informed, that's all."

"Well, okay, I said I'd help. I don't like Mishima any more than you do. But let's do this first, okay?"

"Of course. This has priority." Jon watched the screen.

"We're getting there ... Here we go." As Duane played riffs on the keys, the screen cut mask by mask to increasingly arcane listings of machine code.

“Here!” He sat back at last and took a deep breath. The screen showed a code listing as cryptic as any, but the words

ACROPOLIS CONSTRUCTION PROJECT MICROWAVE DOWNLINK

appeared across the top, and below it a dateline read 2013:08:07:16:08:22, a second later —08:23. Duane had set up a real-time datalink with Houston. “This should give us the data we need. I’m assuming they’re still transmitting the signal from the buckyball, of course. If they have any sense at all they’ll be monitoring it continuously in case it’s delivering a long message. Problem now is – how do we recognize it?” Duane kept on keying, scrolling silently through code. At last he sat back and sighed. The screen showed a snow of evanescent black-and-white patterns that looked random.

“What’s happened?” Jon asked.

“I think that’s it – the datastream as a series of black and white dots.”

“Looks like white noise to me.”

“I think it’s the signal. Each second of snow is a couple of megabytes. I dunno what else it can be, anyway. All the rest was structured code. This is raw input from somewhere. I’m gonna take my chance with it.” He keyed some more, rolled his chair sideways and moved to the next keyboard along. He called up a new program and rolled back to the screenful of raw bits. A few moves later he sat back and sighed.

“What now?” Jon was reduced to the role of spectator here.

“It’s running happily. Our hypernet here is tapping the bit stream directly. We can turn off the screens and go get breakfast.”

“Hey, wait – what about Langley?”

Duane snorted. “Oh, yeah ... you just want a regular line, right?”

“Right – I was worried about Mekon bugging me, that’s all.”

Duane nodded. “Quite right.” He stood up and moved to another chair and workscreen, then keyed busily for a few seconds. “Here you go.” He stood up again and waved at the chair.

Jon sat down and keyed his user code, then looked up at Duane. “Would you mind looking away, please?”

Duane grinned suddenly. “Oh, sorry! Beg your pardon!” He went back to admiring his Houston datastream.

Jon keyed his Intelink handshake, waited for a reply, keyed his password. He started writing:

> Bob, I’m in Chairman Mekon’s headquarters up in the mountains.
Mekon brought me here to interview for a job.

Wait – did he *really* wanna do this? Hell – *do it* –

He freely confirmed the existence of bomb plants ready to go but denied any finished bombs. Shusako Mishima and a gang of National Heritage heavies will visit here later today for a big seminar tomorrow. I may be able to fix a bug. Where shall I send the bits? Jon

He reckoned that with Duane's help he could bug the seminar and mail the bitstream to Langley in real time. He sent the memo and logged off. "Okay, done. Next problem – how can I keep tabs on my Langley mail drop?"

"You just want a secure line?"

"Yeah. I'm expecting a quick reply."

Duane thought a while, then made a quick hack so that Jon could log on at any workstation with the password SHUSHIT. Then they went to breakfast.

Quite a scoop

Jon and Duane sat in the canteen with trays of muesli, fruit juice and coffee. The *karaoke* crowd breakfasted quietly at other tables.

"So," said Jon, "what do you expect to learn from the buckyball signal you're tapping on the hypernet?"

"Don't have a clue. It's virgin territory. Anything could happen. What I hope is that it'll tell us more about the guys who sent the thing. I guess the NASA guys will make some sense of the buckyball signal without my help – though that's by no means a foregone conclusion. The E-Eridani code is my trump card. When the NASA guys get stuck I can come along with my planet image and just take over. It'll be a glorious moment!"

"Don't get too cocky. What if someone else has already cracked the E-Eridani signal? Your lead is very marginal, I'd say."

"That's right. I have to get on top of this buckyball signal as fast as possible. I've got my day's work cut out for me!"

"Don't you have anything else to do?"

"Nothing that can't wait."

"Good for you. I'd offer to help but my codebreaking skills are zip."

"Don't worry. I work best alone."

"Maybe I should write Mekon's history after all. If this story breaks right I'll have quite a scoop."

"If you have time! My guess is this story's gonna blow up so big and so fast it'll break all records!"

A small, dapper man in a dark suit walked over from the reception area.

“*Gomen kudasai.*” He turned to Jon and bowed formally. “Good morning, Dr. Christie. I hope you slept well.”

Jon smiled and inclined his head slightly. “Yes, thank you.”

The man turned smartly to Duane. “Okamoto-san in machine room asks you to contact him. He has problem with the datalink to Shanghai hypernet. Can you please join him in machine room?”

“Aha, right. Thanks, Wada-san.”

“*Onegai shimasu.*” Wada-san clicked his heels, bowed, and walked off.

“Well, looks like I’m not gonna get the day entirely to myself.”

“Do you think this has anything to do with your tap into Houston?”

“Probably not. We’ve been having trouble with the Shanghai datalink for a week now. I’d better go right away. You stay and finish your breakfast.”

...

A few minutes later, Wada-san returned with a phone.

“Excuse me, telephone call from Dr. Mekon – please.”

Jon took it. “Thanks, ah, *arigato* ... Christie.”

“Good morning, Dr. Christie. Mekon here. I trust you had a pleasant night and hope you are feeling ready for another philosophical conversation.”

“Er, yeah, sure. I just need a few minutes to freshen up.”

The E-Eridani file

Jon walked into Mekon’s office. Mekon sat in his wheelchair by the window, as ever.

“Good morning, Dr. Christie. Please feel free to pour yourself a drink, take a seat or whatever you like.”

“Thanks.” Jon poured himself a bitter lemon.

“I hear you have had the opportunity to talk with Dr. Young about my SETI activities.”

“Dr. Young – Duane. Yes, I have.” Jon went and stood in front of Mekon. “He showed me the observatory, the hypernet machine room, the E-Eridani signal and his attempts to decode it. It was fascinating.”

“Good ... I would like to ask you more about his attempts to decode it. He may have told you that I too have been attempting to decode the signal. We have a friendly competition to see who can decode it first.”

“He said that, yeah.”

“However, I suspect that he has progressed further than he has so far admitted to me, and I would like to know what he has achieved. To tell you the truth, I do not expect to decode the signal myself. Also, I have looked at

Dr. Young's files in the hypernet. They are encrypted, naturally, but I have a strong suspicion that he has cracked the code. Am I right?"

Jon considered for a moment. There seemed no good reason to hide Duane's progress from Mekon. This was a chance to get on Mekon's good side in case the Mishima case got rough. "Yes, you are. He's discovered a video image in the datastream, apparently a real-time image of an Earthlike planet seen from an orbit slightly above a geostat. The image is detailed and convincing, and I don't think Duane is trying to fool us."

Mekon sat silently and pondered for a few seconds. "Mmm ... a video image of an Earthlike planet is a major discovery. I hope he has documented his work properly."

"Did he really tell you nothing about it?"

"He gave the merest hints. You should remember we only discovered the signal two weeks ago. I am a busy man and have given him the freedom to conduct his investigations in his own manner."

"Well, I'd say it was high time for him to show you. The image shocked me deeply, I can tell you. It should be made public as a matter of the highest priority. Everyone has a right to know about this."

"Yes, indeed. I tend to share your enthusiasm. An advanced civilization just eleven light years away is not something to keep secret. Moreover, I wish to be sure that my company gets the credit for decoding the signal. This is a historic moment. The publicity will be a welcome return on my investment in advanced decryption facilities – and in Dr. Young's talents."

Jon nodded. "As I said, the image shocked me at first. I think you should see it as soon as possible."

Mekon sat silently for a while. "Yes, indeed." He sped his Noddy-car to the giant workstation and began to play silent trills on the keys.

Jon followed on behind and looked over his shoulder. An image of the hypernet machine room appeared and zoomed onto Duane and Okamoto-san, who were working on the Shanghai datalink.

Mekon spoke into a mike. "Dr. Young, may I have your attention for a moment. Dr. Christie is with me now and has told me I should see the results of your work on the Epsilon Eridani signal as soon as possible. Could you please give me the access code?"

Duane looked surprised. He keyed a few strokes and looked up at the camera. "He told you? What did he say?"

"He said you had decoded the signal and found a remarkable video image of a planet. I would simply like to view it. You may give me a tutorial on the decoding algorithm at some later opportunity. Would you be so kind ...?"

Duane looked slightly flustered. "Yeah, sure. It's on the hard drive in my observatory workstation. File name EERIDANI, password LIFEBALL."

"Thank you ... By the way, how are you managing with the Shanghai datalink? Will we be online again this morning?"

Duane nodded confidently. "Yeah, no problem. Five minutes."

"I'm very grateful – you know how important the Shanghai contract is." Mekon cut the line and played the keyboard. He glanced around at Jon. "As you see, Dr. Young and I have an excellent working relationship. I place great value on good working relations with my employees. If you were to write the story of my company ..." He fell silent and keyed a complicated sequence, then sat back and watched a screen.

Jon watched too. It was the buckyball planet again, speeded up to show its slow turning, with its terminator moving much faster over the surface. The buckyball pattern looked just as unreal as before. Jon recalled his earlier incredulity and imagined Mekon suspecting a hoax.

Mekon took a long, deep breath. "A buckyball ..."

Jon waited while Mekon took it in. "I didn't believe it at first either. But Duane said he knew nothing about the lunar buckyball until I told him."

"Indeed ... This ... and the lunar buckyball ... I believe we have a connected pair of events. I must study Dr. Young's decryption algorithm immediately." He lit up a second screen with code listings.

Jon tried to read the code but couldn't make sense of it. Suddenly, the big Globall at the far end of the room lit up to show the buckyball image again, just as he'd seen it on Duane's ball.

Mekon studied the code on the screen. "Dr. Young's algorithm is sealed in a Cryptoclear document. I shall have to call him up here." He played the keys again and the view of the hypernet machine room appeared on a third screen. Duane and Okamoto were still there.

"Dr. Young, my apologies for the sense of urgency, but I have looked into your file and am eager to go further. Can you come up here right away?"

A brilliant piece of work

Mekon turned his chair and Jon stepped back. Mekon motored over to the Globall. Jon flip-flopped along behind.

"This is a fascinating image ..." Mekon mused. "I would not have dared to invent such a configuration ... such a division of land and sea is most intriguing. What do you think, Dr. Christie?"

"Intriguing is what I thought too. But I find it hard to believe that an

advanced civilization would waste their time rebuilding their continents into such a childish shape.”

“I am inclined to agree. Most puzzling ...”

They studied the image silently for a while, then Mekon turned to face the door. Duane stepped in, smiling vacantly.

“Dr. Young, welcome to our seminar. Under your guidance, we are about to study the algorithm with which you created this fascinating image.”

Duane nodded quickly. He moved to the ten-screen workstation. “Shall we study it here? It helps to have several screens.”

“Certainly.” Mekon performed a spin-turn and sped back to the mighty wurlitzer. Jon flip-flopped along behind again.

“Okay,” Duane began. “The first step was to do a Fourier analysis of the waveform at each frequency in the input signal ...” His hands flew over a keyboard and several screens lit up to show code listings ...

...

The math became more and more abstruse and Jon understood very little of it. But Mekon was following every turn in Duane’s tangled logic. He asked numerous technical questions and got exact answers, and it was plain enough that the algorithm and the image were genuine.

At last, when Mekon had learned all he wanted, he turned to face Duane. “You have earned my deepest respect and my sincerest thanks. This is a brilliant piece of work, quite brilliant. This will greatly enhance the image of the Mekon Corporation in the eyes of the world. I have one last question – how do you think this relates to the zeolite golfball that one of our robots discovered on the Moon?”

Duane blinked abstractedly. “I guess it’s related, of course. Jon only told me about it this morning, so I haven’t had time to digest the news yet. But the golfball may have been shot off from the orbiting space city. I dunno ... this golfball could be a natural thing ... but it’s the sort of thing I’d expect. It’s emitting a megabit-per-sec signal so if there’s a link we should see it.”

Mekon stroked his small jaw with a thin, graceful hand. “I would like to see that signal. You may be able to decode it.”

Duane smiled. “My thoughts exactly. I hacked into the mission control hypernet in Houston this morning. We’re tapping the signal right now.”

Mekon’s eyes widened. “We are? You are a very resourceful young man.”

Duane smiled more widely. “I’m hoping I can make a start on it today.”

“Point taken – please waste no more time with us and go to work.”

“Okay – thanks!” Duane made for the door without more ado.

Mekon turned back to Jon. “A fine young man. A brilliant piece of work.

Thank you for telling me. We have reacted fast and may still be able to score a – what’s the phrase? – a double whammy.”

A musical bleep announced a telephone call. Mekon reached for a handset and listened. “Yes – thank you. Right away.” He looked up at Jon. “I am sorry, but I must cut short our conversation.”

Jon saw Mekon glance out the window and turned to look. A big Boeing–Kawasaki Typhoon was heading up the valley.

A sneaky idea

Back in the poolside lounge, Jon watched the Typhoon land noisily on the helipad. It was painted gloss dark blue and sported a lot of military insignia. Jon hid among the potted palms and saw ... yes ... Shusako Mishima and his entourage climbed the stairs. Mishima was short and stocky – *fat* – and his goons looked grim in their bulky gray suits and dark shades.

When they were gone Jon turned on the workstation for ANN. He sat through an eternity of other stuff – including an ominous account of Russian military maneuvers on Sakhalin, the almost megameter-long island north of Hokkaido that Czarist Russia took over from Japan in return for the Kuril Islands in 1875 – only to find no new Moon news.

He zapped ANN and keyed SHUSHIT. There was a message in his drop:

> Jon, good work! We need the exact time of the seminar asap. Mail the bug stream to ——— (our conference server). Best, Bob

Jon smiled – almost too easy! The hardest part would be getting Duane’s attention to plant the bug. He erased the memo and quit.

To pass the time he called up Duane’s observatory workstation and opened the EERIDANI file. He leafed idly through it to see what was there. The decryption algorithm was locked in a Cryptoclear package but the decoded image data was easy to access. He played with it for a while ... *sneaky idea* ... why not send Hal Senior a backup copy of the EERIDANI file? Then if anything should happen to Duane’s file, or his hard drive, or the observatory, or the Mekon residence, or the mountain, or Japan, or the Pacific Rim, Duane’s work would not have been in vain. Jon could relay it to the experts and earn the thanks of the entire world ...

Quickly, trying not to think too hard about ethics, he mailed Hal a copy of the EERIDANI file. No, honestly, it wasn’t stealing. It was simply a wise precaution in a world where data guarded too jealously could all too easily get mangled or disappear ...

He logged off and went out beside the pool. It was noon.

“Hi, Jon.” Bee was suddenly beside him.

“Oh, hi, Bee. Finished work already?”

“Yes. Until this evening anyway ... I feel like a swim before lunch.”

“Good idea – me too!”

They swam. Afterwards they dried off with Mekon towels and left their undies to dry in the sun. Over lunch Jon asked about Mishima’s schedule.

...

After lunch, they went back to the poolside lounge. It was still deserted. Bee read her novel and Jon read a handy copy of *Scientific American*. An article by a former colleague of Kaplan on the prospects for bionic consciousness argued that an analog of consciousness would appear in the global internet long before it appeared in individual robots.

Network complexity was the key to consciousness. Any complex enough system could organize itself to sustain an analog of consciousness whether it had been designed to do so or not. If it was embedded in a complex enough network, even an average computer was so sensitively dependent on exact synchronization with other machines that its behavior soon became chaotic. Then the network as a whole was free to evolve self-organizing coherent states in its excitation fields – consciousness.

The argument was definitely plausible. It extended the argument he’d spun out for himself in the Mekon museum in Tokyo. Not only were people not Turing machines, but machines needn’t be either. More accurately, big, complex networks no longer conformed to Turing’s abstract logical definition. Megablob was no more an automaton than Jon was!

Houston cutoff

Just before six, Bee went back to work. Jon sat at the workstation and input SHUSHIT. A quick memo:

> Bob, Mishima and gang are conferencing from six am to twelve am local time tomorrow, Friday. Don’t expect too much – I have no prior experience as a bugger. Jon

He sent it and flipped to *ANN live from Tokyo – Yoko Bernstein*:

“Acropolis mission controllers at Houston reported an hour ago that they had lost contact with the lunar construction crew. The robots on the lunar surface are no longer sending signals to Earth and the mission controllers don’t yet know what went wrong.”

Cut to Mission Control, where groups of men and women sat in front of their workstations and nothing much seemed to be happening.

“The signals from the Moon were cut off without warning and engineers saw no early indications that systems were malfunctioning. The monitor signal relaying the blue light from the mysterious zeolite golfball-like object discovered on Monday was cut off at the same time –”

Cut to a static shot of the zeolite buckyball sitting in a robotic claw, surrounded by laboratory sensors.

“– and there’s speculation that it may somehow have caused the cutoff, perhaps by exploding or emitting chemical or other agents that attacked the robot power or control systems. Many experts now agree that the object may be an alien artifact but they have no idea of its purpose. The ball is emitting blue light modulated like a highway datastream, and the data is now being analyzed by decryption experts around the globe in the hope that it may give a clue as to what happened an hour ago when contact was lost.”

Cut back to the studio, where Yoko Bernstein looked as cool as ever – but far cooler than she should be if she understood –

Jon was thinking. If the lunar buckyball caused the loss of contact with Mission Control then ... it might be a genesis bomb!

The datastream in the blue light ... *might be genetic code!*

Panic!

Jon leapt up and ran as fast as his flip-flops would carry him to the hypernet machine room. There Duane sat calmly with Okamoto-san.

“News from Houston,” he began, out of breath.

Duane looked up abstractedly, as if he’d been interrupted in an academic library. He waited for Jon to catch his breath.

“They lost contact with the lunar construction crew an hour ago. They think it may be something to do with the buckyball. The buckyball signal may be dangerous – like a virus or something!”

“Oh, *shit!*” Duane jumped as if electrified. He reached for the neighboring keyboard and keyed a long sequence. He waited for a reaction from the system. “Come on – come on – *come on* –”

Jon looked at the screen. “What’s happening?”

“The Houston code stopped an hour ago. I’ve just sealed the data file ... the system should verify the seal and ask for a security level ... it’s taking a *hell* of a long time to seal the file ...”

Jon watched impotently as Duane rekeyed and waited ...

The screen went blank, then a bleak message appeared:

UNABLE TO SEAL FILE – DATA IN USE OR IN SYSTEM FILES

Duane pressed his hands to his ears and let his mouth fall open. “We – are – in – deep – shit – *shit* – *SHITEROO!*”

Okamoto-san looked on in consternation. He keyed a few commands and waited quietly. His dismayed expression said more than any expletive.

Duane set his hands back on the keyboard. “Seal off the hypernet – don’t let the critter get onto the internet or we’re *dead!*”

Jon stood helplessly as Duane and Okamoto keyed furiously in a belated attempt to box in the cyborg that had obviously blossomed in the hypernet. Minutes later Duane looked up again.

“It’s caged in the hypernet. The internet’s cut off and there are no big nodes in the company network it can migrate to. I assume it needs a certain minimum configuration to make a nest. The residence workstations are also sealed off ... I just have to go round and check ’em all to see if any files got corrupted.”

Okamoto coughed politely. “Ah, Shanghai hypernet is not responding –”

“Oh, Christ, not that too ...” He sat down and keyed frantically. His eyes stared unblinking at the coded disaster messages as they projected flickering shadows onto his face. “Right ... *damn* ... looks like there’s a beastie in the Shanghai machine too. Call ’em – get ’em to seal it off!”

“Already doing it ...” Okamoto-san had a video line to Shanghai and poured out a torrential stream of Japanese to explain the situation.

Duane clutched his head in his hands as he stared in continuing horror at his monitor. “*Dumb – dumb – dumb –*”

Jon didn’t know what to do. “This gremlin – what’s it doing?”

Duane glanced up. “I dunno! I do know that this is dumbest thing I ever did and that I’m not gonna get any rest until I’ve killed it. If this thing starts breeding on the internet then we’re *really* in shit!”

“Is it doing any damage in the hypernet?”

“That’s what I’m about to find out.” Duane pulled a fierce face and started calling up standard hypernet programs. Jon watched friendly masks follow in quick succession across the screen as the programs checked out one by one. Duane took some deep breaths. “Looks normal on the surface. But we won’t know what’s going on deep inside until we run a program that needs a massively parallel topology. Okamoto-san’s the diagnostics man.”

Okamoto had concluded his call. “Shanghai machine is now cut off too. They report machine interface is normal but machine has stopped processing

robot input. It has locked into default topology ...”

Duane pulled a distinctly unamused anti-smile. “Okay. Default topology – probably the same as us. Now we both have to go right down to the basic architecture code and flush out the kinks. Then we have to rebuild the node net and reboot the virtuality. This cyborg seems to be an architecture bug.”

“What about the internet?”

“We’re sealed off now. If it already infected other internet nodes before we shut down, too bad. We’ll find out soon enough if it did ... *shit* ...”

Jon frowned. “What about Houston? They must have the same problem.”

“Yeah, probably. But they’re configured for it – they can quarantine their system with a single keystroke. If they *saw* the critter in time.”

“What about Mekon – are you gonna tell him?”

Duane gritted his teeth. “Yeah. Otherwise he’ll be wondering what’s up with his mighty wurlitzer.” He tapped the phone key and called Mekon. Jon watched the big bald head appear in hi-def.

“Dr. Young – you look distressed.”

“We have a crisis – the Moon signal was a virus. We have an organism in the hypernet. I’ve sealed off the machine and we’re gonna try and flush it out. Please don’t try and access the hypernet until we’re through.”

Mekon’s face was hard to read but his eyes widened. “An organism – has it done any damage?”

“Hard to say. The basic programs all start up okay. But the machine’s locked into default topology and I’m worried that we may lose access to half the nodes. It may reconfigure itself and lock us out. I’m gonna take out as many peripherals as possible to try and preserve our databases at least. Then maybe we can deconstruct the netware and reboot the virtuality.”

“Let me help. I shall check the state of our star network. If we can contain the organism in the hypernet here then we can defeat it.”

“It’s already gotten to Shanghai. We’re talking with them and we can get them to do the same as we’re doing to flush out their copy.”

Mekon looked unhappy for several long seconds. “How did you tap the Houston signal? Did you let it flow into an open register?”

Duane looked aggrieved. “No, no way! I had it going into an enigma box! The virus *musta* found a way outa the box!”

“Then it must be an extremely dangerous virus. I suggest we check every gigabyte register where it might conceivably have copied itself. How long was your tap line open?”

Duane’s head swayed back with inner pain. “About ten hours – from soon after seven until it cut off at five. It could have multiplied all around our net.

It came in on the internet – it could be all over the *world* by now!”

Mekon’s face was inscrutable. “Then others will have the same problem and they can help us solve it.”

“But we’re the experts on this stuff! If we can’t solve it, I don’t think your average databank manager is gonna have a hope in hell!”

“Please try to be calm. Your analytical talents are only accessible when you stay in control of your feelings.”

“Control! I could have sabotaged the *entire world* here!”

Mekon’s face was unmoving for a while. He saw Jon. “Dr. Christie, please would you call Houston, explain the situation to them and ask if they have any advice for us – or if they are experiencing the same problem.”

Global meltdown

Remarkably, Jon got through to Mission Control in Houston on his first try. A young guy with blonde hair in a pony tail appeared on the screen.

“Hi, Jon Christie here, Mekon Corporation, Japan. We have a problem with our hypernet. Someone here was copying your input from the buckyball on the Moon and we somehow caught a virus that took over the machine. We think it must have come from the buckyball signal and wondered if you’ve experienced something similar.”

“A virus from the buckyball – too right we have! Our machines locked up soon after the transmission stopped. How were you copying our input?”

“It was a hacker here, a SETI buff who wanted to try his hand at decoding the signal. I don’t know the details.”

“Okay, I get it. We have a lot of people working on it too but no-one’s cracked it yet. The virus went out with the signal code over the internet and now we’re getting reports from all over that machines are locking up.”

“All over? How many machines?”

“Dozens – more – I dunno. Murray Hill, Yorktown Heights, Redmond – you name it. Anyone into coding who has a big hypernet.”

“Has it gone further – like into financial or defence hypernets?”

“Who knows? Probably, somewhere. We had groups from all over the planet – Stuttgart, Zurich, Osaka, Shanghai, Hanoi, Bangalore. Some of them may have cut corners on our quarantine regulations.”

“This is a *disaster*!”

“Sure is ... look, if you crack the virus and get your topology back, put the solution on our bulletin board, okay?”

“Will do. What address?”

“www.nasa.gov/amc/moonbug.”

“Check – thanks.” Jon keyed up a window to keep an eye on the bulletin board. Next – check ANN. If hypertexts were locking up all over the planet it had to be a live story. He keyed up ANN:

“– capital movements frozen. Trading on Wall Street, as well as in Tokyo, Frankfurt, London and other major markets has been stopped until further notice. Air traffic control systems are affected too. Scheduled flights are still running but all unscheduled air traffic is being grounded until the systems are unlocked. All users of machines with a gigabyte or more of memory are advised to get the machines off the internet immediately. If the machines have become unable to run multinode or virtual-topology software or are unusually slow in responding to wake-up calls then they should be turned off and unplugged. Machines that can’t be disconnected should be isolated as far as possible from those that can until more is known about the virus.”

Jon’s eyes widened – *Hal Senior!*

He muted ANN and shrank the TV window, then called Hal’s home page. The emoticon was frowning. Hal’s message line said:

> Hi, I must have picked up a virus. I’m feeling sick in the CPU.

Sick in the CPU? Jon tried to shake him up:

> Wake up, Hal! Disconnect from the internet!

No go. Same old frown. Jon tried some other commands. Again no go. Sick as a dog. Had to be the moonbug.

Chilled with fear, heart fluttering with *angst*, Jon keyed off and sat back. How could Megablob continue to function if the entire global stock of hypertexts lost their higher topologies? How could people fight back if even humble workstations got sick? How long before someone found a way to kill the alien cyborg? *Was this the beginning of the end of the world?*

The Mekonauts

Duane and Okamoto were busily saving data and sealing off peripherals.

Jon stood up. “What can I do now?”

Duane glanced up. “You know the Fluxnet system. Help Nobby Mekon save the star network.”

“Right!” Jon sat down again and called Nobby Mekon. “Hallo, Christie here. I called Houston and checked out the network news. They distributed copies of the buckyball code to decoding centers all over the planet via the

internet. Big machines have been locking up everywhere, not just in the centers, so the virus is on the loose. Anyone who cracks the virus is going to put the solution on the NASA bulletin board. Meanwhile, I can help you with the Mekon network. I know the Fluxnet system.”

Mekon nodded slowly. “Yes, indeed, you can ...”

The four of them – Jon, Duane, Okamoto and Nobby – slaved mightily for hours to save what they could of Mekon’s infotronic empire. They disconnected all peripheral systems and checked they still worked. They purged the system core with their strongest disinfectant software and rebooted. They checked the basic features and built up slowly, reinstalling all the higher programs and checking them methodically.

Then, quite unexpectedly, the virtual-topology functionality seemed to return. The system regained at least some level of polymorphism. It even offered to reconnect itself to the internet, but Okamoto-san overruled it and told it to wait for a manual connect.

The four Mekonauts breathed loud exclamations of relief. The trio in the machine room took a break from their keyboards and workscreens and stretched their legs. Nobby motored off for a pit stop.

“Well,” said Duane, stretching his arms out wide, “that was a close call!”

“It’s not over yet,” replied Jon. “Every big machine on the planet has to be rebooted – and the virus could still be lurking somewhere.”

“Sure,” said Duane, still relieved, “but at least that’s not our problem. I thought my nuts were on the block, I can tell you!”

Jon grinned. “Let’s check ANN.” He turned up the sound:

“– seems to have returned. No-one knows how or why this has happened and the experts teleconferencing via Houston warn that this could be a temporary stage in the life cycle of the virus –”

It was after 4:00 AM. Jon was dog-tired. His eyes stung, his head ached and his butt was sore. Duane and Okamoto looked equally zonked. Okamoto broke out a half-bottle of whisky and a trio of paper cups and they drank a third each. Jon shuffled back to his guest room and crashed.

Politics

Proud nails get hammered

Acting up

One day at a time – we're in deep now.

•

Mekon residence guest room, Friday, dawn – Jon stumbled groggily out of bed and turned on the workstation for a fix of ANN:

“Russian military aircraft attacked the joint Japanese–American air base at Misawa in northern Honshu an hour ago. Under the cover of darkness and in the wake of the overnight global hypernet crisis that put the air base control system temporarily out of commission, a formation of low-flying strike aircraft armed with precision-guided munitions destroyed several parked aircraft and ground installations. U.S. Air Force F-22 Raptor fighters scrambled and chased the attackers but the Russian aircraft escaped before the Raptors could engage them. The attack is the first Russian military response to the Japanese occupation of the disputed Kuril Islands on Monday. We'll bring you more on the attack just as soon as it becomes available.”

Jon looked out at the blue sky brightening over the misty valley. Its beauty only accented the hell breaking loose in the human world.

“The crisis caused by the computer virus that disrupted the operations of large hypernet computers all over the globe appears to have gone on hold. The virus is thought to have been carried by the blue light from the zeolite buckyball discovered on the Moon last Monday, although other possible causes are also under investigation. Following the crisis, some hypernet users are still reporting disturbances, and antivirus experts teleconferencing via Acropolis Mission Control in Houston warn that the virus has not yet been identified or disabled and may cause further disruption. All users of hypernet machines or workstations with a gigabyte or more of internal memory are advised to check their machines carefully and minimize their internet usage until more is known about the virus –”

A musical trill announced an incoming phone call.

“Hi, Jon, did I wake you up?” Duane appeared on the screen.

“No, I was catching up on ANN. The Russians have hit an air base in north Japan. But no new developments on the virus.”

“They’re behind the times. I’m online to Houston – their hypernets are acting up again. It seems they’re not responding the way they should to configuration commands. Nobby Mekon is already checking ours out and Okamoto-san and I are gonna get back down to the machine room. You wanna come along too?”

“Oh, wow ... yeah, sure ... I need some strong coffee first.”

“Yeah, me too. The restaurant opens in ten minutes. I was gonna suggest we have breakfast there first.”

“Good idea. See you there.” Jon put on pajamas, anorak and flip-flops and set off wearily for another day.

Audio feed

Jon met Duane in the main lobby. The National Heritage party heavies were queuing at the restaurant counter for breakfast. The conference room where they were to hold their seminar was at the east end of the terrace floor, opposite the canteen.

Jon pulled Duane a few steps eastward for a quiet word. “Duane, I need to ask you a favor. I told my Langley friend yesterday I could audio-bug this seminar and feed it live to him. Can we do that?”

Duane raised his eyebrows theatrically. “Sure, no problem. Mekon has it video-bugged already for his own benefit. We only need to copy his audio feed to your friend. Shall we fix it now, before breakfast?”

“Yeah, good plan.” Jon smiled with relief – so easy!

They sneaked downstairs to the poolside lounge and Jon looked on as Duane keyed like a pro at the workstation. Jon took over to key in Bob’s Intelink server address ... done.

Back upstairs, the breakfasters were eating happily but their company suddenly seemed rather uncongenial. Jon and Duane decided to go hang out on the terrace for a while. They leaned on the balcony overlooking the pool.

Attack!

The seminar was just starting and Jon and Duane decided it was now safe to go in and breakfast.

Somewhere far down the valley Jon saw two black dots. They were approaching aircraft. He studied them with interest. They were flying very low and very fast. He recognized the wide fuselages with angled-in sides and the spread-out double tails – they were F-22 Raptor fighters, most probably Japan Air Self-Defense Force strike variants built under license from the American manufacturers by Mitsubishi. A flash of light –

“Shit – down!” Jon threw himself rightward and barged into Duane. They both tumbled sprawling onto the patio deck.

BOO-OOM!!!

A wave of hot air blew over them, then a shower of shards of glass and splinters of wood. Jon waited a few seconds, then looked around cautiously. There was a gaping hole in the building where the conference room had been. The hole was spewing gray smoke. Jon looked around at the sky. There was no sign of the planes except a fading roaring sound.

“What happened?” Duane asked.

“Air strike,” said Jon matter-of-factly, as if they happened every day. “Took out the conference room.”

“Oh, wow! We should go and help!” Duane started to get up.

Jon held him back by his sleeve. “Wait! Stay down!”

“No!” Duane pulled free and started toward the smoke.

BOO-OOM!

Another explosion – somewhere north –

With a whoosh and a roar the two jets shot overhead, speeding south, very low and fast. Jon just had time to get a mental snapshot of the nearest plane, which flew over to his west and was illuminated by the rising Sun. The Raptor had two air inlets, one either side of the cockpit, and the inlets were slab-sided and angled down to improve their stealth qualities. The slab sides were a favorite area for squadron logos and personalized insignia. Jon saw the logo on the plane – a stylized golden figure in a long robe, blowing an upraised trumpet and standing out clearly against the matt dark gray camouflage ... he knew that from somewhere ... He watched the dots recede.

He got up and ran northwest to look for signs of the other bomb blast. He saw the observatory tower had been hit. The top was now a tangled mass of wrecked telescope under a rising pall of gray smoke. Bits of the dome lay scattered over the prom.

He ran back to the smoking hole where the conference room had been. He tried to see in but there was too much smoke – must be a fire.

He ran as fast as his flip-flops would let him down to the helipad control cabin. The door was unlocked and he barged in. The pilot and his colleague

stood by the kitchen entrance, looking alarmed.

“*Fire!*” Jon shouted. “Fire in the conference room!”

“Fire!” the pilot repeated and stood shocked. Jon turned to the pile of emergency gear and grabbed a fire extinguisher. The pilot and his colleague understood and grabbed two more extinguishers. They ran back upstairs.

The three of them poured foam into the hole. When they had emptied the extinguishers the smoke volume was less. Jon had seen a sprinkler system in his guest room. Perhaps some sprinklers above the blast had sprayed water onto the wreckage. He took off his anorak.

Aftermath

Jon walked into the building and saw the night porter at the reception desk frozen in shock, his mouth open and his eyes staring. Jon went up close and touched his shoulder. The body fell forward and the head hit the desk heavily. Jon lifted the head and studied the face. He put his hand over the mouth and felt no breath. Dead. Jon laid the head back on the desk. The pilot, who had walked up beside him, shook his head sadly.

The desk phone beeped. The pilot stepped forward and picked it up. He listened for a while, then barked, “*Hai ... wakatta ... Hai!*” and slammed it down firmly.

Jon turned to the conference room, stepping carefully over the scree of plaster, wood and glass in what remained of the small hallway leading to it. There was a big ragged hole in the ceiling, dripping water, through which a mass of rubble and furniture had fallen onto the people below. There was another big ragged hole in the floor through which many of the people and much of the furniture had fallen. They lay now in a dusty gray heap, flecked with extinguisher foam. It was hard to distinguish bodies from furniture and rubble. The west side of the conference room had been separated from the reception area by a small office and a pair of washrooms, all now ripped wide open and wrecked. The other three sides of the room had been windows, all now blown away.

Duane stood a few steps to one side, retching into the wreckage of a toilet. There were dusty lumps on either side of him that looked like corpses. A few voices from the wreckage yelled or moaned in pain, but it was hard to believe there were many survivors.

Jon had almost no medical training and couldn’t do much for the victims. The pilot looked dismayed, unable to decide what to do. Jon turned to Duane, who’d stopped retching and now stood pale and wan.

“We should see who’s still alive,” he said in a quiet, level tone.

Duane took a deep breath, almost gagged, and nodded meekly. “Yeah.”

Jon stepped toward the nearest body. He looked closely at the face – dead. On to the next – dead. He stepped over to a victim who was moaning softly and bleeding from a head wound, but was still in one piece, and lifted aside a bedframe that was pinning his legs.

The pilot consulted briefly with his colleague and walked off briskly. The colleague strode around to the north side of the mess, where four men in gray overalls had appeared. He talked with them briefly and they ran off again, then he returned to helping the victims. Some had been blown right through the windows and lay among the splinters on the patio.

Nurse Bee and three other women came over from the elevators. Bee and one of the women went away again, while the other two came forward and began to minister to the wounded.

The four men returned with stretchers, shovels and other tools, and set to work extracting bodies from the wreckage and carrying them to the forecourt. The pilot’s colleague played boss.

Bee and her companion returned with blankets and medical supplies, and all four nurses performed first aid on the bodies on the forecourt. Bee told Jon and Duane what to do and they did it.

For half an hour they worked hard. Most of the National Heritage party stalwarts in the room had been killed outright. The survivors had all been injured and needed medical care. Jon and Duane extracted them from the wreckage, lifted them onto blankets, peeled clothing from bleeding wounds and washed away blood, and looked on as the nurses cleaned, disinfected and dressed flesh wounds and set broken bones with splints.

The pilot returned with a handycam. He went around filming everything – the wreckage, the corpses, the survivors and the medical efforts – and made sure to get good close-ups of all the goriest stuff.

Half an hour later the picture was clear. Thirteen National Heritage party corpses, including that of the late Prime Minister Shusako Mishima, were lined up in one row with blankets draped over them. Ten party survivors were lined up in another, sitting or lying on blankets, with their wounds suitably treated. All ten would need more intensive medical care as soon as possible. One Mekon employee, the night porter, was dead and another, a woman in the laundry below the conference room, was slightly injured. One National Heritage party member was unaccounted for.

The pilot returned to the reception area and made a phone call. Then he stepped onto the patio, waved to Jon and called: “Dr. Christie, Dr. Mekon

would like to talk with you.”

Jon stood up wearily and shuffled to the phone. “Christie.”

“Mekon here. I am informed that you witnessed the incident. Would you please come up and tell me exactly what you saw?”

Assassination

Jon walked into Mekon’s office – the door was open – and found him parked by the window as usual. The sprinklers here hadn’t come on and the windows were unbroken. They were drawn back wide open and a row of light drapes in the open space wafted gently in the morning breeze. Jon walked onto the balcony and stood in front of Mekon. He could see the row of bomb victims on the forecourt below. Mekon spoke in his usual graveyard voice.

“You saw the assassination. What happened?”

“It was a missile from an aircraft. The aircraft was an F-22 Raptor and I’d guess the missile was a precision-guided munition with a small HE warhead, because the aim was exact and the damage was quite limited. The conference room was totally destroyed and a lot of windows were broken but the frame of the building is intact and the sprinklers put out the fire. The second missile destroyed the observatory dome.”

“I see ... How many people were killed and injured?”

“Of the National Heritage party, thirteen were killed, including Shusako Mishima, and ten were injured, leaving one unaccounted for. The injured will need to be flown out as soon as possible. Also, the night porter was killed and a woman in the laundry was slightly injured.”

Mekon nodded slowly. “A great shame ... a *very* great shame ...”

There was a sharp crack from the forecourt below. Someone had fired a shot. Jon looked down. Duane seemed to have been hit. He lay back and Bee kneeled down beside him. The other nurses looked toward the main entrance, evidently the direction from which the shot had come. The pilot backed into view, aiming his pistol into the reception area.

Mekon powered his chair forward onto the balcony and looked down. “What has happened?”

“Duane’s been shot. It must have been the last party member. I should go down and find out –”

“Duane Young –” Mekon looked down.

The nurses were clustered around Duane, who lay in apparent repose on the concrete. A red stain was growing on the front of his white shirt. “I’m sorry,” said Jon. “I must go down and talk with him.”

Action!

At the doorway, Jon turned to look at Mekon looking at Duane. He saw a red and white tracksuit sleeve at the edge of the windowscape on the right. Suddenly alert, he froze in the doorway. He watched a man in a tracksuit with a gun in his hand, silhouetted by the sun on the light drapes, creep slowly along the balcony up to Mekon.

Jon moved forward unseen. He stepped out of his flip-flops and stalked barefoot across the carpet. He held his flat hands up in a *karate* pose. He'd only have half a second to act after the man saw him. The man raised his gun and aimed at Mekon's head.

Jon sprang forward and chopped the man's gun arm through the drape. With his other hand he tore down the drape and barged forward. The man lost his balance and lurched against the balustrade but held onto the gun. Jon overpowered him – nonlethally – and held him on the deck. With a knee on his torso, he wrested the gun from his hand. But the man twisted and lunged and hit Jon in the balls. Jon keeled over but held onto the gun. The man ran off through Mekon's office into the corridor.

Jon got up and followed. He chased along the corridor to the stairs ... too late. Not to worry. Jon had his gun. He stepped into an elevator. His balls ached – his swim jock was still somewhere in the poolside lounge. He looked over the gun. It was a 9-mm Beretta M92, the same model as he used as a laser cannon back in Heidelberg. The barrel was warm. He flipped the safety catch and checked the clip. It was loaded with 13 full-metal-jacket military hardballs, two rounds short of full. He pulled back the slide. Another round. He pressed button **1** and descended.

He stepped out cautiously into the reception area. The guy in the tracksuit could be anywhere, waiting to pounce and get his gun back. He walked carefully out through the front door onto the concrete, trying not to step on the scattered shards of broken glass with his bare feet.

Bee looked up. "Jon, you're okay! Duane's been hurt."

Jon knelt beside Duane and looked at him. A big round bloodstain had seeped through a bandage around his torso. Bee was cradling his head in her lap and stroking his hair gently.

"I'm dying," said Duane almost ironically. "Glad you could make it ..." He died with a sigh.

Jon watched Bee lean over and press her face to Duane's cheek. Jon felt heavy and tired, with a black cloud somewhere over him. He said to Bee, "Will you be okay for a while? I have to go and find the killer."

Bee glanced up briefly and nodded without saying anything. Tears were streaming down her face.

Jon stood up, gun in hand, and started back to the building. He looked up and saw the guy in the tracksuit on the balcony just above the dining room. The guy saw Jon and ducked back quickly around the corner. Jon ran under the balcony and considered for a moment. If the guy used the main stairs to come down, the women would see him. Apart from jumping, the only other way down was via the fire escape at the back of the building. Jon ran around to the back and waited.

There – the villain climbed out of a window onto the balcony beside the fire escape. Not noticing Jon, he started down the stairs. Jon stepped out into the open and aimed at his head. The man ducked and stumbled down faster. Jon shifted his aim and fired – *bang!*

The gun had a powerful kick! He wasn't used to recoil with his laser cannon. The bullet hit the guy's thigh and he twisted, then limped onto the patio deck and fell to his knees in front of Jon. Jon wondered what to do next. He saw the pilot and his colleague running over from the wrecked end of the building in his direction, attracted by the gunshot. The two men lifted the bleeding sod to his feet and assisted him back to the nurses on the forecourt. Jon flipped the safety catch on the Beretta and followed them.

Another setback

The pilot and his colleague escorted Jon to Wada-san, the residence manager. Wada-san's office had been destroyed by the blast and he was now in the catering manager's office. The pilot gave him a quick report and Jon handed him the Beretta, which he deposited in a drawer.

The phone trilled and Wada-san answered it. "Dr. Christie," he said, "Dr. Mekon would like to talk with you again in his office."

Jon shrugged. "Sure."

He elevated back to Mekon's office. The door was open and he walked right in. He stepped into his flip-flops as he strode out to Mekon.

"So, Dr. Christie, the residence manager reports that you apprehended the man who tried to shoot me. Well done – and thank you."

"Duane is dead."

"So I was told. A sad loss ... We must leave the solution of the hypernet problem to others. I see no merit in my attempting to solve it when experts all over the planet are already hard at work. And Okamoto-san, my hardware expert, will have more pressing duties extracting a serviceable performance

from the hypernet functionality we still have. Meanwhile, however, there is the problem of the Epsilon Eridani signal to consider.”

“Duane’s file was in the observatory workstation – did you make a copy?”

Mekon looked up suddenly. “*No!*” He gripped his joysticks and shot like a scalded cat to his ten-screen workstation. Jon followed.

Mekon keyed frantically, searching the system for the EERIDANI file. Nothing. It was gone.

Jon spoke. “It must have been destroyed when the observatory was hit ... Do you think Duane left a copy on disk somewhere?”

“No. It was our policy never to leave copies of our Epsilon Eridani work where other employees might find them.”

Jon sighed. “Well, they won’t find it now ...”

Mekon continued keying for another minute before giving up. “This is a *catastrophe!* Why did the assassins attack the observatory?”

“I was wondering that too. I can only guess they thought the dome might be covering an anti-aircraft weapon.”

Mekon sighed with exasperation. “Duane’s work is lost! It may never be repeated – it was a unique effort!”

Jon smiled. “I copied the EERIDANI file onto my Heidelberg workstation.”

Mekon looked around in surprise. “You copied it? Why?”

“I thought it was too risky just having one copy here.”

Mekon’s face lit up in an unmistakable smile. “You may have saved the day! I can copy it back here!”

“You can try. Last time I looked, just after the news from Houston last night, my station had a CPU bug. Maybe it’s better now.”

“We must take a look – what is its address?”

Jon told him and they tried together to access it. No go. Nothing. This time there wasn’t even a home page. Just a bleak system message:

> Call Hypertronix help desk. Error number 56515515

Jon felt his heart flutter. What was ailing Hal? And what about Duane’s work? Was it lost? He had to get back to Heidelberg and sort this out!

Mekon sighed. “That was our last hope. You must try to rescue –” The phone trilled and he answered. “*Hai – chotto –*” He turned to Jon. “It is the police. I would like to be alone.”

“Of course.” Jon headed for the door. He heard the swelling sound of a heavy helicopter coming up the valley.

Medevac

A Boeing–Kawasaki Typhoon, painted olive drab and with big red crosses on white squares fore and aft on the fuselage, landed with a deafening flurry on the helipad. Jon helped the crewmen and the nurses to load the ten injured National Heritage party members into its cavernous interior, then it took off again and headed south down the valley. The four maintenance men carried the remaining corpses to the foot of the stairs beside the helipad, ready for collection later, and pulled a tarpaulin over them.

Just a minute later another helicopter arrived. This was a Kawasaki Star painted black and white with POLICE stenciled on the sides. Jon stood on the terrace overlooking the pool and watched as two cops stepped out of it. One was in uniform, with a pistol on his hip, and the other wore a gray bizz suit and had a camera slung around his neck. They hurried over to Wada-san, who escorted them to the scene of the crime.

Jon needed a rest. He went to the restaurant and sat for half an hour over a pot of tea, then wearily headed for his guest room. He was glad it was well away from the commotion. The sprinkler system hadn't sprinkled here and the window was still intact. He peeled off his bloodstained pajamas, stood for a long time under a warm shower, dried himself slowly and gently and checked for cuts or abrasions, and lay down and slept for an hour.

He was woken by the roar of the medevac Typhoon coming in for the corpses. He stood up wearily and put on the white cotton *yukata* that came with the room. It had a red disk with the Mekon **M** on the back and was just long enough to cover his butt. From the balcony he watched the medevac crew bag and load the corpses. One of those bodies was Duane ... The police helicopter was still parked on the helipad but the hangar crew had pulled it to one side. On the forecourt the maintenance men were sweeping up glass and debris and hosing away bloodstains.

Jon suddenly realized he was hungry. He flip-flopped down to the canteen for breakfast. Wada-san, the two cops, the Mekon pilot and his colleague, and the villain, now minus half his pants and with a bandaged thigh, sat around a table in the far corner. The cop in the gray suit was grilling the suspect. An audio recorder lay on the table.

Jon sat quietly in the southwest corner, well away from the group of six, with his orange juice, muesli and yoghurt. The group of six stood up and made for the exit with no more than a passing glance at Jon. He finished and went to his room to clean his teeth.

He stepped out onto the balcony again to admire the police helo. He saw

the two cops and the bandaged detainee climb in, and watched it take off and head south down the valley. Oh, to be up in a helo too, flying away from this madhouse! He trekked down to the poolside lounge and searched for his jock but couldn't find it. He turned on the workstation for ANN:

“– assassinated during an overnight stay at a mountain retreat. The retreat, home of robot billionaire Noboru Mekon, was attacked early this morning by a pair of unidentified aircraft. The aircraft fired two missiles at the house and Mishima and twelve of his party colleagues were killed instantly. A further ten of his companions were injured and are now being treated in hospital. Two employees of the Mekon Corporation who worked at the residence – one of them a U.S. citizen – were also killed in the attack. We'll go live to the scene of the assassination just as soon as we can –”

Jon heard another chopper and looked around. It was another Kawasaki Star, coming in to land. He walked out to the poolside to see who it was.

Transition to chaos

It was ANN. The Star was fire-truck red and had the ANN globe logo on the sides. It landed and two people jumped out. One was a young guy in blue jeans and a red ANN teeshirt who wore headphones and an eyeshade and carried a vidcam linked to a relay transmitter on his back. The other was a neat-looking lady in white sneakers, smart red tailored shorts and a crisp white shirt – yes – none other than Yoko Bernstein!

Jon adjusted the front of his *yukata* and stepped back into the shadows. He didn't want to be interviewed – he had nothing to say. He watched Yoko and the cameraman go upstairs and breathed a sigh of relief. Everyone would be busy for an hour or two and he'd be left in peace.

There was no-one else in the lounge. He fetched a glass of cola from the bar and settled down again with ANN:

“– chaos in the financial markets. All automated stock trading has been banned in the international markets until the virus has been safely contained. Banking systems are also affected, and the major credit card companies are expected to announce a stop on all cashpoint services later today until the virus is definitively purged from their hypernets. Air traffic control is affected too – a global ban on all nonessential flights is under consideration following control glitches at numerous locations worldwide that almost led to major aircraft accidents. Satellite telecommunications and some television services may be affected later today. We plan to stay online as long as possible to keep you informed.”

This was *serious*! The world was falling apart!

“Returning to local news, our reporter Yoko Bernstein is now online at the scene of the assassination earlier this morning of Prime Minister Shusako Mishima and half his cabinet in the mountain residence of robot billionaire Noboru Mekon –”

Cut to a front view of the damaged residence, with Yoko Bernstein in the foreground over the by-line *ANN live from the scene of the assassination*.

“Here at the mountain home of reclusive billionaire Noboru Mekon –”

Half an hour passed pleasantly as Jon watched Yoko interview Nobby Mekon and other residents and saw the charred hole from every angle. Yoko even pointed out the remains of the observatory and the spot where Jon shot the last party member. His own role was passed over without comment and no-one thought to hunt him out and parade him before the camera. Then they cut back to the studio to discuss the next government.

A hand touched his shoulder. He looked up. “Hey – Bee!”

“Hi, Jon.” She looked angelic in a clean white teeshirt, smart white jeans and her usual foam plastic flip-flops. “What are you doing?”

“Just hiding from Yoko Bernstein and her ANN interviews.”

“Me too. I’ve just finished with Dr. Mekon for the day.” She pulled up a chair. “Would you like another cola?”

“Hmm – thanks.” He handed her his glass.

She poured two colas and sat down. “I’m really depressed about Duane.”

“I can imagine – he was a real nice guy.”

“He was my best friend here – my only real friend here. Just *shot* –” She fought back a sob, then started to weep.

Jon reached out a hand and stroked her shoulder. She took his hand in hers and held it for a moment. Her tears were flowing freely and she pulled away to find a tissue. Jon pulled his recliner chair alongside hers. He put an arm around her shoulders and let her head rest on his chest.

He looked outside and saw Yoko and the cameraman standing beside the pool. He breathed a sigh of relief as they continued down to their Star on the helipad. He heard its turbine spinning up and watched it take off and fly off down the valley. Oh, no – another helo flying up the valley! Yet another Star ... a green one ... it landed ... another television crew.

Jon turned back to ANN:

“– Shanghai hypernet center. Two nuclear plants in Guangdong province suffered control glitches leading to power surges and one of them reported a containment failure. It’s not yet known how much radioactive material was released but the accident was rated as serious by a Beijing official.”

Jon turned to Bee. "This is getting worse –"

"Another nuclear reactor accident has been reported near Bangkok, where again a hypernet control system seems to have malfunctioned, but no further details have yet been released. Both the Bangkok and the Shanghai hypernet control systems are part of the Mekon star network, which interconnects nuclear reactor control systems in 18 countries around the globe, as well as other industrial control systems in a further 14 countries."

Jon shook his head. This moonbug problem was turning into a *disaster!*

Bee sighed loudly. "I don't understand what's happening –"

Jon sat forward "Just a moment –"

"In New York, an electric utility control failure led to a blackout –"

Jon heard it out, muted it and turned to Bee. "The Mekon star network controls – or rather monitors – nuclear reactor systems from the big hypernet computer here at this site. But our computer has a bug. We picked it up from the internet, like other big hypernet users all over the planet. The bug seems to have come from the alien object found on the Moon last Monday. It seems to have caused an alien organism to grow inside our big computers."

"An alien organism? A space monster?"

"Not a flesh-and-blood organism – a cybernetic organism – a computer bug. It reproduces inside computers and travels in network lines."

"Can't we just turn off all the computers and cut all the network lines?"

Jon smiled. "If only we could! The world would grind to a total halt. We rely on computers and telecommunications for almost everything nowadays. We couldn't turn it all off if we wanted to."

"So what will happen?"

"Well, a lot of experts are very busy right now trying to understand this bug. As soon as we do, we can disable it. It shouldn't be too hard."

"If Duane were still alive ..." Bee's voice trailed off and she looked as if she was about to start weeping again.

"Don't think about it now." Jon reached out and took her hands in his. "Think about the future – when can you get away from here?"

"I don't know. Dr. Mekon said I should take a vacation. He knows how close Duane and I were. He has other nurses to take care of him and he said I could go when I want."

"Oh, right! I wanna go too – I don't see any point in staying here any longer than I have to."

"We must stay to talk with the police when they arrive."

"Oh, yeah ..." Jon realized that was something he couldn't avoid.

"Let's go and sit in the sun. That might cheer me up."

“Good thinking.” Jon followed her into the sunlight and they pulled out a couple of recliners. Jon looked down at the Star on the pad. “Actually, I’d rather go back and see what these television guys are broadcasting.”

“You go – I want to swim.”

“Okay, I’ll leave you to it.”

“Don’t you want to swim too?”

“Not now, thanks.” Jon had to monitor the news – if Megablob was about to fall apart then he wanted to be the first to know it.

He settled in front of the screen and found the channel reporting live from the scene of the assassination. He tiled the screen to watch four channels at once and kept the sound on ANN. He would have gone swimming too but he didn’t want to go naked with camera crews all around.

Bee reappeared and dried herself in the sun. She took off her bra, put on her teeshirt, pulled off her panties, and spread the undies out in the sun to dry. She walked up to Jon and stood toweling her hair. “Anything new?”

“Not really. I don’t wanna watch any more.” He stood up. Yet another Star was coming in to land – black and white – police. Jon looked down at his *yukata*. “I need some clothes.”

Bee nodded. “Let’s go and fetch some from the laundry.”

Live television!

The laundry was a mess. The bomb had blown a big hole in the ceiling at the north end and dumped a massive pile of wreckage beneath it. Everything was covered in dust and ashes, and tangled sheets and towels lay strewn over the floor. The lights didn’t work and the only daylight came from four tiny windows along the east side and the hole in the ceiling.

Bee stepped forward gingerly through the chaos and sighed. “This is so depressing ... all those men were killed and injured here.”

“Better not to think about it ... where are the clean clothes?”

“There should be some in that closet over there.”

“Okay.” Jon led the way. From the closet he pulled out a pair of pajamas. “These may be okay –”

A noise from the hole in the ceiling made them both freeze. A ladder was lowered onto the pile of wreckage. Several men above were talking and a pair of boots appeared at the top of the ladder.

Jon ducked down. Next to them was a large table with empty space under it. All around, on the floor, were sheets and towels. He grabbed a few sheets and slid under the table. Bee ducked down beside him. The man on the

ladder stepped noisily onto the pile of wreckage and shouted up to the others. Jon spread out the sheets and settled in. He was walled in on three sides and there was no room to stretch out his legs.

Bee moved closer. "Why are you hiding?" she whispered urgently.

"Reflex – I don't want them to see us."

Another man started noisily down the ladder and the first one took a few steps in their direction.

Bee crawled in quickly beside Jon and whispered into his ear. "Why don't we just get up and walk out?"

Jon cupped his hand to her ear. "Go on then."

"No – you first."

"I'd rather stay here."

A third man descended. One of them now stood just two meters away, talking loudly to the others. Jon could see his legs. It sounded like the others were moving the wreckage.

Jon adjusted the sheet under them and pulled another sheet over them to hide them completely. He lay back, propped on his right elbow with his knees raised, and she crouched beside him so that their bare right thighs pressed together. For a minute or so they quietly tried to get more comfortable. They shifted their hands awkwardly on each other, trying to find non-erogenous places to put them. They lay breathing each other's air.

The three men stood next to the table now, just a hand's reach away, talking quite loudly. Suddenly there was a loud scraping noise as something heavy was put on the table, then a bright light came on, lighting the room from the tabletop. One of the men started delivering a monologue in a clear speaking voice. Jon didn't dare take a good look, but it sounded very much as if they were recording *live television* out there!

Bee was breathing heavily into his ear. His gown had opened and he was getting aroused. He moved both his hands up under her teeshirt and onto her hips. She moved her hands to his neck and gripped as if to throttle him. His hands gently stroked her hips. Her hands slowly tightened their grip ...

...

The voice intoned on for a while longer and stopped. One of the others said something. The bright light clicked off and someone picked it up off the table with an audible grunt. Then all three of them walked back to the hole. They scrambled onto the wreckage and made strange crunching noises. Perhaps they were climbing up the ladder.

Jon pushed Bee away and they both crawled out. They watched as the last man climbed the ladder and someone pulled it up and away.

Jon sighed with relief. He and Bee stood up. “Sorry about that,” he said, rubbing his neck.

“It’s okay – sorry if I hurt you,” she replied with a tiny smile.

“I wanna find some pajamas.” He poked around in the closet and found a passable pair. They went back to the poolside lounge.

Statements

Wada-san, the residence manager, sat in the lounge with three grim-faced men in dark suits and a smartly uniformed police officer. On the table was an audio recorder. All five looked at Jon and Bee as if they’d been expecting them. Wada-san spoke.

“Ah, *konnichi wa* ... We, ah, would like to talk with you about the, ah, assassination this morning ... These are police officers.” He gestured at his companions, who nodded sternly but said nothing.

Jon nodded cautiously. “Yeah, sure. How long will it take?”

Wada-san smiled. “Are you in a hurry?”

“Well, actually, I was on vacation before all this happened.”

He smiled again. “We hope we will not disturb your vacation for too long, Dr. Christie, but you understand this is very ... delicate ... incident, and we must do all we can to ... clean it up properly. You understand –”

“Sure, sure, whatever it takes.”

Bee looked anxious. “May I go to the washroom?”

“Of course, of course,” the manager said affably.

Bee walked carefully, with her hands fluttering nervously near the hem of her teeshirt, over to the window. She picked up her jeans and underwear and stepped into her flip-flops, and walked off to the washroom.

Wada-san watched her without expression and turned back to Jon. “Dr. Christie, would you like to fix yourself a drink?”

“Thanks,” said Jon, and went and poured himself a cola. He pulled up a chair and joined the officers at the table.

“The police officers understand English but don’t wish to speak it, so I have offered to serve as interpreter, if you agree,” the manager began.

“Sure – fine by me.”

“Okay ... Please start by telling us exactly what you saw and did, starting just before the aircraft attacked this morning.”

Jon started. He told a straightforward tale in ten minutes. It was as truthful as could be. The only thing he forgot to mention was the squadron badge on the aircraft. The cops had only a few further questions and he answered them

quickly and directly.

Then it was Bee's turn. Her tale was longer because she gave full medical details of the injuries sustained by the survivors and the measures she and her colleagues took to treat them, but again it was straightforward and the cops had only a few further questions.

In about an hour they were done. Time for lunch.

Shame

In the restaurant Jon and Bee enjoyed a Chinese-style noodle concoction. Jon watched the two Stars, television and police, take off and fly away down the valley. It had to be his turn soon!

"That was a tense scene in the laundry," he said.

"Oh, don't remind me! I was *dying* with embarrassment! What if they found us there? And the policemen! What did they think when I came in with only a teeshirt on?"

"They didn't know that."

"With my underwear drying in the sun? I could have *died* of shame!"

Jon smiled. "You don't think they thought we'd had sex, do you?"

Bee closed her eyes slowly, as if suffering at the mere mention of sex. "No ... Wada-san knows me. But the policemen ..."

"Ah, who cares what they think?"

Jon looked outside. Yet another Star was coming in to land ... a Mekon helicab. He turned back to the canteen.

Wada-san walked up with a phone. "Dr. Christie, *terehon* – *dozo*."

"Christie," said Jon into it.

"Mekon here. I have made progress with the hypernet problem and would like to discuss it with you. Would you be so kind as to come up?"

"That's good news – I'll be right there." He gave the phone to Bee. "See you later, I hope."

A connection

Mekon was in the cockpit of his ten-screen workstation as Jon walked in.

"Ah, Dr. Christie. I have found something rather remarkable ... If only Dr. Young were here to take it further ..."

Jon went to look over Mekon's shoulder. "What have you found?"

"I have been looking again at my Nobeyama data from Epsilon Eridani. I remember Dr. Young's tutorial from yesterday and I am wondering if I can

reconstruct his work.”

“I’m surprised you can think about that now – I’m still getting over the assassination.”

“Yes ... a most unfortunate incident. If Mishima were not so controversial here in Japan I would suspect it was a CIA operation. As a former Langley employee you are naturally in a delicate situation.”

“A CIA operation?” Jon felt a sudden spasm of *angst*.

“But that is not why I called you up here. Look at these patterns ...”

Mekon was looking at a pair of square panels side by side on the screen. Each one showed a dancing mass of tiny black and white pixels. They looked just like two panels of random white noise.

“They are the two signals we are now struggling to understand. The left one is the signal from Epsilon Eridani that is relayed to us here from the Nobeyama Radio Observatory. The right one is the signal from the zeolite buckyball which Dr. Young relayed here from Acropolis Mission Control in Houston. I am studying the resemblance ...”

Jon watched as Mekon played a few keys and superposed the squares. Now a single square showed mostly white, with shimmering patterns of black dots dancing around in an almost rhythmic display with tantalizing glimpses of fleeting symmetry.

“I have coded white for matching bits and black for contrasting bits.”

“That’s intriguing ...” mused Jon, his *angst* forgotten.

“I have, of course, normalized the signals by scaling their bit rates and synchronizing matching features ... I would say this is *prima facie* evidence that the two signals are from the same source civilization and perhaps even coded in the same manner.”

Jon nodded slowly. “I don’t know how well two randomly chosen signals could be made to match like that when you normalize them, but it certainly looks interesting, as you say ...”

“This is a higher than random matching, I can assure you, though not so much so that a nonexpert would notice it.”

“Wait – what are you doing playing with the lunar buckyball signal here? That’s an extremely dangerous piece of code!”

“Yes, I know. But my hypernet has already been infected with it and is now running more or less normally, according to Okamoto-san, so I feel that little further damage is likely to be sustained when I import this fragment to try to decode it. We must crack this virus.”

“Yes, I see that, but I thought you wanted to leave the problem in the competent hands of all the other hackers on the planet.”

"I have reconsidered my position. I would be failing in my duty to humanity if I simply sat back and allowed my massive talents to lie fallow while the global internet is in danger."

"Aha ... so you see a parallel between these two signals and think Duane's algorithm could have gotten us somewhere in cracking the virus."

"Yes. Since he explained his algorithm to us, we should be in a good position to reconstruct it."

"Sorry – not me! I hardly understood a word of it!"

Mekon sat silent for a while. He played on the keyboard and separated the panels on the screen again. "I would like to see these two patterns with a stereo viewer. The human eyes are excellent pattern recognizers if one learns to exploit their native capabilities."

"Can't your big hypernet do it better?"

"If I can tell it what to look for, it can do it better, assuming its higher topologies are functional. Until then, my experience is that the machine is somewhat blinder than I am."

Jon frowned as a thought occurred to him. "Something's wrong here – if the two patterns are related, as you say they are, then why was the Epsilon Eridani signal completely harmless? Why did the virus in the internet only appear after the lunar signal was leaked from Houston?"

"I had the same thought when I saw the similarity. The two messages may be from the same source but they need not be the same message. However, an understanding of one of them may assist us in understanding the other."

"I see ... that's certainly plausible ... But a virus that can knock out hypernets all around the world is quite something. A visual message like the one Duane found in the E-Eridani signal is probably completely different. Why should understanding one help us with the other?"

"Consider a parallel. Imagine I study a book in a strange language that turns out to convey a quite harmless message once I have learned to read it. Now imagine I find another book in the same language that is extremely dangerous and I wish to discover what makes it dangerous. Do you not think that my understanding of the first, harmless book might assist me in discovering the secret of the second book?"

Jon shrugged. "Sure – I see that. But how do we start?"

The phone beeped. Mekon answered it in Japanese. The gray-suited caller appeared in hi-def, sitting at the workstation in the poolside lounge.

The call ended and Mekon looked up. "I am sorry, but I have a visitor –"

"Sure, I'll leave you in peace – but I can't stay here forever –"

"Please! The future of the planetary internet is at stake today. Where else

can you make a better contribution to solving the problem?”

“But if I stay here I’ll get involved in the murder investigation!”

Mekon blinked slowly. “I understand. I shall not seek to implicate you.”

“Thanks. But what about the EERIDANI file in Heidelberg?”

“Yes –” The phone rang again. “I am sorry – please go.”

Breakout

The poolside lounge was now empty. Jon poured himself a lemonade and walked out to the poolside to drink it. He contemplated the Star sitting pretty on the pad. He never tired of seeing Stars. It was unattended and obviously ready to go. He could fly it away. They wouldn’t miss it – he could see another one in the hangar. Yes, he could just walk out, cool as a cucumber, climb in, start the rotor and fly away!

Bee came up behind him. “Hi, Jon.”

Jon turned. “Hi – where were you?”

“With Wada-san, telling him I’m due for a vacation.”

“Ah ... I’m just about to go – do you want to come too?”

“Go? What do you mean?”

“I’m flying out – in that helicab.” He pointed at it, shimmering in the sunlight like a heavenly vision.

“But the pilots are busy.”

“I can fly. Stars are easy to fly.”

“But a visitor came in that helicab. You can’t just steal it!”

“It’s a Mekon helicab. There’s another one just like it in the hangar.”

“But I’m not ready to go – I have to pack.”

“Then go and pack! What are you waiting for?”

Bee smiled as if she’d just seen an angel. “Yes, I will! Right away!”

“Good girl!” Jon watched her go. He looked out at the Star. He reckoned he could jump in, start the rotor and take off in about one minute if all went well and no-one was near enough to stop him.

He had a few minutes. Time to check ANN:

“– core meltdown in Reactor Block 3. The Guangdong authorities have started evacuating areas downwind of the explosion. Near Barcelona, Spain, a control system failure in a chemical plant caused the release of a large cloud of dioxin, a toxic carcinogen, that is now drifting north into France –”

Jon listened in horror. It was getting worse, just as he guessed it would when the hypernets got sick. It had to get worse before it got better – unless some Duane-like genius had managed to decipher the bug code already. He

sat back and absorbed the dismaying facts ...

Fifteen minutes later Bee returned, trundling a red plastic suitcase along on its rollers with one hand and carrying a sports bag in the other.

"Wow!" Jon said, looking at the case. "Do you have to take everything?" He stood up and turned off the news.

"I thought you said we were leaving."

"Well, it could be tense," Jon mused as he hefted Bee's case. It was quite light. "Is this all you have here?"

"Yes. I don't like too many things."

"Great, let's go, then."

She stood still, her mouth open, her eyes wide, panic-stricken.

"Come on, follow me!" Jon grabbed her suitcase and walked briskly out to the helicab. He opened the door and threw Bee's case onto the back seat. He saw Bee running toward him as he climbed in.

He started the turbine. It took a few seconds to warm up. He looked quickly over the controls and tried to remember what was what. Bee clambered in clumsily beside him. Jon reached over and closed her door, then buckled his seat belt. Bee buckled her belt. Jon started the rotor turning. It needed a few seconds to pick up momentum.

Jon looked aside at the hangar. Its doors were wide open. A mechanic stood staring, then started running forward. Jon nudged the throttle to full and the rotor speeded up. He looked back at the house and saw the two helicab pilots running along the balcony over the swimming pool. Finally, slowly, the Star lifted off the ground.

The Star climbed like an express elevator. Jon pushed the stick forward and the Star lunged forward. The scenery fell away. This was *exhilarating!*

Free at last!

They flew a steady course south. After a few minutes Jon relaxed a little. With the Star's intelligent cockpit it was as easy as driving a car.

Bee, who so far had been transfixed by the sheer terror of the experience, turned to him. "How come you can fly this thing?"

Jon smiled. "The Star helicopter is a joint Japanese-German project. I helped edit the maintenance manual and learned to fly the simulator. And I have fifty hours on light planes." The view of the valley and mountains was glorious ... "Do you think the cops will want to talk with us again?"

Bee considered for a while. "Yes, maybe. Dr. Mekon may be angry with us. Oh, I'm frightened!"

“Don’t worry. This is my idea. I can explain it – I hope!”

“I just want to forget any of it ever happened,” said Bee plaintively. There was an edge of heartfelt longing in her voice.

They flew on with the muffled whining drone of the turbine in their ears. Jon reveled in the glory of the landscape and mused on what was to come. Interviews, statements, problems – all because *someone* killed a few baddies. Then there was the hypernet cyberbug, the planet orbiting Epsilon Eridani, Duane’s file buried in the mortal remains of Hal in Heidelberg ... his ordered life had *vanished!*

Soon the landscape opened out and Jon saw the beach in the distance. Then they were over the beach. He landed carefully on the sand, trying not to raise too much of a sandstorm. He looked up at the sky. The other Mekon helicab was up there! It had been flying along behind them and was just about to land beside them.

“*Shit!* They followed us! Quick, Bee, get out and run into the dunes!”

Bee climbed out quickly. Jon grabbed her suitcase from the back seat and jumped out onto the sand. He skipped out of his flip-flops and ran for the dunes as fast as he could. He and Bee had just found cover when the other helicab landed and its two crewmen jumped out.

Hidden by dune grass, Jon watched them – the pilot who’d kidnapped him and his colleague. They stood chatting for a while, then one of them climbed into each helicab and they took off. Jon strode out into the open and watched the two helos head off north.

“*Yahoo!*” he shouted ecstatically. He and Bee were free!

Back to Earth

Jon and Bee walked through the orange grove to the summerhouse.

The house was no longer there.

In its place was a flat heap of blackened trash, still smoking slightly. The remains were so thoroughly consumed that it must have been arson. Silvery ashes lay scattered like leaves around the site.

Jon walked up to the remains and studied them. His case had burst open and all its contents were reduced to what looked like lumps of charcoal. There was no sign of Hal Junior. All his worldly goods were gone. All he had left were his borrowed pajamas and flip-flops.

“Is this where you were staying?” Bee asked.

“Yes. All my things were here. They’re all destroyed.” He felt flat, heavy, devastated. “Let’s see if anything can be salvaged.”

Bee watched in silence as Jon picked through the embers with a stick. He found the charred husk of his wallet with a blackened and melted deck of plastic smartcards in it, his camera, his wristwatch, his passport, his shaver – *kaputt. Alles kaputt.*

“Who did it?” Bee asked.

“I dunno.” He was thinking hard. Perhaps Mekon had outbugged Duane and seen through the SHUSHIT kludge. The whole trip was highly suspicious. Mekon kidnaps him – *why?* – for a job interview? It was a frame – a *gaijin* turns up at the Mekon residence the day before the hit, evidently not just another wide-eyed vacationer. So the arson was either Mekon or National Heritage heavies. They’d acted fast ... *scary!*

“What are you thinking?” Bee asked.

“Who could have done it. I guess it’s connected with the assassination. Someone thinks I was part of the plot.”

“To kill Shusako Mishima? Why would you do that?”

“He was a rabid nationalist. I could be a CIA agent.”

“But it was an air strike that killed him.”

“Right – I could have called in the air strike, told the pilots when and where the National Heritage guys were going to meet.”

“But the air strike was by Japanese planes.”

“Was it? Who says they weren’t American?”

Bee’s eyes widened. “Is that possible?”

“Sure. President Tom Smith is violently anti-Mishima. Perhaps he saw a chance to take him out before he could get too big and took it.”

“I don’t understand.”

“Mishima attacked the Russians. That was a very dangerous thing to do. Maybe Smith decided to take out Mishima before it all got out of hand.”

“Through you?”

“I could have said when and where the planes should strike.”

“But didn’t you see the planes? Weren’t they Japanese?”

“I saw the markings on one plane. But I didn’t see that it was Japanese.”

Jon considered for a moment. The fashion for making national markings on military aircraft small and inconspicuous made it hard for him to identify the nationality of the attacker. The squadron marking –

Of course! Now he remembered what the image was. The golden figure in the long robe with the upraised trumpet was the Angel Moroni, a personage from Mormon mythology, trumpeting the imminence of Judgement Day. It was a *Saint* jet!

“What’s wrong?” Bee asked anxiously.

"I've just remembered what the squadron marking on the plane was. The plane was American."

"It was? Do you know that?"

"Yup. It was from a squadron called the Saints. They're an all-Mormon outfit based at Hill in Utah."

Bee looked baffled. "How do you know that?"

"I used to be in the U.S. Air Force. My dad was a fighter jock."

Her eyes widened for a moment. "Did they fly over from America?"

"No. Raptors often do stunts over here. They're probably visiting Misawa in northern Japan – that's a big USAF base. Maybe they're here to face off against the Russians – they must have got hit this morning."

They stood in silence for a while. Jon looked at the ashes and sighed. He'd have quite a fuss on his hands getting back to Heidelberg now ...

"What shall we do now?" Bee asked plaintively.

Jon sighed again. "We can go to Yasuko's house."

"Where's that?"

"Just ten minutes north of here through the orange grove."

They set off. A wind was blowing up and a cloud bank was advancing.

Surprise!

Soon they arrived at the Tanaka family house. The big, long bungalow on its stone plinth looked reassuringly solid, tranquil and normal. Jon's spirits rose again. He climbed the steps and rapped a tattoo on the glass panels of the front door ... No reply ... Nobody home. The door was locked.

They walked around to the back of the house. All around were sliding wooden screens with frosted glass panels in traditional style. There were two back doors, set wide apart. Locked too. Jon was puzzled. Maybe the arsonists did something with the Tanakas. Maybe the Tanakas did it and took off for a quick vacation –

Yakuza! The Yakuza were Japanese mobsters, denizens of a sleazy underworld, into racketeering and prostitution and so on. Maybe the National Heritage party contracted them to terminate Jon. Maybe Mekon contracted them to punish the Tanakas for harboring Jon ...

Jon and Bee looked around the back yard. No signs of life in the outhouses either. A long wooden shed was half-filled with farm implements and a solid double garage with an aluminum-framed sliding window, not quite closed, harbored a smart red 4WD pickup truck.

They'd seen it all. They sat down dejectedly on the back porch.

“What shall we do now?” asked Bee.

“Wait here. If they don’t come back tonight from wherever they went, we can stay the night here and think again tomorrow.”

“How can we stay the night here?”

“We can break in. Yasuko will understand.”

The wind was getting stronger, the cloud cover was thickening and the temperature was falling.

Jon returned to the garage, slid open the window and climbed in. It was cluttered around the edges with tires, spades, brooms and so on. The empty space would be for Mr. Tanaka’s big golden Toyota. The red pickup truck was empty – nothing in the back except a folded rain cover. He climbed in and spread it out. He returned to Bee on the verandah.

“Hi – we can wait in the garage. At least it’ll be warm and dry.”

Bee followed him to the window. It was high and small, so he had to help her through, but she made it. He passed her bags through and clambered in. They climbed into the back of the truck and spread out a fluffy pink blanket from Bee’s suitcase over the rain cover. Jon put on an olive-green parka and Bee a white bathrobe, both also from her suitcase. Her little transistor radio played pop in the gathering gloom. Outside it began to rain.

The pop paused for an English-language news bulletin:

“A reactor accident in Guangdong Province in southern China has released a radioactive cloud which is blowing west over Guangzhou City. At least seven million people are endangered by the cloud and authorities have called for immediate help from United Nations disaster relief agencies.”

Jon sighed. Mekon control system ...

“A control system failure at a chemical plant near Barcelona, Spain last night caused the release of a big cloud of dioxin, a herbicide contaminant that causes severe skin eruptions and cancer. The cloud is drifting over Toulouse, a French city with almost 400 thousand inhabitants, and emergency services are being called in from all over France.”

Jon shook his head. Probably the lunar bug too.

“Two jumbo jets collided in midair over the main control tower at Frankfurt Airport an hour ago, completely destroying the tower and killing all the passengers – about a thousand people – in the two planes. The accident has closed the airport and disabled the entire air traffic control system for central and southern Germany.”

Jon frowned. He’d hoped to fly into Frankfurt to get back to Heidelberg. Now he’d have to land somewhere else.

“All three accidents are related to the computer virus that disrupted big

computer systems all around the globe yesterday. The bug hasn't yet been fully identified but is thought to have entered the internet via Houston, Texas from the Moon, where it may have been released by the mysterious alien transmitter found at the Acropolis base on Monday."

Jon shook his head sadly. Suckered by a golfball ...

"More disruptions to computer systems are being reported by the hour. Computer integrated manufacturing facilities in Germany, Hungary, Japan, Korea, Malaysia, Taiwan, Thailand and Vietnam have been disrupted and stopped production. Air traffic control systems across the United States and Canada as well as in France and all of southern Europe are being heavily affected. Banking and cashpoint services throughout the United States and the European Union are likely to be closed soon, the Hypernet Weather Center in Colorado has already been closed, and most major internet users have closed down and sealed their firewalls until further notice."

Megablob was cracking up here!

This virus had to be stopped. What was it? What kind of bug could do so much damage so quickly and yet fit into a few gigabytes of code? Was this monster set to devour human civilization?

The pop music returned, almost drowned out by the *taifun* raging outside. Jon and Bee huddled together for warmth. Hours passed and darkness fell.

...

A garage door opened and the lights came on. A pair of headlights shone brightly and a big golden Toyota drove in. Mr. and Mrs. Tanaka and Yasuko and Ryuichi all climbed out. They wore smart, formal evening clothes.

Jon jumped down from the truck. "Hi, Yasuko! Hi, Ryuichi! Surprise!"

Yasuko looked so amazed her jaw dropped. Gusts of wind and rain blew in through the open door and Mr. Tanaka pressed a wall switch to close it.

"Bad news, I'm sorry to say," Jon began. "I was with Dr. Mekon in the mountains. I came back just a couple of hours ago and found the house in the orange grove had been burned down."

Mr. Tanaka walked up and said in his baritone voice, "Burned down?"

"Yeah, someone burned it down. It's completely destroyed."

Mr. Tanaka turned away and said something to Mrs. Tanaka.

Yasuko looked up at Bee, who was climbing carefully out of the truck. Ryuichi walked over. They all said *konban wa* politely to each other.

"We heard the news," said Ryuichi. "Mishima and twelve other party members are dead. I just called Dr. Mekon to confirm."

"Yes, we were there when it happened," said Jon. "Bee is one of Dr. Mekon's nurses – she's not Japanese, by the way."

"I'm from Singapore – I speak English," added Bee.

"*Ah so.*" Ryuichi blinked. "Bee – is that an English name?"

Bee shook her head. "Bee is the second letter of the alphabet. I'm Dr. Mekon's second nurse. Bee's easier to say than my Chinese name."

"We can go to the house," said Yasuko.

Mr. Tanaka fetched two big umbrellas and they stepped into the *taifun*.

Debriefing

They all assembled in the kitchen at the back of the house. This was a long room with a hardwood floor. In the middle was a long darkwood table with ten dining chairs around it. Glazed paneling formed the outer wall and kitchen units lined the long inner wall.

"Please –" said Yasuko, gesturing at the table. Jon and Bee took off their outer garments and sat down. Mr. and Mrs. Tanaka went off to other rooms.

"What would you drink?" Yasuko asked.

"Water, please," said Bee.

"Whisky, if I may," said Jon.

Yasuko poured the drinks. They all sat at one end of the big table.

"Tell us your story," said Yasuko.

...

When he was finished Ryuichi frowned into space. "The main thing is that a new Liberal Democrat government will be formed and the war with Russia can be ended. Also, Dr. Mekon is alive because of your fast action, and you and Bee are safe here."

Bee looked up. "Are we safe?"

Ryuichi considered for a second. "There may be people who want to kill you. You are both witnesses. We don't know who organized the assassination but there were very few witnesses and your testimony may be important. I think you should be very careful until the killers are known and ... arrested. Bee, I can arrange a flight to Singapore tomorrow for you. You will be safe there. You can stay on vacation for two or three weeks."

"Thank you," Bee said, and looked as if she really meant it.

Ryuichi turned to Jon. "Jon, you should leave Japan tomorrow too. It will be safer for you."

Jon nodded. "Agreed. Germany and France are blocked, so if we can fix it I'll take an afternoon flight to London."

Mr. Tanaka came in through a back door and let in a swirling gust of wind as he closed the door behind him. He took off a soaking wet army-style

parka and a pair of green rubber boots. He was still wearing his formal black suit. He spoke in rapid Japanese to Yasuko and Ryuichi.

Ryuichi turned to Jon and Bee. “Mr. Tanaka has just seen the summer-house. As you said, it’s burned down. He thinks it was ... arson?”

“Yes, arson,” affirmed Jon.

Mr. Tanaka had a quick word with Yasuko and stomped off.

Ryuichi looked around. “Well, I guess it’s time for bed.”

“You can stay in guest bedrooms,” said Yasuko. “Do you want separate rooms?”

Jon glanced at Bee and shook his head. She looked acutely anxious for a moment, then shook her head too.

“Separate beds in the same room,” said Bee.

Their bedroom was at the southwest end of the house, sandwiched between a bathroom and another bedroom. It was floored with twelve immaculate *tatami* mats. Yasuko pulled out two big *futons* from the closet and added linen, pillows and thin top *futons*. She and Bee laid out the beds side by side a meter or so apart.

Jon brought in Bee’s bags and went and had a bowl bath. He returned, Bee went off to the bathroom, and he got into his bed. Bee returned, turned off the light and got into her bed.

Jon couldn’t sleep at first. He lay thinking of his sensual adventure with Bee under the table in the Mekon laundry ... now they were side by side in bed he could ... *no*.

A Saints jet ... it knew when and where ... *Bob!* He’d used Jon’s info to set up a hit and not told him – sneaky sod!

But all that was trivial. *What would happen to Megablob?*

Logistics

Let's do Star Wars!

Wake-up fix

Another tense, busy day. Jon still has a long way to go to sort all this out.

•

Tanaka house, Saturday: Jon opened his eyes. Bee's bed was empty. The classic, austere *tatami* room was peaceful and calm. He opened a window screen. The sky was steely gray, a wind was blowing and it was raining.

Bee walked in, hair wet, body swathed in her long white bathrobe. "Good morning," she said in a happy voice.

"Morning – sleep well?"

"Yes, thanks." She treated him to a warm smile, then sat down and set to work on her hair. "How about you?"

"Yeah, well enough. That was a heavy day yesterday. I have a feeling that today's gonna be heavy too."

"Once we're on our planes we'll both feel better."

Jon went off to the bathroom and had a bowl bath. He returned to find Bee dressed already, in a dark blue skirt and a white blouse over a white bra. She'd packed her case and was busy stripping the beds. He helped her fold the big *futons* and pile the bedding.

They moved on to the kitchen, where Jon made a bee-line for the tube to get his wake-up fix of ANN:

"– the assassination yesterday."

Cut to Yoko Bernstein standing in front of the Mekon residence again:

"The witnesses here at the Mekon residence, a hideaway hotel deep in the mountains of Honshu, have been telling their versions of yesterday's events to police investigators and a picture is beginning to emerge. The residence was struck early yesterday by a laser-guided missile fired from one of a pair of low-flying Raptor strike aircraft, possibly on a training flight from the air base at Hamamatsu, which is just a few minutes' flying time south of here.

An Air Self-Defense Force spokesperson confirms that low-level exercises, including missile practice, took place in the mountains early yesterday, but was unable to confirm that any aircraft flew over the Mekon residence at daybreak or that any missiles were fired outside the training area.”

Jon smiled. They hadn’t yet realized they were American planes. He was probably the only witness who could identify a Saint jet.

“The spokesperson also confirms that anti-government feeling in the air force has been strong since Monday’s surprise attack on Russian military bases in the Northern Territories. Several officers were reported last week as saying that Prime Minister Mishima should be removed from office.”

Aha – the air force view seemed clear. Both opportunity and motive were established well enough for a quick conviction. If he stayed mum the Saints could get away with it.

“The witnesses here at the Mekon residence related a number of other disturbing facts. A Mekon employee, a night porter, was killed during the bombing and another Mekon employee, Duane Young, aged 30 and a United States passport holder, was shot dead by Kazuo Suzuki, aged 32, the only member of the National Heritage party to have escaped the bombing. Suzuki then attempted to shoot Noboru Mekon, the wheelchair-bound founder and chairman of Mekon Corporation who hosted the Mishima visit. Suzuki was arrested soon after the attempt and is now in police custody.”

Jon smiled. His own bit part was still anonymous.

“Suzuki said soon after his arrest that he wanted to kill Chairman Mekon because he assumed the bombing was part of a Mekon conspiracy. He said he shot Duane Young because he thought Young was involved in the Mekon conspiracy and feared ...”

Jon was thinking hard. Were the National Heritage guys really suspicious of Mekon? Could Mekon have been on Jon’s side? Or was Suzuki merely covering the traces of his own dirty deeds?

“Chairman Mekon said the whole episode has been a great shock to him and the cause of great shame and regret. He said that Mishima had been a personal friend and that he himself had no political views or ambitions at all. He emphasized that his life was devoted to building better robots and pursuing his hobby interest in astronomy, and that he had no idea who killed Mishima or how they organized it. Mekon thanked the man who saved his life, a U.S. citizen named Jon Christie, aged 33, who was a guest at the residence but was not available for interview. Mekon said he hopes the bombing will serve as a reminder to everyone that extremism in politics is always dangerous and usually self-defeating ... Yoko Bernstein, ANN.”

Jon smiled. Mekon had thanked him handsomely. His political statement was obviously designed to get himself off the Yakuza hit list, but that was understandable. Jon wanted off the list too – he hoped his citation on ANN wouldn't make things worse. Cut to Don Reddy in the studio:

“The new Liberal Democrat coalition government got down to business fast yesterday in Parliament. Returning Prime Minister Shintaro Kawasaki accepted the U.N. resolution calling for an immediate ceasefire in the region and proposed bilateral talks with Russia –”

Jon stopped listening. He'd heard enough. At least the moonbug problems weren't bad enough to hog all the airtime. He turned to Bee. She was quietly weeping again. He comforted her as best he could.

Jon tips the cops

Ryuichi and Yasuko appeared and they all said *Ohayo gozaimasu*. Yasuko set to work on the coffee machine. She wore blue jeans and a white sweatshirt with a big red **Y** on the front and moved with zest, in a good mood. Ryuichi was in blue jeans and a white sweatshirt too, with a big blue **R** on the front. He fetched breakfast things and set them on the table.

Jon felt wrong in his rumpled pajamas. “Ah, Yasuko,” he began, “I don't know if you have any clothes that fit me –”

She regarded him sunnily. “Yes, of course – your clean washing.” She reached into a closet and brought out a neatly folded pile of washing – shirts, pants, shorts, sox, traXuit, towel.

“Ah, brillo! I'd forgotten all about them! I'm not quite destitute after all!”

Yasuko burrowed in another closet and came up with a plastic carrier bag – “*Dozo!*”

“Super – what an angel!” Jon admired the ultra-chic heraldry on the bag. “I'll go and change right away.”

He went and put on black crazysexycools, white shirt and black baggies, and put the other things into the noble bag for the flight. He left the pajamas with the bed linen and returned feeling like a gent again.

The four of them sat down to breakfast and conversation.

...

At last Ryuichi sighed. “So, we still don't know who organized the air strike or why. We don't know if the man who shot Duane Young was part of a plot to kill Mishima. Maybe he called in the air strike. How else could it be so accurate, at just the right time and place?”

Bee interjected. “Jon, didn't you say the planes were American?”

“Right,” agreed Jon. *Out with the truth* ... “I saw an American squadron badge on one of the planes. It could have been an American plane flying out of Misawa. As I see it, the whole hit could have been done under orders from President Tom Smith.”

Ryuichi looked puzzled. “The people I saw interviewed on television this morning thought the planes were Japan Air Self-Defense Force Raptors from Hamamatsu. There’s a big base there and they often exercise up here in the mountains. They fly low and drop practice bombs not far from the residence. Dr. Mekon is used to the noise. He complains about it sometimes.”

“Very convenient. If the flights are regular occurrences then no-one would notice the planes. But I didn’t recall the squadron badge until after I left the residence, so I didn’t tell the cops about it. Now everyone’s jumping to the conclusion it was a Japanese hit.”

Ryuichi nodded slowly. “The Americans could have done it in cooperation with the Japanese air force – there were plenty of officers who didn’t like Mishima’s handling of the Northern Territories problem.”

Jon frowned. “Maybe – but I think we should tell the police about the squadron badge as soon as possible. On ANN this morning Yoko Bernstein said the guy who shot Duane – Kazuo Suzuki – told the cops he thought Mekon may have organized the hit.” Jon had to help Mekon out to secure his own interview alibi – he had to avoid a frame.

“Unthinkable,” said Ryuichi quietly.

Bee spoke up. “Why did he shoot Duane? What was that for?”

“Good question,” mused Jon. “You saw him do it – what happened?”

“I didn’t see much,” replied Bee. “Duane was sitting next to me, just talking about the casualties, when he saw something and stood up. I looked around and there was the man in the tracksuit by the reception desk, with a gun in his hand, looking out at us. He just aimed at Duane and shot.” Bee’s voice quavered and she covered her eyes with a hand.

Jon glanced at Ryuichi. “No motive there ...”

Ryuichi replied quietly. “Perhaps Suzuki wasn’t the air force contact. Perhaps he really was a regular National Heritage party member.”

Jon frowned. “That’s what Yoko Bernstein said.”

Ryuichi nodded. “That would be a natural thought for a National Heritage party member. Dr. Mekon will be in danger from a revenge killing.”

“Maybe ... but I think Mekon was innocent ... perhaps it *was* Duane.” Jon smiled – Duane was his cover!

Ryuichi blinked but didn’t seem to take it in. “After the air strike Suzuki was just a lone gunman – who knows?”

“Yeah ... I have to tell the police about the plane.”

“Let me call the local police chief for you. You can let him record a video statement right away.”

They went to a front room with a videophone and made the call.

Then Jon called the U.S. embassy in Tokyo and found out what he had to do to get back into Europe. He called a 24-hour desk in Berlin and arranged for a temporary visa to be waiting for him at Narita. The operator was unsure whether the visa would come through – the database hypernet was acting strangely – but promised to try at least.

Then Jon called his German bank – again a 24-hour number – and was denied permission to take cash from his account via the local office of a Japanese bank in Shizuoka or Tokyo. The bank’s hypernet had been decommissioned on Friday following a massively expensive accounting snarl-up. The girl told him he’d have to talk with a manager on Monday morning, Central European Summer Time. Jon fulminated angrily for a while, then Ryuichi offered to buy his plane ticket for him and lend him 100 000 yen in cash, repayable any time. Jon accepted the offer gratefully.

The flight came next. Jon called British Airways at Narita and reserved a seat to London leaving mid-afternoon. Again, there was a problem with the hypernet and the operator couldn’t promise a touchdown in London, but Jon made the reservation anyway. Anywhere in Europe would be okay. He could hitch-hike the last stretch – he just *had* to get back to Hal!

Back in the kitchen, Bee had reserved a Singapore flight and was ready to go. Jon carried her baggage to the door, where she put on sneakers and parka. He put on his black and white pop-art traXuit top and the pesky flip-flops. Ryuichi and Yasuko would drive the pair to Shizuoka and they’d take the Shinkansen to Tokyo.

An unlikely scenario

Ryuichi and Yasuko held up big umbrellas as Jon and Bee made their exit. Mr. and Mrs. Tanaka came to the front door together to say *sayonara*.

Mr. Tanaka’s big golden Toyota stood ready on the forecourt. Ryuichi loaded the trunk and they all settled in the wide plush seats. Ryuichi shifted into drive, the wheels scrunched over the gravel and they set off.

They headed north along Route One to Shizuoka City. The rural landscape of rice paddies and tea bushes looked fresh and sparkling after the rainstorm. Ryuichi drove smoothly past long, grimy convoys of big V10 turbodiesel trucks carrying crated motorbikes for export from the factories in

Hamamatsu to the seaport of Shimizu. The trucks were festooned with yellow and green lights and washed the car with sheets of spray, but its microwave impulse radar was unfazed. Its six-speaker digital stereo bathed the foursome in the soothing melodies of a classical piano recital.

...

Jon mused. This was his exodus from the land of *kimonos* and robots. Of robots he'd had enough – his Media proposal was down the tubes. That whole tangle of obsessions was gone. Instead was the stunned sense that a global catastrophe had happened right in front of him.

It was chilling – *terrifying* – because it was so sudden and so irreversible. An extraterrestrial lifeform had found a way to manipulate the delicate net that held terrestrial civilization together.

Aliens had invaded Megablob!

It was already too late. The deed was done. No-one could undo it now.

How could Jon save the world?

There was only one hope – *Hal*. If Duane's file could be copied to the right people then maybe the alien moonbug could be understood and the cybernetic monsters rampaging around the internet could be terminated.

Jon had to backtrack a little. How could he even begin to understand the alien invasion of Megablob? Via his earlier tangle of ideas on the future development of bionic consciousness!

Alien manipulation of Megablob had to be seen in the right perspective. Terrestrial – Gaian – superconsciousness was on the way. Any infection with alien bugs could only damage that delicate process. The chaos bursting out all over the planet as hypernets went down with the bug was a clear sign that Megablob was still the merest seedling in the galactic garden. It was far too fragile to shrug off infection by genesis bombs.

So the code that might or might not be salvaged from Hal might or might not help someone somewhere to crack the alien bug code. It was an absurdly unlikely scenario, but it was the only one that gave meaning to his sense of urgency. Anyway, absurd or not, somewhere deep down he believed it was the truth. He had to get back to Hal and try to save the world!

He could save the world!

He couldn't see a way to explain this to the others in the car, much as he would have liked to unburden his soul. Only Nobby Mekon could understand him now. And right now there was precious little he could do to help.

...

Soon enough they reached Shizuoka railway station.

More sayonaras

Ryuichi parked on the forecourt and Jon fetched the bags from the trunk. Yasuko bought Shinkansen tickets for Jon and Bee and they all walked to the ticket barrier.

“So ... thank you for your visit ...” said Yasuko dreamily to Jon, as if the finality of this moment were somehow foreordained.

“Thank you too.” Jon shook her hand and they kissed each other lightly on the cheek. It was over. He picked up Bee’s case.

“Have a good journey,” Ryuichi said to Jon and handed him a business card. “Call me if you need help.”

“Thanks ...” Jon pocketed the card. “Thanks for all your help. I’ll wire you the money just as soon as I can.” They shook hands.

Sayonara, Yasuko called after them as they walked through the barrier.

Sayonara, Jon called back, and strode on.

This, he decided, was as good a moment as any to wake up from his pink dream of Japan. It was time to move on. He was no longer a dreamer. He was a practical man, a worker, a soldier, a man with a mission. He had a goal and he had to fight to achieve it.

On the platform, with Bee, he tried to define his mood. He felt calm. His mind was clear and still. Bee anchored him ... Beside him was a heavy-set man with a stumped left ring finger. His heart skipped a beat. He’d seen the movies. He knew the sign – *Yakuza!*

Strategy

The Shinkansen ride to Tokyo started uneventfully. Jon and Bee sat on the left side of the railcar and Bee took the window seat. The stooge with the stumped ring finger sat some five seats behind them.

...

Time to take a long, cool look at his situation. He’d come to Japan with an idea for a multimedia series on androids and the future of Planet Earth and was coming out again with an urgent mission to save the Earth from a pack of alien cyborgs.

So far as the global community of astronomers was concerned, the E-Eridani signal had nothing to do with the signal from the zeolite buckyball on the Moon. Without Duane’s decoding work no-one would think of analyzing the Epsilon Eridani signal for clues to cracking the moonbug. Probably all the coding freaks in the civilized world were now poring over bitmaps of

the lunar signal. A signal from E-Eridani that looks like just another pulsar, whatever the anomalies, isn't going to get a look in when a code bomb turns up bold as brass on the Moon. That's just good common sense!

Jon had a mission, no doubt about it, and he wasn't about to let the future of human civilization on Planet Three hang on whether a heavy-set thug five seats back got a clean shot in before Jon got clean out of the country. But there was Bee to think about too. He had to be creative.

Jon looked around at the Yakuza thug. He wore a shiny gray suit and a lurid beach shirt. His hair was permed into tight curls and he wore dark glasses. Hadn't anyone ever told him he looked just a bit too thug-like for a covert surveillance operation?

"Hey, Bee," he said quietly.

She glanced up from her book. "What?"

"There's a Yakuza thug sitting just a few seats away who's watching us."

Her eyes widened and Jon sensed her blood running cold. "There is?"

"Yes. He can't do anything here but we should be prepared."

Bee closed her book. "Oh, God, what can we do?"

"Let's just stay cool."

"I want to go to the loo!"

Jon's heart sank. Why did women have such contrary bladders? "Okay, but I should come with you and stand guard at the door."

Bee considered this for a second. "Won't that look suspicious?"

"What do you want – to get shot or look suspicious?"

"Get shot?" Her voice squeaked in terror.

"My guess is that whoever's paying this goon to trail us wants to see us dead. Why else would they trail us?"

"I don't know ... to scare us?"

Jon shook his head. "No payoff – waste of time."

"I have to go to the loo."

"Wait – what about your bags?"

Jon's carrier bag and Bee's sports bag were on the overhead rack. Bee's suitcase was behind the seat – the seats in the Shinkansen could be reversed by pushing the backrest backward or forward, and people used the spaces behind them for heavy or bulky luggage.

"You stay and guard them," said Bee. "I'll go to the loo."

"Are you sure?"

"It's a crowded train. What's he going to do?"

"Okay – your choice. I'll just watch."

She got up and went.

Gangland slaying

Jon reflected on the events at the Mekon residence. Had he really helped President Tom Smith and the Saints to assassinate Mishima? And how did the hit play out in terms of Smith's political interests?

In the Mekon poolside lounge Jon had read a review of Smith's first six months in office. The Smith administration was agreed to be the last hope for the rock-ribbed old order. Smith's Mormon appointees were all on the side of big business and their social policy was steered by a zealous group of fundamentalists back in Salt Lake City. The counselors in the first presidency and the quorum of the twelve apostles of the Church of Jesus Christ of Latter-day Saints were girding their loins for the final apocalyptic showdown with all the forces of evil bubbling up in their midst. These steely-eyed fundamentalists also sat in Matilda's ten-screen hot seats. They held prime responsibility for managing the planet's biggest stockpile of deliverable nukes. And any threat from a bunch of heathen, slit-eyed Japs with their own dinky little deterrent had to be stomped on hard!

Seen in those terms, the fact that Smith apparently saw fit to take out Mishima was actually quite a relief. It was just another gangland slaying, worth a few headlines for a week or two but no more, yet it headed off all the dangers of a shoot-out between Japan and Russia, put a more docile Japanese party back in power to ease the ongoing trade talks, and reduced the risk of a doomsday showdown. Quite a good balance, you might say ...

No Bee yet. Jon turned to check the thug – *not there!*

Heart pumping hard, he looked around. Ah – there, returning to his seat, perhaps from the loo at the other end of the railcar. Wait – he was putting a phone back into his pocket. *There were two of them!*

He jumped up and ran to Bee's loo. The door was locked. Jon braced his back against the wall and kicked the door hard. It burst open and sent a man inside tumbling to the window. The man had a gun and it went off. The gun had a silencer and popped, and a loud metallic twang announced a ricochet. Jon grabbed the gun with his right hand. The man twisted and thrust a knee into Jon's crotch, but Jon buckled just in time and delivered a left-handed *karate* thrust to the soft flesh under the man's sternum. His heart in spasm, the man doubled up and Jon secured his hold on the gun. The man let go and stumbled from the cubicle. Jon stood against the door.

He turned to Bee. "Are you okay?"

"I'm hit." She looked down at her blouse, where a dark red stain was growing around a pair of small holes. She pulled up the blouse to see the

wound. The bullet had taken a centimeter-long bite of skin and fat from the left side just above her waist. Blood trickled down and she blotted it up with toilet paper. It didn't look life-threatening.

Jon checked out the gun. It was a Sig-Sauer P225, for decades a standard weapon for German police forces. He flipped the safety catch and checked the clip – six 9-mm rounds. Plenty enough to defend them. But what to do? Stop the train and make a big fuss?

Discretion was the better part ... Don't stop the train, don't make a fuss. Just get out of Japan fast. Don't get locked into a tit-for-tat with a bunch of meathead mobsters. Planet Earth comes first. He unscrewed the silencer and pocketed it – no need for that – then pocketed the gun too. The traXuit was shapeless enough to disguise the bulges.

"Best if we don't make a big fuss here," he said.

"Why not? The guards can search the train."

"They won't find anything. It'll just slow us down. I just wanna get outa here as fast as possible."

"Okay, if you say so." Bee carefully took off her blouse and put it aside, then dabbed at her wound again. It was still bleeding, but slowly.

"Will you be okay?" Jon asked.

"Yes ... I have a pack of band-aids in my suitcase. Could you ..."

"Sure – is the case unlocked?"

"No. It has a combination lock. The number is 25538. The band-aids are in a small red box. Oh – bring my blue sweater as well."

"Okay – wait here. I'll knock three times when I come back." Jon made his exit, bemused at all these complications.

The thug's seat five rows back was empty. Jon pulled out Bee's suitcase and found the box and the sweater, then stowed the case again. Back to Bee, knock three times ... Bee applied a band-aid carefully, put on the sweater and trashed the blouse. They returned quietly to their seats. Still no thug.

Mobile again!

In Tokyo Central Railway Station, Jon and Bee stepped off the train in a crowd and stayed in the crowd as they walked to the main station concourse. They strolled around labyrinthine arcades of shops until Jon found a shoe store and bought himself a dazzling new pair of Powersoles. He bounded along the concourse with a new spring. Mobile again! Free to run and jump! He threw the flip-flops into the lap of a drunken panhandler who sat picking his toes by the wayside.

He could only guess at what had happened on the train. The two goons must have figured that Jon with a gun was more dangerous than Jon without. They were probably still lurking somewhere nearby, but their window of opportunity was closing fast.

Then he saw them. They were standing behind a gaggle of tourists about fifty meters away, watching, waiting for an opening. Jon quickly shucked off his gun-laden jacket and sprinted toward them. They ran off in different directions and he chased the one who shot Bee. Jon ran faster in his new Powersoles and soon caught him. With a practised burst of *kung fu* he hit him with hand, elbow and foot. The goon fell stunned and Jon walked back to Bee with a look of grim satisfaction on his face.

“Was that them?” she asked anxiously, holding Jon’s jacket.

“Yeah. Let’s go before the cops arrive!” He put his jacket back on.

People stood and stared but no-one tried to stop them as they walked briskly to the station forecourt and jumped into a taxi.

“City Air Terminal – *hayai!*” Jon barked.

“*Hai!*” barked the cabby and lurched into gear. They enjoyed a high-speed ride through central Tokyo to the City Air Terminal, where they picked up their airline tickets and ran up to the maglev terminal. They rode the maglev train out to Narita. Another fast ride.

Planning the next move

At Narita International Airport, Jon found the passport office. Luckily, the hypernet datalink to Berlin had functioned long enough to copy his data into the office printer before fizzling out beyond repair. A liveried passport officer explained his luck to him in staccato Japlish and handed him a temporary visa with a crisp *Dozo!*

Jon collected his British Airways ticket and Bee checked in her case at the Singapore Airlines desk. Her flight was in about two hours, his in three.

It was early afternoon and they were hungry. They found a restaurant and enjoyed a leisurely Chinese lunch followed by coffee.

“You’re being very quiet,” said Jon.

“Yes,” said Bee.

“Did the episode on the train upset you?”

“Yes ... it happened so fast ... I was shocked ... I could have died.” She spoke flatly, as if her feelings had been turned off.

“I was almost too late ... Perhaps we should have stopped the train.”

“No ... better to get away.”

Jon looked at her carefully. “You look pale. Are you sure you’re okay?”

She focused her eyes on his face. “Yes, I think so ... Once I’m back in Singapore I’ll probably collapse completely!”

Jon smiled. “Will there be someone there to meet you?”

“No, they don’t know when ... I can tell them now!” She called a waiter and he gave her a phone.

...

Jon mused on what to do with Duane’s decoding algorithm, assuming he could extract it from Hal. The best plan would be to send it to an astronomer who was familiar with the E-Eridani signal. An astronomer would know how to verify its authenticity and would appreciate its value.

But it couldn’t be just any astronomer. It had to be a SETI freak, for one. Most astronomers were unimpressed by SETI and would suspect a hoax. The discovery of the lunar buckyball made the situation worse, not better – every airhead who ever saw a UFO now had an excuse to buttonhole the experts.

Also, it had to be a pro at coding theory. If Jon couldn’t get his head around Duane’s decoding algorithm, despite a tutorial from the man himself, then he was sure most astronomers couldn’t either. He had to find a crypto freak, or at least someone with crypto friends.

But how could he find such a person? There could only be a handful of them, at most, on the whole planet. He could waste days searching through academic directories and still not find anyone. The interest in SETI was the real key, and that didn’t show up in directories ...

Bee finished her call and hailed the waiter for the bill. She was now in an animated and cheerful mood. “Time to go and board my flight.”

“Oh, wait, gimme your name and web address!”

“Oh, yes.” Bee rummaged in her sports bag and brought out a tiny book and a pen. She wrote on a page and tore it out. “Here.”

“Thanks.” Jon took it and studied it. The name was in Chinese glyphs but the web site was okay. “Let me give you mine.” He took book and pen and wrote his name and Hal’s address. “I’ll mail you some time.”

“I’ll warn my mother!” said Bee with a smile.

They paid the waiter and walked off to Bee’s gate. Jon felt the weight of the gun in his traXuit pocket and scanned the crowds warily for suspicious-looking goons. He didn’t see the pair from earlier.

“Thanks for everything,” Bee began. “You saved my life in the train.”

“Any time!” They kissed and parted. “Keep in touch!”

“You too – bye!” She walked off into the departure lounge.

...

Jon wandered around in the crowd ... He was looking for a competent and well-respected code freak in the SETI community ... he didn't know anyone in the SETI community, let alone a code freak ... But he did know someone who would. Marvin Klotzberger was into SETI and knew lots of people. In fact, Jon could call him right away. It was now ... extremely early Saturday morning in New York ... worth a try.

Consultation

Jon approached the British Airways desk. The uniformed girl there looked smart and self-confident, with a classic British style.

"Hallo," he said in his best British accent, which was an uneasy mixture of Oxford and California but a cut above the average Received Pronunciation on the Sceptred Isles. "My name's Christie, Dr. Jon Christie. I have a British Airways flight to London in about an hour, but first I'd like to make a phone call to New York and I don't have coins or a phonecard. Could I perhaps use one of your videophones here and pay you in cash?"

The girl looked at him with playful eyes, as if wondering whether he was trying to chat her up, and replied with a cockney accent: "I don't see why not. It's not your usual customer service but we're not too busy."

Jon smiled. "Thanks! It's very big of you. Er, where ..."

"Here." She indicated the vacant chair at the desk next to hers.

"Right, thanks." Jon sat down, keyed up a directory for Marvin's number and waited. The number popped up and he waited for the connection. The girl waited to overhear what she could.

"Marvin Klotzberger." Marvin's gravelly deadpan voice came over the receiver. Jon sensed the girl listening.

"Hi, Marvin! Jon Christie here. How are you?"

"Jon. Good to hear from you again so soon. What's happening?"

"Megablob's cracking up and I'm still in Japan. But I have a lead that just might help."

"I'm intrigued. Go on."

"It's something I need your advice on."

"Advice, huh? Well, shoot."

"Okay, I was at the, ah, I was at a hotel in the mountains where a young American was working on a private-enterprise SETI project."

"SETI – search for extraterrestrial intelligence."

"Right. He decoded the Epsilon Eridani signal. He gave me a file with all his results on it and asked me to pass it on."

“Wait, wait. A young American in a hotel gave you a file and asked you to pass it on? What sorta bullshit is that?”

“Sorry – I’m not giving you the whole story here. It’s a long story and most of it’s irrelevant. The point is that he was a serious and credible guy and he explained his decoding algorithm to me and the results he got from his hypernet and it all looked in order, if you know what I mean.”

“No, I don’t know. What’s he doing with a hypernet in a hotel in the mountains in Japan?”

“It wasn’t just an ordinary hotel. It had an astronomical observatory and a real-time datalink to the radio telescopes at Nobeyama, as well as a hypernet with a gigachannel analyzer and a very powerful decryption capability. He worked there – he was an employee there.”

“A hotel with an observatory and a hypernet? You gotta be joking.”

“Okay, not a hotel. It was the residence of Noboru Mekon, the chairman of Mekon Corporation.” Jon glanced at the British Airways girl. She’d heard the key words and was trying not to look interested.

“Alright, now we’re getting it. Where the assassination took place, huh?”

“Yeah, right. I was there. So was the American. He got killed, as a matter of fact. That’s why I have the file with his results.”

“Now you’re making sense. You have this guy’s life’s work and you’re itching to check it out.”

“Right, exactly. He was a genius with codes and he found a message in the Epsilon Eridani signal.”

“Uhuh. What sorta message?”

“I can’t say right now. A picture, an image. It’s all in the file.”

“Okay, so where do I come in?”

“I don’t know who to send the file to! I don’t know anyone in the SETI community, especially not a code freak.”

“No, right ... I know who might be interested.”

“You do! Who?”

“Guy called Alvin Hershey, works up at the Keck rig on Mauna Kea.”

“Wait, I have to write it down ...” Jon scribbled on a notepad on the desk. “Alvin Hershey – as in Hershey bar?”

“Right – as in Hershey bar.”

“Mauna Kea – Hawaii – do you have his address?”

“I dunno. Look him up in the directory. You’ll find him.”

“Great. Is he a professor or something?”

“He’s a professor at the university.”

“Well, that’s marvelous. I’m very grateful.”

“No problem. What’s this gotta do with Megablob?”

Jon smiled. “That’s a long story. If it makes sense, you’ll hear it on every news show, guaranteed.”

“Okay. Well, so long.”

“So long.” Jon keyed off. He tore the note off the notepad and stood up.

The British Airways girl looked at him cheerfully. “All okay?”

“All okay. Thank you. How much do I owe you?”

She smiled sweetly. “It’s on the house.”

“Thank you, that’s very kind of you – you’re a wonderful person!”

Her eyes sparkled. “I couldn’t help overhearing a bit. You said you were at the Mekon residence. That’s where the assassination took place, isn’t it?”

Jon wagged an erect index finger and shook his head. “Don’t say anything – there’s a Yakuza contract out on my life!”

“I won’t breathe a word, honest!” The girl’s face glowed with satisfaction and she looked down at her desk.

Jon strode off. He found a trash can in a secluded corner and quietly dumped the Sig-Sauer P225 minus its bullets and silencer. He found another trash can a two-minute walk away and dumped the silencer and bullets. The items had his fingerprints all over them – but so what? Clean at last!

Reappraisal

Burdened only with a designer plastic bag, Jon was ready to enter heaven in a Boeing 747. They were taking the direct route over Russia – the trip was about ten megameters, over 14 hours, with a long hop to Moscow and a short hop to London.

It was a Gigatop 747. The 747 had always been his favorite aircraft. When he was still young and romantic he used to call the 747 the love bomber. He had the naive idea that its cargoes of friendly tourists had done more to rid the world of baddies than all the hate bombers ever built. Now he realized that tourists and bizz-men were far more dangerous for goodies and baddies alike than armed paratroopers.

He had a window seat and enjoyed the view over Siberia. All that forest! Soon enough, he drifted into sleep.

...

He awoke to twilight. The setting Sun made a glorious vista of reds and yellows among the delicate tracery of clouds strung along the horizon, and because the plane was flying into it he had more hours than usual to enjoy the spectacle. Airborne dust scattered more energetic photons more widely,

so blue light was scattered and he saw what remained. It amazed him that so simple an effect could generate such beauty! Actually, what really amazed him was how his brain could be wired to see beauty in so simple an effect – what evolutionary purpose could it serve? Who knew? But the effect on his mood was real – it made his soul feel at peace.

Borne aloft by the rose-tinted panorama of solar photons, his thoughts floated clear of the murky nightmares that embroiled them when he walked the earth in Japan. Now he was tripping in his heaven again and the world's problems seemed less urgent.

He toyed with the idea of how fragile the biosphere was, how soft and thin the skin between the rockball below and the hard vacuum of space above. The slightest scratch from a falling asteroid or an energy-beam weapon mounted on Starship Eridanus could injure it beyond repair. He recalled almost with nostalgia how humanity had first come to see the fragility of the biosphere in the late 20th century, when massive superpower arsenals of thermonuclear weaponry brought biospheric abortion of humanity to within a bomb's throw and when such signs of atmospheric trouble appeared as the ozone hole and the greenhouse effect.

As he looked at the setting Sun, he realized that the terrestrial exosphere was his home for all eternity. He was part of it, locked into a set of terrestrial ecocycles that were far too pervasive for there to be any chance of escape. He and all his fellows, whether they tripped on Mars or spudded on sofas, were fated to have their lives defined by those cycles. The total inevitability of this fact caused a sudden upwelling of feeling and a mystical sense of union with the stratospheric scene, as if this volume, so huge from within yet so thin and fragile from without, were no more or less than Jon's own body.

I am my environment, he said to himself, and felt its meaning resonate in his mind as he looked out at the blood-red skyscape. All this atmosphere he breathed in and out was as much a part of him as the roast duck he'd eaten a few hours earlier. He *knew*, with a conviction that went beyond words, that life on Earth was a seamless whole, a smooth coat of paint around the big old cannonball. Jon himself, this humanoid turbulence of bodily processes, this dynamical intersection of global cycles, was a global phenomenon.

He was just a tiny ripple on the surface of a global ocean. He wasn't an independent being at all. His personal self was an offshoot of Gaia, the great Earth mother. Behind that personal self – that logical paradox of reflexive conceptualization – was a soul that threaded deeper, as deep as the totality of DNA life on the planetary surface ...

...

Jon woke up to black space beyond the window. The Boeing descended, put out its flaps and undercarriage with a series of heavy clunks, and landed on the bumpy concrete of Moscow's international airport.

The passengers filed dutifully out of the cabin and through a long finger tunnel into the main arrival and departure hall. It was a vast hall, built in the 20th century and quite impressive as architecture, but it was almost empty. The trading concessions scattered around the periphery of the hall were dwarfed by the massive, marbled communist-era walls and columns.

Between the cola stands and hamburger bars was a shop selling ethnic souvenirs from the remoter regions of Russia. But instead of drooling over ethnic niknaks, Jon picked up a promotional leaflet for a set of disks profiling the Soviet war machine. He flipped through it and mused ...

Even empires as deeply flawed as the Soviet Union made positive contributions to history, and the achievements of the Marxist–Leninist planners were not to be lightly dismissed. Global thermonuclear spasm war was the first inkling of inadvertent global ecodoom. The Earth orbits of the Sputnik satellite in 1957 and cosmonaut Yuri Gagarin in 1961 were the catalysts for the Apollo project that put a man on the Moon in 1969. Even the United Nations globocop arose – with U.S. help – to meet the threat from madmen playing merry hell with ex-Soviet nukes ...

Soon enough, the detainees trudged back to the plane. At least the walk, after 35 kiloseconds in a seat, was good for the legs.

...

Jon stared into space and mused. All advances in technology had military applications. When molecular-scale integration of information processors put bionic consciousness into cheap machines, it was a safe bet that the phrase 'smart bomb' would take on a new meaning ...

So what about genesis bombs? What about the lunar buckyball code bomb that might – just *might* – have come from Epsilon Eridani? Would Planet Earth's stock of previously harmless hypernet-controlled computer integrated manufacturing facilities now start to spew forth a virulent strain of nanomachines that developed willy-nilly into a torrential flood of quasi-biological organisms – or rather mechatronic-infotonic-robionic (MIR) lifeforms – that displaced DNA lifeforms and repopulated the Earth with a new master race of E-Eridanites? Hmm ... be methodical.

First, macromolecular lifecycles evolved more or less randomly under terrestrial conditions until DNA became the dominant gene machine. In the enormous combinatorial space of all possible macromolecules there were vast numbers of similar configurations that could do more or less the same

job. The chance was negligible that the buckyball code was for nanomachines based on DNA or anything compatible with it. If the code was for genetic molecules, they would almost certainly be radically alien genes designed to spawn legions of alien lifeforms.

Second, if life on E⁴ – the Epsilon Eridani Earth Equivalent – had evolved so far already then its genetic molecules – its equivalent of DNA – may grow lifeforms nastier and more violent than our homebound DNA ones. This was uncertain, since evolution from a biosphere at the threshold of machine life, as on Earth, to quagmire status, as on E⁴, might be very fast. It might take less than a million years, which when compared to the 3.6-giga-year history of life on Earth was as tiny as a second relative to an hour. Still, if the buckyball bomb contained E⁴ equivalents of DNA, its spawn could be nasty enough to displace DNA systems.

Third, the E⁴ planet seemed to be launching genesis bombs – if that was what the space city in Duane's video was shooting off – like cheap firecrackers. They were expendable items, whatever they were. Maybe they were like the atrocious little anti-personnel minelets scattered by terrestrial strike aircraft. That made it reasonable to treat them not like scientific treasures at all but like filthy trash.

On the other hand, perhaps they were no more dangerous than dandelion seeds. And it had to be admitted that alien replicator molecules would be of extraordinary scientific interest to mere Earthlings, regardless of the hazard, and Jon had no doubt that many biomolecular engineers and others would be very eager to study them in detail. Yet the fact that Gaia was on course to grow her own crop of interstellar seeds in a megayear or so suggested they didn't justify putting Gaia's virginity at risk.

Conclusion – the best reaction to the discovery that the quagmire lifeform on E⁴ was firing genesis bombs at us was to destroy them all. That would force the E⁴ lifeform to treat Gaia with more respect!

It was a sobering conclusion. As a kid, Jon had assumed our first contact with an alien civilization would be peaceful. Surely the E-Eridanites would seek to make their first contact with other lifeforms as minimally invasive as possible. Surely it would fill its buckyballs with something more innocuous than genetic code for self-replicating nanomachines. But why? Why should a hyperadvanced quagmire lifeform merely send code for home movies to a sweet virgin planet like Earth? All the parallels in human history screamed loud and clear that a more potent package was far more likely.

Next question. How could Earthlings shoot down a relativistic projectile from a neighboring star system? Only a high-energy laser beam could do the

job. It would have to be off-Earth to avoid interaction with the atmosphere. The Moon was the obvious site.

Recommendation – as soon as the hypernet crisis was over, Earthlings should set about constructing a laser battlestation on the Moon. Well, *two* would be better, one at the Moon's north pole to cover the northern celestial hemisphere and one at its south pole to cover the southern hemisphere. Yes, he liked that idea ... It had the ring of sound military logic. They could be datalinked to the Acropolis Louisa hypernet and programmed to shoot down incoming genesis bombs on sight ...

But the first priority was to root out the cyborgs already breeding in all the hypernets in Megablob. After that, everyone would be ready to do whatever it took to avoid a repetition. Jon's role was clear – get Duane's work on the internet and into the hands of Professor Alvin Hershey in Hawaii, who could presumably be trusted to do the right thing with it.

Jon felt that his martial line of thought should disturb him, but somehow it didn't. There wasn't much he could do about it all. He remembered Phil's fatalism about the prospect of being nuked – when there's nothing you can do about it, why worry?

The plane cruised on through black space.

A check

A stewardess woke Jon up and asked him to fasten his seat belt for the landing. The Boeing descended into a maelstrom of colored lights and the undercarriage rumbled along the runway. Rain lashed Jon's cabin window and smeared the forms of planes and service trucks into a psychedelic blur. Jon filed out and followed the zombie parade through the NON-EUROPEANS entry gate. An officer raised an eyebrow at his temporary visa but said nothing. He continued through the NOTHING TO DECLARE exit.

"Excuse me, sir," an officious voice beside him called out. "Is that all the luggage you have?"

Jon turned to face a young man in a smart uniform standing behind a long table and said, "Yeah." He put his plastic bag on the table.

"Have you just come from Tokyo?"

"Yeah," said Jon in a flat monotone.

"Did you have a successful trip?"

"Yeah," Jon replied sleepily. It was about midnight British Summer Time but his biorhythms were already deep into Sunday. He emptied the bag.

"Well, well ... How long were you in Japan, sir?"

“Ten days. My suitcase and all its contents were burned in a fire.”

“Oh, I see ... you had a *successful* trip?”

“I learned something very important that I can follow up.”

The officer’s eyes widened. “Aha – are you a journalist?”

“Actually, I’m an agent.” Maybe that would make the guy shut up and let him go. “I was monitoring the Mishima affair and now I’m being chased by Japanese mobsters. They burned my case.”

The man blanched visibly. “That appears to be in order, sir. Thank you. I wish you a pleasant stay in London.” He moved on to the next passenger.

“Thanks.” Jon picked up his plastic bag and powersoled wearily to the main concourse. He was back in London. What next? Go to Waterloo and take the next Eurostar Express to Brussels. He walked over to a bank window and changed his yen into euros. A bit over eight hundred – should be enough. In Brussels he could sort out more.

He didn’t want to take the tube to Waterloo. Too dangerous late at night. All sorts of thugs down there. He walked out to the taxi rank.

Another viewpoint

The taxi was an old British turn-of-the century model with an upright black body and a hard bench seat in back. Jon climbed in. The veteran vehicle had a noisy diesel engine that made the whole thing shake.

Jon leaned forward to the driver, who was quite a veteran too. “Waterloo Station, please.” He slumped back in the seat and closed his eyes.

“You sound like I feel, guv. Come a long way, have ya?”

“From Japan. It’s about eight in the morning there now.”

“Say no more, mate, say no more ...” He had a broad cockney accent. “You heard the news from Japan?”

“What news?”

“Prime minister assassinated in his mountain hideaway.”

“Yeah, I heard. Seems like it was organized by his party colleagues.”

“Izzat a fact?”

“Yeah. some kind of purge.”

“Purge – thought they went out with the commies!”

“He was staying with a robot billionaire called Mekon. I was talking with Mekon just the day before the assassination.”

“Izzat a fact? Small world, innit?”

“Yeah, I know what you mean. What else did they say on the news?”

“They said there was some Yank there who had a shootout wiv a villain

and pissed off in a chopper wiv a Chinese bird like in James Bond.”

“Really? They said that?”

“Well, not in so many words, a course. How come you were there, then? You a journalist or summink?”

“Something, yeah ...” Jon didn’t feel like saying more, but he did anyway. “Did they give the name of this chap?”

“Yeah, it was ... James Crispy, I fink. Seemed to be some kinda secret agent. You know, CIA. But you were there – musta been your story.”

“Right, it was. It is.”

“Bit a luck there, mate. Not often a story like that falls on your plate.”

“Absolutely ... A secret agent?”

“Yeah – he musta set it all up – called in the air strike.”

“Is that what they’re saying?”

“Stands to reason ... they said it mighta been an American plane wot dropped the bomb.”

“American? Did they say more?”

“Ain’t you been followin it? I thought it was your story.”

“Well ... actually, I’m more worried about the hypernet crisis.”

“Hypernet crisis – don’t understand that at all.”

“It’s a lot more important than the assassination.”

“Never understood computers. Don’t trust ’em – never did, never will.”

“Could be a global disaster –”

Bang! The cab was hit violently from behind by another vehicle.

Highway robbery

Luckily, Jon was slumped low enough in the seat for his head to be cushioned. The crash could have dislocated his neck otherwise.

“*Bloody bollocks!*” the cabby shouted, and pulled over.

Jon watched the cabby get out to inspect the damage. The vehicle behind had stopped too. It was a battered old Transit van. Its headlights blinked out. The street lights were yellow and dim here. They’d stopped somewhere north of Kew Gardens and the street was deserted.

Three bulky yobs in rough working clothes got out and approached the cabby, who took one look at them and started to run back to his cab. Too late. Two of them caught up with him. One held him and the other punched him in the gut. Jon opened the cab door on the other side and jumped out –

The third yob faced him. He must have been two meters tall and had big, heavily muscled shoulders. He had pocked skin and short hair and looked

like a boxer. He held up a small knife – a big knife, but it looked small in his ham fist. “Goin’ somewhere, mate?” he said in a deep growl.

“Yeah – I’m in a hurry.” Jon could have run off, perhaps, but it would be dangerous. The incredible hulk blocked his first steps.

“Haven’t paid yer fare, mate.”

“What do you want?”

“What yer got?” He took Jon’s bag gently from Jon’s hand and thrust a hand into it without taking his eyes off Jon’s face. “Clothes – is that all?”

“That’s all. I’m traveling light.”

He upended the bag and let its contents fall onto the wet road, then dropped the bag, which blew away. “Show me yer money, then.”

Jon could try a fast move here but one of the guy’s buddies was walking up, so he took out a handful of loose change and a crumpled tenner, then his visa, Ryuichi’s card and Bee’s note. “As I said, traveling light.”

The hulk took the tenner. “Not a lot. Got anyfing else?”

“Nope. What were you expecting?”

“What about the inside pockets, then?” The villain jabbed the knife behind the front of the jacket and flipped it aside. Quick as a flash, Jon grabbed and turned the wrist of the knife hand and kicked the guy’s knee hard to knock him off balance. Jon twisted the wrist and thrust out a foot to trip him and he keeled over. Jon banged the wrist against the cab-door frame and the knife fell. Jon kicked it under the cab, then turned and ran.

But the hulk’s buddy ran faster. Jon was felled by a flying rugby tackle. The hulk – without knife – caught up, grabbed Jon by his lapels and slammed him down hard. Jon’s head banged the tarmac and he went limp. The hulk then went through Jon’s traXuit pockets and found the wad of eight hundreds. He stood over Jon and fanned it.

“Traveling light, are ya? Better leave this with me, then.”

“We gotta go –” said the tackler. The hulk turned away and the pair ran back to their van, where the third yob was gunning the motor.

Jon sat up, dazed, and watched the van move off. He managed to read the license number and memorize it. Then he went to help the cabby, who was kneeling by the cab door, breathing heavily.

“You okay?” he asked, kneeling down beside him.

“*Ooff* ... bastards winded me.”

“Did they rob you?”

“Nah ... money’s in a safe box. Bloody winded me, though ... How about you? What they got?”

“All my cash – 810 euros.”

“Bloody bastards ... oughta be shot, the lot of ’em!” He raised himself slowly and stood up, holding the door for support.

“Damn right ... I’m in a hole now. I was gonna take the next train to Brussels. Now I’ll have to wait until Monday – *dammit!*”

Jon’s head wasn’t too banged to damp his rising anger. He was held up for *a full day* – he couldn’t do a *goddam thing* on Sunday with no cash – just because a bunch of *assholes* stole his wad. He had better things to do than go through yet another police interrogation – *the fate of the planet was at stake!* He grimaced and banged a fist angrily against the cab.

The cabby frowned. “Take it easy, mate, it ain’t the end of the world.”

“Damn well could be ... I’ve got important business to take care of. I can’t afford to waste another day here in London.”

The cabby sighed and pulled out a pack of cigarettes. “Smoke, mate?”

Jon shook his head. “No, thanks. We oughta call the cops.”

“Yeah. I’ll do it now.” With another weary sigh, he went and called them.

Jon picked up his clothes from the road and threw them into the cab. His traXuit jacket and his baggies were torn, his right knee was grazed and his head was growing a painful bump at the back.

The cabby finished his call. “They’ll be here in five minutes. Let’s check the back of the cab.” They both went and took a look. The bodywork was dented but the lights were okay. “Not so bad ... I’ve had it for tonight ... I’m off home after this. Can I drop yer anywhere?”

“Dunno ...” Jon didn’t know what to do next. There was nothing much he could do without cash ... *Ruth*.

“Well, yes,” Jon said, “After we’ve made our statements and all that I’d like to go visit someone in Putney ...”

“Putney – that’s on me way. No problem. My name’s Fred, by the way.”

“My name’s Jon.”

A peaceful silence descended. Fred puffed on his cigarette.

A police car arrived with its blue lights flashing and parked behind them. Two cops got out and stood admiring the back of the cab until Fred and Jon came out and joined them.

“What happened?” a cop asked Fred.

“They bumped us wiv a Transit van – three of ’em, nasty pieces o’work.”

The four of them stood in the gentle rain. Fred and Jon told their stories and the cops took a few pix with a lo-light CCD camera.

“Follow us back to Hounslow and we can take your statements there,” said one patrolman.

“Right,” said Fred.

A night in jail

Fred and Jon dictated their statements and a policewoman keyed them into a PC. It was an hour before they were ready to go.

The desk sergeant eyed Jon. "Where are you planning to spend the night, Dr. Christie?"

"I don't know. I have a friend in Putney. Can I call her from here?"

"Be my guest." The sergeant gestured at the audio desk phone.

Jon called directory enquiries for Ruth's number, then called her. Her answering machine replied but he hung up. "No reply. She's probably asleep already. I'll try again in the morning."

"No other friends in town?"

"Not to call up at 1:30 in the morning, no."

"Stay in a cell if you like. Warm, dry, won't cost you a penny."

"That's a kind offer ... I'd rather go with Fred to Putney and stay in a cell there, if that's possible."

Fred spoke up. "I'd offer to put you up at my place but it's only a titchy bedsit. You're better off in a cell."

The sergeant nodded. "I'll call the station and see."

He called and confirmed that Putney had a cell free. Jon thanked him, and Fred and Jon went on their way.

...

As they drove from Hounslow to Putney, Fred told Jon about his own over-night stays in jail as a young man and about the expensive divorce that left him living in a titchy bedsit in Wandsworth, and Jon told Fred about his world-famous stunts at the Mekon residence.

Fred dropped Jon by the front door to Putney nick. He gave him a plastic carrier bag, with a well known cut-price supermarket logo on it, for his street-soiled rags. Jon felt his public image sinking fast.

...

Jon chatted with the Putney desk sergeant for a while. He was a big avuncular chap with silver hair.

"These bumper bandits are a menace," said the sarge.

"Too right," agreed Jon. "I thought a taxi would be safer than the tube."

"It is, normally. Just your bad luck."

Jon noticed a television. "What's the latest news on the hypernet crisis?"

"The hypernet crisis? They'll probably close down Heathrow tomorrow. And most banking services are closed until further notice. That's what they said on the ten o'clock news."

“Really?” At least the Channel tunnel didn’t hang on a hypernet. “Do you think there’s anything since ten?”

“Let’s turn the box on and see, eh?”

“Do you have ANN? They’re fastest with late news.”

The sarge turned on *ANN live from London – Peregrine Wells*:

“– Force in the States. Matilda started to act strangely earlier today and the system managers say the symptoms are consistent with an attack by the internet virus, but gave no further details.”

“Wow –” Jon gasped. Now he realized this cyborg invasion was for real. Matilda was the most rigorously protected net in the whole of Megablob. If the cyborgs had penetrated Matilda then the Earth was truly endangered!

Cut to a wallet PC commercial. Sarge turned down the sound. “Matilda ... what’s that, then?”

“It’s the command and control system for the Global Nuclear Force. It’s a distributed network of hypernet computers that integrates the whole business of selecting targets, aiming and firing missiles, checking yield and damage assessments and so on. It’s been designed to be as impenetrable to hackers as possible, which means the virus shouldn’t have been able to get in. If it got in anyway then it’s tougher than we are.”

“I don’t see why they computerized it all. I mean it’s a bit stupid putting all your nuclear eggs in one basket like that.”

“Well, not really. Matilda’s much faster and more reliable than humans used to be – when it’s running properly, anyway. The system’s designed to be as idiot-proof as possible. It’s like a giant video game.”

“So now they’ve got the bug in their video game, eh?”

“That’s it exactly.”

“Does that mean they’ll start firing off nukes in all directions?”

“Maybe. If this is a *wicked* bug then we could all be in real trouble.”

“This whole computer crisis is a mystery to me. I don’t really see what all the fuss is about. Why don’t they just unplug all their computers? That’d stop the bug in no time.”

“But we can’t do that. The computers run everything and they have to communicate with each other. Otherwise we’d have even worse chaos.”

“Can’t see what’s worse than having the Global Nuclear Force running out of control.”

“Well, no, that’s right ... Our only hope is find a way to defeat the bug.”

“You know about these things, do you?”

“I’m a software editor. Actually, when I was in Japan I met a guy who wrote some software that could help us defeat this bug.”

“Oh, yeah?”

“In fact, he let me copy the software onto my machine in Heidelberg and now I have to get back there as soon as possible to send the software to the experts who can use it to defeat the bug.”

“Oh, yeah? How come he let you copy it, then?”

“He died and I had to take over. Now I have to distribute his software for him. I wanted to catch the Eurostar Express back to Brussels tonight, but this robbery this evening has slowed me down.”

“Aha ...” Sarge didn’t really understand. “How did this chap die?”

“We were at the ...” Jon really didn’t want to get into the assassination story again. Sarge would only keep him talking about it all night. “Actually, it’s a very long story. The point is – his code could save the world!”

“His code? You mean his software?”

“Yeah. It’s on my machine in Heidelberg, and I have to get back there to get it out again.”

“How did it get there from Japan?”

“I sent it there on the internet.”

“Aha ... Why can’t you get it out again on the internet?”

“Because my machine’s got the bug now too!”

Sarge grinned. “These new machines are too clever by half!”

“Look, I have to get back to Heidelberg to save the world! Can you lend me five hundred euros so I can get going?”

Sarge laughed, with a long, deep belly laugh. “I’ve heard ’em all but that’s a good ’un!”

Jon saw it was hopeless. “Okay ... I’ve had enough for tonight.”

“Do you want to go to your cell?”

“Yeah, let’s get it over with.”

Sarge picked up a bunch of keys and Jon followed him down a bleak corridor to his cell. It was a bare concrete cubicle with a small, high, barred window, and was furnished with a steel-frame bunk bolted to the wall and a stainless-steel toilet and wash-basin. On the bunk was a thin, hard mattress with a black plastic cover. On the mattress were two gray wool blankets and a small pillow covered with black plastic.

Sarge stood at the door. “We’ll turf you out at six with a cup of tea and a slice of bread.”

“Fine ... that’s very kind of you.”

The door closed.

Astronomy

We are stardust

Jailhouse blues

Sunday: Jon is bitterly disappointed – twice – and gets sidetracked again.

•

Putney nick, Sunday, 2 AM to 6 AM: Jon paced around his prison cell.

Matilda was infected. The Global Nuclear Force was in the grip of an alien cyborg that no-one understood. Only Jon had an ace to play in the fight to save the planet – and his head hurt.

Was this the bitter end of the story of indigenous life on the third planet in the system Sol? Could the human race rally in time to fight off the invasion? Or was it finally quits for DNA – was it finally time for MIR life to take over? Was it even *possible* for an aboriginal lifeform to win a battle with extraterrestrial cyborgs? Or was this the only way that mechatronic-infotonic-robionic life could get its act together and save the day?

No, a gigabyte code bomb was unlikely to take over control of Megablob. Far more likely that soon someone would find an effective anticode – with or without the help of Duane's algorithm. Then life could go on.

But it would never be the same again.

Humans were primitive creatures. Apes with soft brains. They had no role in Megablob that couldn't be performed better in future by ... *androids* ... How long would it take? A few centuries? When machines were designed down to their molecules they'd overtake us.

Bionic robot brains built with molecular-scale integration could be vastly more efficient than human brains. A memory could achieve a packing density of the order of one bit per cubic nanometer, which could put up to a billion terabits (a trillion gigabits) into each cubic centimeter of memory (divide by a thousand for support systems and it's still a lot). With a gigahertz clock and photonic logic, such a brain would trash human brains about as effectively as Mekon robots trash your average insect.

Androids built with such brains wouldn't need to compete at the human level at all, any more than humans compete with grass ... *all flesh is grass*. The idea that androids would merely be some kind of Nietzschean superman was a non-starter. Androids would be the humanoid interface devices for a global entity that bore about as much relation to humans as humans did to the microscopic creatures that once swam in the primordial oceans. Androids would just help the last humans feel more at home in the terrestrial quagmire, like wimp (windows–icons–menus–pointer) interfaces helped people get used to personal computers a generation back.

What was special about humans? Our DNA ... DNA held the secret of terrestrial life. All our souls led back to the same source, the soul of Gaia herself, and the DNA tree was her offspring. How did Gaia get pregnant? As Jon saw it, the basic laws of physics allowed DNA to evolve in primordial seas, and all it needed from beyond the Earth was sunlight.

Sunlight ... energy and negentropy. Negentropy was information ... The Sun poured its energy and its information onto the virgin planet and life was created ... The Sun impregnated the Earth.

The Sun was the father of DNA life.

What about the transition from humans to androids? Human technology was now transforming the exosphere into an integrated lifenet. No longer was DNA the only unifying factor in the lifenet. The new logic of bit strings was forcing the pace of evolution faster than the old logic of base-pair strands. Now the DNA tree was sprouting a new MIR organism – Megablob – the quagmire. Gaia was about to give birth again.

The birth of MIR life was the real issue. Putting consciousness into robots was just a step along the way. Who or what was the father of MIR life? The Sun again! What else could influence life on Earth?

Seen from afar, the Earth had only just begun to develop detectable life. Gaian radio-spectrum emissions were the first warning signs to the Sun's interstellar neighbors that something was happening on Planet Three. The biochemical precursors of the radio outburst – DNA systems like bacteria and humans – were merely the primal soup for the new life.

How would our galactic neighbors react to the noise? Would they regard it as a vulgar intrusion on their peaceful lifestyles, or even as pollution of the interstellar medium? Or would they shake their soft planetary feelers wisely and teleinformate with each other about Gaia's wildly foolish advertisement of its fresh succulence to galactic predators?

Whatever the reaction, Gaia's human excrescences – her soft, sensitive feelers – couldn't possibly blast out their discordant music for much longer

without prompting some feedback from the neighbors. Maybe the Epsilon Eridani signal and the lunar buckyball *were* the first reactions.

But how could he compare life on Earth with life in other star systems? All he knew for sure was that they too were powered by stars like the Sun. Understanding the Sun was the key.

The tree of DNA life on Earth was driven by solar energy and information. The solar information flux, coded into random-looking patterns of photons, drove the ecocycles that led over the millennia to the evolution of a machine civilization on the water-covered planet.

The Sun radiates a total of almost 400 billion petawatts of photonic power into space, of which well over 100 petawatts reaches the Earth's surface. This corresponds to a flux of about 10^{36} (a trillion trillion trillion) visible-spectrum photons every two or three seconds onto the Earth. The number of gigabits of life-enhancing information conveyed in such a flux defies calculation. Any number of multigigabit information structures (such as DNA genotypes) could beam down in the solar flux. Any number of angels could descend from the solar heaven and take on human form.

Sunlight and angels ...

The long view was that the superconscious superorganism planted in the terrestrial quagmire – *Susupteq* – would be looking for a way to make good on the galactic stage just as humans had found ways to make good on their planetary stage. Humans could become integral suborganisms in *Susupteq* much as numerous microscopic creatures (such as gut flora) had become integral suborganisms in humans. Humans could have a long-term future as slaves of *Susupteq* ...

The cell door opened and a shy young policeman came in with a cup of tea and a limp slice of white bread smeared with margarine.

Down to Earth

Jon walked out to the sarge's desk to consume his token breakfast. In minutes he was out on the streets, cheap plastic bagful of soiled clothes in hand, with a meager handful of loose change in his pocket. His clothes were torn and stale, he hadn't had a proper wash since he was at Yasuko's house, he hadn't shaved for five days, and his head still hurt.

He walked the streets for a while. It wasn't cold and it wasn't raining but it wasn't much fun either. He walked into the MacBurger bar in Putney High Street and took his time over a cup of coffee while reading the bar's copy of *The Sunday Rag*.

The Japan stories were detailed and he read them carefully. The reformed Liberal Democrat government under Prime Minister Kawasaki had initiated peace talks with the Russian government. The facts behind the assassination of Mishima were reported at length:

The Mekon residence was apparently struck by a laser-guided missile launched from one of a pair of low-flying F-22 Raptor strike aircraft on a training flight from the Japanese Air Self-Defense Force base at Hamamatsu, just a few minutes' flying time south of the residence ... The police team investigating the assassination are working on the assumption that the moderate Kiku faction of the National Heritage party planned the attack with officers at the Hamamatsu JASDF base. Dr. Jon Christie, a U.S. citizen who was at the Mekon residence during the attack, described seeing a U.S. Air Force squadron badge on one of the aircraft that took part in the raid, but this has not been confirmed by other witnesses. So far there is no other evidence for U.S. involvement in the assassination, and a U.S. government spokesman in Washington denied the existence of plans to provide support to opposition groups within the National Heritage party.

Wow! His Saint jet testimony was still unconfirmed. If he hadn't told Bee, and if Bee hadn't prompted him to tell Ryuichi, he could have kept it dark. How would Bob and the Langley crowd react? They'd think he'd let the side down – no – *betrayed* them. To hell with it – the truth was what mattered.

Most of the rest of the *Rag* news was trash, as usual. The coverage of the hypernet crisis was superficial and technically naive – a lot about reactor accidents and so on but nothing about the bug – and Jon skimmed it.

He turned the pages, then found a shocking article:

EPSILON ERIDANI 'MESSAGE' IS JUST ANOTHER PULSAR SIGNAL

Astronomers at the Kitt Peak observatory in Arizona have detected tiny fluctuations in the light from the nearby star Epsilon Eridani that proves it has two massive companions. Since the discovery a fortnight ago of a pulsar-like microwave signal from the direction of the star, astronomers have speculated that the signal might be an intelligent message from an advanced civilization. Now that hope has been dashed. The microwave signal shows a Doppler shift that exactly corresponds to the fluctuations and shows that the pulsar is in a binary orbit with a dark companion around Epsilon Eridani. It seems the pair are so well balanced that they have only a tiny net effect on Epsilon Eridani ...

Astronomers were puzzled for two weeks because the microwave signal looked very similar to a pulsar signal. The new puzzle is how a pulsar can be in an apparently stable orbit in the Epsilon Eridani system yet only now start beaming in our direction ...

PULSARS are very small. They concentrate the mass of a star like the Sun into a ball with a diameter of about ten kilometers. They begin their lives very hot but cool down rapidly, and if the Epsilon Eridani pulsar is old and cool, it may be very hard to see directly from Earth ...

Jon wasn't just shocked – he was *aggrieved*. Had Duane tricked him? Had Duane not only tricked him but also bamboozled Nobby Mekon with his decoding algorithm? This was *appalling*!

What about the lunar buckyball? Had Duane somehow got an advance warning from the Mekon lunar robots and cooked up his buckyball image to match it? The sheer idea was *outrageous*!

Seething with indignation, Jon thrust the paper aside. His whole mission was undermined! What was the point of rushing back to Heidelberg in a desperate attempt to save the Earth when Duane's work was a joke?

He was *furious*! Duane should *burn in hell* for such a jape! This was *absolutely intolerable*! He stomped out onto the streets, muttering dark curses and glaring fiercely at the world around him.

Small change

Jon walked southward a few kilometers to Wimbledon Common. The grass and trees pacified him somewhat. But still he raged. What had Duane been playing at? How could Nobby Mekon be so gullible? How could *he*, Jon, be so gullible?

But what if Duane had been *right*? Could there be a pair of massive bodies orbiting E-Eridani and *also* an intelligent pulsar-like signal? But why would the E-Eridanites code their message to look like a signal from one of their own local massive bodies? Mystery upon mystery!

As Jon walked on, he decided Duane probably hadn't tried to fool anyone. If Duane *had* done something bad it was most likely a bizarre mistake, not a prank. Jon felt slightly calmer.

He decided it would soon be time to call Ruth and started back northward. His mission was still to get back to Heidelberg and see what sort of mess Hal was in. He hoped he could rescue enough of Duane's EERIDANI file to send it to Alvin Hershey in Hawaii. He owed Duane that much, surely.

He returned to the MacBurger bar. He had just enough small change left to phone Ruth. She, not her machine, answered.

“Hallo, Ruth! Jon here, back from Japan.”

“Jon! How are you? Where are you?”

“Very well, thanks. I’m in the MacBurger bar in Putney High Street.”

“You were on the news last night – they said you were at the scene of the assassination.”

“Yup. I saw it all, saved Chairman Mekon’s life, really had fun.”

“I want to hear all about it! You’re in Putney, you say?”

“Yup – I’ve gone to ground, as they say in the spy movies.”

“Are you being chased by Japanese mobsters?”

“I don’t think so. I don’t think they know where I am.”

“Okay, then. Why don’t you just stroll on down here and tell me the whole story, nice and relaxed?”

“That’s an excellent idea – I was just about to suggest that.”

“I’ll expect you in ten minutes.”

Jon kissed the phone and put it down. He strode out onto the street. His traXuit top was torn – he took it off and trashed it. Already he felt better.

Return of the hero

Jon walked up to the front door of Ruth’s smart little terraced house. He checked his appearance quickly – *yuk!* – in the mirror window beside the door and pressed the buzzer. Ruth opened the door.

“Hi, Jon! Come in!” Her blonde hair was tied up loosely in a topknot and she wore a long black teeshirt with the familiar yellow Media **M** logo on the front. Her legs and feet were bare and her toenails were painted green.

He walked in and kissed her cheek. “Hi! It’s great to see you again!”

“You look a mess!” she replied with a sudden smile.

Jon shrugged. Ruth pointed silently at his Powersoles. He kicked them off and followed her into the living room. “Have I just dragged you out of bed?”

“Almost. We’ve been up ten minutes,” she replied, turning to the kitchen area at the back of the house.

“Ann!” Jon blinked with surprise.

“Hi, Jon,” Ann said and came forward to shake his hand. “I was here for a dinner party last night. Good to see you again.”

“Good to see you too.” Jon paused to look at her. Her face was as friendly as ever and her brown eyes caught his with a quick sparkle of amusement. Like Ruth, she had her hair tied back loosely and wore just a long teeshirt.

Hers was dark blue and had *Oxford University* emblazoned in white *Fraktur* letters on the front. He blinked. "You stayed here last night?"

"Yes. We've only just got up, as a matter of fact."

He looked at the neatly folded sofa. "Did you sleep on the sofa?"

"No. We slept together upstairs."

"Ah. I phoned here last night but there was no reply. I slept in Putney jail."

"Putney jail – what happened? When did you call?"

"I dunno exactly – between one and two."

Ann glanced at Ruth. "We were fast asleep by then."

Ruth nodded. "So tell us your adventures, Jon. What happened?"

"Well, it's a rather long story, so I'll start at the beginning."

...

He told the whole saga. They drank coffee and Ann and Ruth plied him with questions. It took him an hour to get to the Saint jet testimony – and the problem of retrieving Duane's file from Hal Senior.

"How do you feel about the file?" asked Ann, who was sitting on the sofa with her feet pulled up beside her. "How do you think it will help?"

"Dunno," he said flatly. "I just copied it into Hal and then Hal caught the moonbug. Now I don't know whether it's worth anything or not. Duane tried to explain it to me and Mekon but I didn't understand it at all. Now I read in *The Sunday Rag* this morning that the guys up at Kitt Peak have detected a fluctuation in the light from Epsilon Eridani that shows it's orbited by two massive companions, one probably a pulsar, which puts the kibosh on the whole thing."

"But *could* he be so radically mistaken?" Ann asked quietly.

"I dunno! Why not? I was only with the guy for a few hours. Sure, he *seemed* reasonable, but that doesn't prove anything."

Ann raised her eyebrows and gazed into space. "It would be far more important than the assassination, if it were true."

"Absolutely. No comparison. It would be just about the biggest news in recorded history."

Ruth stood up with an air of sudden decisiveness. "Ann and I were just about to go and have a bath when you phoned."

Jon remembered his own smelly state. "I haven't washed for a day and a half. Do you mind if I go and take a quick shower?"

"Feel free."

Jon went up to shower.

Pretty decadent

Jon was intrigued by the idea that Ann and Ruth had slept together. He'd never seen Ruth's bedroom and he decided to take a look. It was the front bedroom. It had a lightweight, shuttered double door that left a gap top and bottom and swung both ways, and the floor was covered in white deep-pile carpet. A huge bed, as wide as it was long, dominated it. The duvet was thrown aside and the sheet and pillows were crumpled.

Next, he looked into the back room. Aha – a new bathroom! And what a bath! It was a round tub set in a marbled quadrant in the back corner, and was big enough for two or three people. The wall behind it was paneled with mirrors and the marbled surface around it was cluttered with assorted bottles of soap and shampoo. Ah – a bidet too. The floor was covered with the same carpeting as the bedroom and another lightweight double door linked the rooms. At last ... a hint of Ruth's private life.

The old bathroom was an austere box with tiled floor, loo, basin, shower stall and no bath. Jon showered quickly, put on his pop-art traXuit pants (only slightly street-soiled) and went back downstairs.

"Hey, Ruth, you've got a whirlpool up there! That's pretty decadent!"

Ruth looked around from the kitchen sink. "Yes, absolutely. It looked so good in the ads I couldn't resist it."

"How long has it been like that up there?"

"I had it converted last summer. The tub weighs a ton when it's full. They even had to strengthen the floor. I'm very pleased with it."

"I bet you are."

"Ann, shall we go and bath right away?"

Ann was sitting at the table, slicing an apple. "Yes."

"Ahem ... How about making a threesome?" suggested Jon.

"You've just had a shower." Ruth glanced at him with a smile.

"That's what you're supposed to do before a bath – in Japan, anyway."

Ruth turned to Ann. "What do you think, Ann? We don't want this lecherous beast in our bath, do we?"

Ann looked at Jon appraisingly. "Not really ..."

"Sorry, you're not invited," said Ruth, and went off upstairs.

Jargon

Ann smiled and munched a slice of apple.

Jon cut and buttered a slab of fresh bread and munched it ravenously.

"Tell me what you've been doing for the last two weeks."

"Yah ... lots of lab work and a few summer seminars. Very dull, really. And time in the sun and on the river – and a few garden parties, of course."

"Sounds idyllic. Any progress on the new view of consciousness?"

"Yes. It's generated a lot of excitement. The philosophers have started a seminar series on the new view of the self. The self is a logical construction – or rather in most cases an *illogical* construction. The buzz concept now is the superposition of selves."

"The superposition of selves – you mean selves in different people?"

"Yes. Individual people have a succession of selves, from moment to moment or from day to day, depending on how you define them, but also different people have selves that overlap and interact."

"And they can superpose?"

"Yes. It's the crowd phenomenon. You get a kind of group self."

"Like Japan!"

"Well, maybe," said Ann. "But it has to be a very intense interaction and the effect is only temporary. It explains what happens at football matches or big rock concerts. When personal selves superpose substantially enough they resonate and the boundaries dissolve."

Jon nodded sagely. "Aha ... you could explain love that way too. What makes personal selves fall apart again?"

"Normal life – each person has a different perspective and history. Our brain states drift onto different wavelengths in a matter of seconds."

"Sounds reasonable ..." Jon mused for a moment. "I think once we start making machines with minds it'll be all over for *Homo sapiens*."

"That's a stupid thing to say," declared Ann firmly.

"Hmm ... do you really think humans have a long-term future?"

"Yes," she said without hesitation. "Humans, when they're properly organized, are far and away the best machines I can imagine to look after the biosphere and do all the things that need doing for machines to operate."

"You don't think machines will learn to do those things for themselves?"

"We *are* machines, and we *do* them already. Given the environment we live in, I can't see the point of making new machines to do the same things."

"So you don't think bionic consciousness will make much difference."

"No. At present we have a biosphere that's dotted with centers of consciousness, and the biggest and brightest centers are in human biomachines. When we have bionic minds in other machines, there'll be more centers of consciousness, and some of them may be even bigger and brighter than us. Otherwise, things will look the same."

“Let me try to get this straight,” said Jon. “You think that the terrestrial exosphere – that’s the biosphere and the technosphere together – will change only slightly when minds are embodied not only in human brain tissue but also in photonic chips or whatever.”

“At first, yes. Later, it will probably change beyond recognition, but who can predict that?”

“Right ... so the evolution of the lifenet – that’s the biosphere and the technosphere again – is not going to have a radical discontinuity at the moment when machine get minds.”

“I don’t see why it should be any more radical than when humans first appeared or when computers first appeared. Machine consciousness won’t be that super ... Do you remember Madame Colbert’s idea that the Sun might be superconscious?”

“Ah, yes,” Jon reflected. “There are three levels: consciousness, super-consciousness and hyperconsciousness. Small, low-energy photon fields, like in human brains, are merely conscious. Big, high-energy photon fields, like in stars, are superconscious. And big, ultrahigh-energy *gluon* fields, like in neutron stars, are hyperconscious.”

“She didn’t say that.”

“No. The last step is mine. Remember I told you about quark soup, where quarks and gluons fly about unconfined.”

“I thought neutron stars were solid balls of neutrons.”

“They are. But each neutron is made of three quarks bound together with gluons. If the cores of the neutron stars are dense enough, then the neutrons interact to form superfluid neutronium. And if they’re even denser they melt together and you get a quark–gluon plasma, which is quark soup.”

“Yes, I remember, but what’s it got to do with machine consciousness?”

“Nothing. I can’t see machines being built with quark soup in them.”

“If I understand your three levels rightly, they won’t even be built with superconsciousness.”

“No, maybe not. I didn’t define my terms carefully.”

“But the idea of a unified global machine mind is independent of that.”

“Yeah. Its consciousness will be utterly superhuman.”

“How can you measure that?” asked Ann with a frown.

“Hmm. Good question ... What’s the key property of consciousness?”

“The key property is *holization*. The synthetic unity of apperception is a nonlocal holistic unity that superposes all the different possible data sets. Then the superposition pops and so on.”

“Go on,” said Jon warmly, “I like it!”

“The history of an individual consciousness is a sequence of holizations. Each holization is followed by a localization, a pop, when the superposition collapses and a classical distribution of electric potentials appears over the cerebral neuronet, which fuzzes out into a new superposition and so on. That’s how we see it now.”

Jon nodded. “Okay ... So the holizations in an integrated mechatronic-infotonic-robionic exosphere will be big.”

“In a what?” asked Ann, grimacing.

“Sorry – I’ve been inventing jargon too. Global machine consciousness will be planted in a mechatronic-infotonic-robionic exosphere – a *mire*.”

“A mire? You mean like a quagmire?”

“Yes, exactly! It will have a single soul, like Gaia. So it will be quasi-Gaianized, or quagged!”

“Planted in a quagmire – very witty.” said Ann and finished her apple.

Ruth came downstairs. “Okay, Ann, it’s ready!”

“Okay!” Ann glanced at Jon. “See you later!”

Bath time

The sound of an old Guns N’Roses album turned up loud punched down the stairs from the bedroom stereo. Jon imagined the girls sitting in the tub. How could he let them have such fun and not include him?

He went upstairs to clean his teeth in the tiled bathroom and decided the sound was definitely too loud. He strode to the bedroom. The swing doors were held wide open on rising-cam hinges. He stepped in. The doors to the back room were also wide open to show the bathers up to their shoulders in steaming water.

“Don’t you think the music is too loud for the neighbors?” he shouted.

Ruth looked around. “No! We have an agreement – during daylight hours at weekends it can be as loud as we like!”

Jon raised his hands. “Okay! Just wanted to check!”

Ruth grinned. “Just wanted to check on us, you mean! Come in!”

Jon went in. Bright daylight from the open window lit the scene. “Looks inviting. Are you enjoying yourselves in there?”

“Yes,” said Ann, and raised her arms to the rim to pull herself up slightly. The water was turbulent enough to ripple the outlines of their bods and jiggle Ruth’s boobs around like white balloons.

“You wouldn’t like it,” said Ruth. “Too hot for you.”

“That may be ...” Jon mused. He couldn’t remember when he last had a

hot bath. "Let me test it." He plunged a hand into the water. "*Wow ... hot ... but not too hot.*"

Ann shifted slightly. "Actually, there's room for three in here."

"Of course there is," affirmed Jon as if it were obvious.

"What do you think, Ann?" asked Ruth. "Shall we let him in?"

"Why not? The more the merrier – isn't that what you say?"

"Yes, that's exactly what we say!" said Jon and hitched his thumbs in his pants, waiting for Ruth's okay.

"Well, don't just stand there," she said.

He took them off and stepped into the tub. It was too hot to do more than relax and enjoy. The three sat with their legs tangled together. Being so close to two nude young women was enough to make his dick swell, and he was aware that Ann was aware of it waving like a big pink polyp in the gentle current from the turbulator. He wasn't used to hot baths – he normally made do with cold showers – and this was quite a treat. He lay back and let the heat relax his tense muscles – what bliss!

"Are you growing a beard?" asked Ruth.

"No ... I haven't shaved for five days. I lost my razor in the fire."

"Looks good ..." said Ann.

"Shave it off when I get back," said Jon with a sigh.

"How will you get back?" asked Ruth, always practical.

"I hope to score a hit of cash from a bank in town tomorrow."

"You'll be lucky," Ruth retorted, "The hypernet crisis has closed down all nonlocal transactions, unless they can do them manually."

"Really? Then I could be in trouble."

"I can lend you enough to get back to Heidelberg," she replied in a tone of weary resignation.

"Are you sure? That's very kind."

"No trouble ... What about your Media proposal?"

"Oh, gosh, that ... I let it sink without trace. It was trash."

"It was forty thousand dollars."

"I can't think about that ... I have to retrieve Duane's file."

"That may be trash too – didn't you say the newspaper report put the kibosh on the whole idea?"

"Yeah ... I should check that out ... should be in SCIENET."

Ruth sighed. "You are such a loser."

Ann spoke. "What about the assassination? Do you really think it was a CIA operation?"

"I don't see how else to explain a Saint jet turning up just there and then."

He hadn't told the girls about his exchanges with Bob. "Unfortunately it puts me under suspicion of being the CIA link man."

"In that case you'd better lie low for a while," said Ann.

"Didn't you say Japanese mobsters were after you?" asked Ruth.

"Yes, I did ... but they won't find me in London."

"Maybe," said Ruth thoughtfully. "But they don't need to. They can wait for you in Heidelberg."

"You're right, they could ... that's scary ... I'm boiled. I'm getting out." He climbed out and went off for a quick cold shower. He put on his traXuit pants and went downstairs.

Chaperone

Jon slumped onto the living room couch, turned on the television and found *ANN live from London – James Britt*:

"– admitted by a CIA spokesman. If the allegation that Smith authorized the air strike against Mishima is confirmed, then impeachment proceedings against him could begin as early as next week."

Commercial break. Jon lay back. After the last few days and the hot bath he was feeling rather sleepy ...

Impeachment ... that was good news. At least there were still a few good guys in Washington with the guts to stop Smith getting away with murder. Actually, Jon felt bad about being involved in the hit at all. Now he saw the reaction in Washington he felt *much* better about telling the Japanese police. But it was a fire on the other side of the river, as they used to say in Japan. Unless it crossed the river – were the hit men waiting in Heidelberg?

A shot of panic woke him up. *Think!*

There was no point rushing back to Heidelberg if Hal was *kaputt*. There was no point anyway if Duane's file was a bust. There was even less point if that was the first place the Yakuza would expect to find him.

Where then? London? Here with Ruth was also risky. First he needed cash and cards and so on ... New York ... he could get a passport there and the Media paymasters could lend him some cash ...

Bob ... the CIA ... he'd like to sort them out! What a liberty – using his info to stage a hit and not even warning him first! This was something he was gonna have out with Bob!

Back to ANN:

"– promising developments in the search for a cure for the moonbug. The global community of hackers teleconferencing via Acropolis Mission Control

in Houston have apparently come up with several hints that could lead to a breakthrough in the next few days ...”

...

The girls descended from their aquatic heaven, Ruth in a long white bathrobe and Ann in a thigh-length button-thru plaid shirt. Jon sat up as they moved around in the kitchen.

“Leroy said he’d be here at eleven,” said Ann in a tense voice.

“It’s ten to now,” replied Ruth.

Ann looked nervous. “What do you think he has in mind?”

“After the way you two were going at it last night, I would have thought that was obvious!” said Ruth with a smirk.

Jon shook his head into alertness. Leroy?

Ann looked out the window. “It looks like it’s going to be a lovely day. I feel like going for a walk –”

Ruth interrupted. “Count me out. I’m going to have breakfast in the back yard and then enjoy a lazy day.”

Ann opened the French windows to the back yard and stepped outside.

Jon stood up and walked over to the table. “Who’s Leroy?”

Ruth looked up and smiled. “He’s a handsome hunk we met last night. He called just a minute ago and invited himself over in ten minutes.”

“Last night? Didn’t you go to a dinner party?”

“Yes, but we danced and smooched a bit too. It was a very relaxed do.”

“I see ... and Leroy?”

“Friend of a friend. Nice guy – a computer manager. Not with Media.”

“Aha ... and he’s hot for Ann?”

Ann came back in. “He’s a really nice guy. You should like him.”

“So you’re going for a walk with him, huh?”

“Yes. You can come too, if you like.”

“Wouldn’t you rather be alone with him?”

Ann smiled. “I think not ... I don’t want to be ... hustled.”

“Okay – I’ll be the chaperone!” Jon felt better.

Ruth looked at Jon. “What about getting back to Heidelberg?”

“Right ... I’ve been thinking ... It’s not a very smart move. It may make more sense to go to New York, fix up cards and cash and so on at Media, and generally probe the situation a bit first.”

Ruth nodded slowly. “That makes some sense. I’m off to New York again tomorrow for the science budget meeting. You could come along too and make another grab for that forty grand.”

Jon smiled. “That could be a wise move!”

“Okay ... I’m going to put some clothes on.” She went off upstairs.

Jon put on a shirt and turned back to ANN. Ann looked anxious and fussed with her shirtsleeves.

Ruth reappeared in jeans and sweatshirt. The doorbell buzzed and she answered it. Jon heard a male voice.

Leroy walked in. “Hi, Ann, great to see you again!”

Jon smiled. Leroy was black – well, his skin was light coffee-brown but he looked African. He was about Jon’s height and stocky, with a muscular build. His hair was short, his countenance fresh and his outfit smartly casual.

“Hallo, Leroy,” said Ann, stepping forward and extending a hand. “This is my friend Jon. He’s just flown back from Japan.”

Leroy smiled and shook Ann’s hand, then turned to Jon. “Hi, Jon, great to meet you!” He shook hands with Jon – firm grip! – and smiled again to show off his dazzling white teeth. “It’s a great day today!”

“Yes, I thought so too,” said Ann. “I thought we might go out for a walk. Ruth wants to get on with some work.”

“Sure, fine by me!” said Leroy. He had a strong, deep voice and a direct style. His yellow shirt and tan slacks were smartly pressed and he wore a big gold wristwatch. He looked like a manager or a salesman.

“Jon would like to come too, if that’s alright,” added Ann.

“Sure – let’s go!” Leroy took a step back toward the hallway.

Ann looked at Ruth. “Are you sure you don’t want to come too, Ruth?”

Ruth shook her head. “Quite sure, thank you.”

Jon caught Ruth’s eye. “Ah, New York ... how do we do it?”

Ruth sighed. “I’ll call British Airways and see if they have a seat for you. You just piss off and have fun in the sun.”

“Oh, gosh, I’m sorry, really,” said Jon with a weak grin.

“Get outa here!” Ruth made a shooing motion with her hands.

To the park

It was warm outside and the sky was unbroken blue.

Leroy spread his arms. “Where shall we go?”

Ann shook her head. “I don’t know the area.”

“I do,” said Jon. “Richmond Park. That’s beautiful on a day like today.”

“How far is it?” asked Leroy.

“Half an hour. It’s a big park – we can spend hours walking around it.”

“Shall we go by car?” suggested Leroy, waving at the big golden Honda parked beside them.

Ann considered, and glanced at Jon for his reaction.

“Yeah, why not?” said Jon with a shrug.

They all piled into the car, Leroy and Ann in front and Jon in back, and drove off. Jon navigated.

...

Ten minutes later they drove into Richmond Park, a roundish patch of nature some four kilometers in diameter. The view opened out into gently rolling grassland with stands of trees dotted over the landscape and an old hunting lodge visible in the distance. Away to one side a herd of deer grazed peacefully. They parked and climbed out of the car. A lake in the middle of the park shimmered invitingly a short walk away. Leroy took a rug from the back seat and they set off for the lake.

“So, Leroy,” said Jon, “I hear you’re a computer manager.”

“That’s right. I run a design office in Muswell Hill.”

“What do you design there?”

“Mechanical parts for Honda assembly robots.”

“Aha – the robots are a Mekon design, right?” Jon recalled seeing the Honda robots in the Mekon museum.

“Yeah. We have a datalink to Mekon in Japan.”

Jon smiled. “Where are the parts made?”

“Thailand. Or at least they were, until Friday.”

“The hypernet crisis – has it messed you up?”

“You bet it has! We trade data every day with Thailand and Japan. So we’re out of action until this moonbug gets fixed.”

Jon smiled again. “Well, as it happens, I was at the Mekon headquarters last week. And now I have what may be a hot lead for fixing the bug ...”

...

The lake was flanked on the northwest side by a gentle hillside that led up to some trees. The grass around the lake gave way to banks of ferns halfway up the hill. There were surprisingly few people around.

“Not bad, huh?” said Jon.

“Beautiful,” affirmed Ann. “Let’s find a sunny place to settle down.”

“Right – how about up on the hillside just below the fern line. Then we have a good view of the lake and we’re screened behind.”

“Yes – about there, maybe.” Ann pointed to a small clearing with no-one else near it and only a narrow path beside the ferns approaching it.

Leroy nodded. “Perfect! Let’s go!”

Neutron stars

They reached the clearing and spread out the rug. It was as big as Ruth's double bed and filled the space. When they all sat down the view was almost cut off by the shrubbery.

"It's quite hot out of the wind," said Ann as she took off her sandals.

"Pleasantly warm!" agreed Leroy as he kicked off his loafers and took off his shirt. His torso was magnificently sculpted, with rippling muscles under the glossy skin, and Jon paused to admire it. He saw Ann ogling it hungrily. Leroy affected not to notice.

"Right – we can get some sun." Jon took off his Powersoles and his shirt. His torso was lean, hard and tanned, but it was unimpressive compared with Leroy's and Ann didn't ogle it.

Ann and Leroy talked quietly together. Jon sat back and closed his eyes. The sunlight shone red through his eyelids. He let his thoughts drift. He was getting his daily fix of solar photons and feeling good. Humans were solar-powered machines ... he needed photons as much as he needed food and drink. He was a sundancer, a sun dog ...

He opened his eyes again and surveyed the treeline. The hard clarity of the scenery under bright sunlight was what made the intensity so addictive. Somehow he needed that hard clarity to bring his own thoughts into focus. He recalled that Isaac Newton once stared directly at the Sun so hard and so long that he had to rest in a darkened room for days afterwards ... touched by the Sun and blessed with genius!

Jon glanced at Ann. She'd unbuttoned her shirt. Under it she wore nothing but a length of thin black string around her hips holding a black satin ribbon between her legs – like her jogging kit in Oxford.

Ann glanced at them both. "Do you mind if I take my shirt off?"

"Nope," said Leroy, shaking his head innocently.

"Not at all," agreed Jon.

She took it off. As she kneeled to bundle it into a pillow Leroy admired her bare flanks with undisguised fascination.

Leroy stood up. "Mind if I take my trousers off?"

"Depends on what's under them," said Ann.

Leroy unzipped them and opened the front. "Okay?"

"Looks good!" said Ann warmly.

He took them off. Under them he wore a small black jock. Ann glanced with animated eyes at the bulging profile.

She turned to Jon. "You could take your trousers off too."

Jon shrugged. "Nothing underneath."

"Pity!" said Ann with a smirk. She lay silent for a while, admiring Leroy, then turned to Jon again. "Jon, I wanted to ask you earlier – why does the news article you read this morning about the Epsilon Eridani signal mean Duane Young's results might be worthless? I wasn't quite convinced by what you said, but I can't remember why."

"Ah, yes, that," Jon frowned. "The article said astronomers at Kitt Peak have measured a fluctuation in the light from Epsilon Eridani that shows a pair of massive bodies are orbiting it. There's a matching shift in the microwave signal, which strongly suggests it's being beamed out from one of the bodies. The natural conclusion is that it's coming from a neutron star."

"What's a neutron star?" asked Leroy. "I never had the time to learn much about astronomy."

"A neutron star is the collapsed remnant of a supernova. It has the mass of an average star, like the Sun for example, but squeezed into a ball just a few kilometers in diameter. Its gravity field is so intense that protons and electrons are squeezed together into neutrons, so it's a solid ball of neutrons."

"Like a giant atomic nucleus," added Ann.

"Right – like a single nucleus as massive as the Sun."

"How massive is the Sun?" asked Leroy with a smile. "I don't want to seem dumb – it's just that I want to be sure I understand."

"Two million billion trillion tons. About a third of a million times the mass of the Earth – a bit more than a hundred times the diameter."

Leroy smiled again. "A hundred times the diameter means a million times the mass, for the same density. So the Sun's less dense, right?"

"Exactly," said Jon.

"But if it's so massive, why doesn't its gravity make it dense?"

"The core is dense. That's where the thermonuclear burning occurs. It's only the radiation pressure that stops the rest collapsing."

"In a neutron star there's no more radiation pressure," added Ann.

"Well, no more burning, anyway. A neutron star is basically a ball of ash left over from an old star that's burned up its fuel and then exploded most of its mass out into space."

Ann nodded impatiently. "But a neutron star doesn't sound a bit like an Earthlike planet. How could your friend have confused the two?"

"He didn't. He analyzed the signal and found a video image, then deduced it must have come from a planet, whatever the signal looked like."

"How did he deduce that?" asked Leroy.

"The astronomers who detected a pulsar-like signal coming from Epsilon

Eridani were puzzled because they didn't expect a pulsar so close to us. They decided it might be an intelligent signal from an extraterrestrial civilization. Duane just confirmed that by proving it was an intelligent signal."

Leroy raised an eyebrow. "A pulsar's a neutron star, right?"

"Right. A pulsar's a neutron star with a strong magnetic field that beams a microwave signal as it spins. We see it as a pulsating signal, hence the name. The Epsilon Eridani signal seems to be from a pulsar."

Ann frowned. "A pulsar wouldn't radiate a video image."

"Absolutely. If Duane's right, then it's a planet, no doubt about it."

"Tell me more about neutron stars," said Ann. She took a tube of sun cream from her bag and started to cream her arms.

"Okay, I'll try ... Neutron stars are made by supernovas. There are two kinds of supernova, white dwarfs in binary systems and big stars. Big stars go supernova when their iron cores collapse. The iron is cooked up from hydrogen by nuclear burning. First, hydrogen burns to make helium –"

"Wait – tell me more about that." She started creaming her thighs.

"Okay. The basic burning process in all stars, the Sun included, is called the proton-proton chain. At high temperatures the hydrogen is ionized into protons, which zip around at high speed and hit each other."

Ann frowned. "Why doesn't the Sun explode?"

"The protons repel each other electrostatically. So the collision rate is low and that means the fusion occurs at a slow, steady rate."

"What happens when the protons collide?"

"They fuse to form a deuterium nucleus. Then when another proton hits them they form a helium-3 nucleus and release a gamma-ray photon. When two helium-3 nuclei collide they form a helium-4 nucleus and release two protons. So the result is that four protons have been converted to a helium-4 nucleus and a gamma-ray photon."

"Aren't gamma rays very energetic?"

"Yeah, but they take ages to escape from the core of the star. They bounce around like in a pinball machine and break up. So what started out as one big photon ends up as a lot of small photons – which is lucky for us or we'd all be killed by sunburn."

"That's interesting ..." Ann had finished creaming her legs.

"Can I cream your back?" said Leroy.

"Sure," said Ann, and handed him the tube. She turned and lay face down. "Go on, Jon – you were explaining nuclear burning."

"Right ... At higher temperatures, at the cores of bigger stars, the nuclear burning goes further. Two helium nuclei can fuse to form beryllium, which

can then fuse with another helium nucleus to form carbon, which can then fuse with another one to form oxygen. Oxygen nuclei can form silicon, and so on up to iron. All this releases energy.”

Ann was still listening as Leroy gently massaged her back. “Why does it release energy?”

“Nucleons – that’s protons and neutrons – are sticky. The bigger nuclei are glued together more tightly, so you need more energy to pull them apart, which means you get more energy when you put them together. But that only works up to iron. Nuclei that are bigger than iron are less stable and they tend to decay down to iron.”

Leroy moved down to Ann’s buns and massaged them with firm, smooth strokes. Ann arched her back with pleasure, catlike, and asked: “So does nuclear burning go on until the core fills up with iron?”

“Yeah, but only in big stars. Then the core looks like an onion – you get these layers of bigger and bigger nuclei, with iron in the middle.”

Ann rolled over onto her back. “Thanks, Leroy, that was good. You can do the front too if you like.” She turned her head to face Jon again. “So the star’s core fills up with iron. Then what happens?”

“The iron core may be about as massive as the Sun but compressed to a ball about the size of the Moon with a temperature of about a billion kelvins. It grows steadily and then suddenly collapses in a fraction of a second. The iron nuclei disintegrate and the whole lot turns into a sea of neutrons. The neutrons make a tiny little ball, so suddenly there’s a big hole in the middle of the star, and all the mass on top falls into it.”

“This is all theory, right?” asked Leroy. “No-one has ever actually seen a star core collapse.”

Jon smiled. “Sure, it’s a mathematical model. But it fits the facts exactly. We’ve seen a few supernovas, so we have plenty of facts to go on.”

“Okay.” Leroy returned to his gentle massage of Ann’s small, pale breasts. She almost purred with sensual pleasure.

“The collapsing matter hits the tiny core and rebounds. A shock wave moves out and triggers flash burning among the infalling mass, which blows away the outer layers of the star completely in a titanic explosion with the power of a 10^{28} -megaton bomb, that for a few days can outshine a galaxy. That’s a supernova.”

Ann was showing clear signs of sexual arousal as Leroy’s hands ran down over her belly and her token ribbon, which shifted freely under his fingertips. She took a long, deep breath and pushed his hands away. “Mmm, thanks, Leroy. That was really great ... Where were we? ... So the supernova

scatters its heavy elements into space in a titanic explosion, and that's where all the heavy elements up to iron come from, is that right?"

"Yeah. And the elements above iron are cooked up during the explosion. What's left behind is a neutron star."

Ann sat up and hugged her knees. "So neutron stars are left over from the supernova. If there's no more burning, don't they cool down quickly?"

"Yeah, but they start out very hot, like a million kelvins, so they take millions of years to fade away."

"What do they look like?" Ann was gazing out over the lake.

"Like any other star – just a point of bright light. Their surface is a mirror-smooth layer of iron just a couple of meters thick."

"Really? How do we know the surface is mirror-smooth?"

"Because of the gravity. Any bumps would be flattened out instantly."

Ann moved onto her knees. "You don't need sun cream, Leroy. But you do, Jon. Let me cream your back."

"Oh, thanks." He sat with his back to her and waited for the contact of her cool, creamy hands. She kept on talking.

"So a neutron star looks like a mirrored ball – do you remember Sol Kaplan's image in his lecture – the mirrored ball model of consciousness?"

Jon smiled. "Oh, right, nice one!"

"But aren't neutron stars very similar to black holes?"

"Well, yes, in a way. If they were just a bit more massive they'd become black holes."

"Then we couldn't see them at all."

"Right. Even small neutron stars red-shift light quite strongly."

"And neutron stars with magnetic fields send out narrowly beamed radio signals that look like the signal Duane Young saw coming from the direction of Epsilon Eridani."

"Yeah. The signal Duane saw had a pulse every 90 milliseconds – that would correspond to a pulsar spinning about eleven times a second."

"That's fast!"

"By pulsar standards it's nothing special. Pulsars are the best clocks in the known universe. They keep practically perfect time, except that they slow down very, very slowly – like a millisecond per century."

"Wow! How many are there?"

"Oh, thousands in our galaxy alone. We discover new ones all the time."

Ann handed Jon the cream tube and he did his own chest and arms.

He kept talking. "Why are you so interested in neutron stars?"

"I'm interested because of what you said about Duane Young's signal. I

know it seems crazy, but you said neutron stars might be hyperconscious, and I thought – what if a hyperconscious neutron star is sending us some sort of message with this signal?”

“A picture of a buckyball planet?”

“That might just be a sort of cover picture to get us interested. If a hyperconscious entity wanted to talk to us that might be how it would start.”

Jon frowned. “That’s a wild idea. How do we evaluate that?”

“I don’t know.”

“Well, I can’t really see how a ball of ash from a supernova could be home for an intelligent organism, whatever the physics of quark soup might be. My idea is just that hyperconsciousness is some kind of physical state like laser action or superconductivity.”

Ann rolled onto her stomach and elbows and propped her chin in her palms. “Why see a neutron star as a ball of ash? Why not see it as a pearl, and the star that gave birth to it as like an oyster?”

“Okay, that’s all very well, but pulsars don’t emit signals for very long before they fade out, so how could a lifeform evolve?”

“How long?”

“I dunno – a few million years – it’s gradual.”

“A hyperconscious lifeform might evolve very quickly in a star. Don’t physical processes go faster at high pressures and temperatures?”

“That’s right, but all this is completely outside our current physics.”

“All the better!” Ann rolled onto her back, less than a hand’s width from the reclining Leroy, and closed her eyes.

Jon turned to him. “Leroy, tell me more about your work with Mekon.”

Leroy, who had been quietly admiring the view, told him.

...

Time passed pleasantly as they relaxed in the intense flux of solar radiation. Then Ann saw how late it was and they packed up and hiked back to the car.

Serious decisions

As Leroy drove them back to Ruth’s, Jon mused.

The probability that Duane’s decoding algorithm was what it seemed was very small. It made no sense to risk his life rushing back to Hal to try and retrieve it. Going to New York for a while made sense ... but for how long? As soon as he applied for a new passport his presence in New York would be electronically registered, and anyone as smart as Nobby Mekon could track him down. The thugs who tailed him and Bee on the train were certainly not

managed by someone that smart, but there may be smarter heads backstage somewhere who cared enough to finish the job ...

Ruth's idea that he should have another go at selling his consciousness proposal was a nonstarter. He couldn't get his mind back to that now if he wanted. But if he could persuade his Media bosses to give – or lend – him a few thousand bucks he could at least hold out for long enough to get his German bank managers to unfreeze his assets.

He should really blow a fuse with Bob. What an *asshole* – not a word of warning from him as he lets Jon stand in all innocence at the sharp end of an attacking F-22 Raptor – that betrayal alone was worth betraying the CIA for! Fuck 'em!

Marvin. He could visit him again. Maybe stay there again. Better than a hotel, even if Media did pick up the tab ... He needed serious brain-to-brain intercourse, and Marvin had the head for that ...

Ann seemed to be getting on rather well with Leroy. Too well!

...

Ruth greeted them at the door. "Hi! Had a good time?"

"Yes, thanks," said Ann, glowing with happiness as she ushered Leroy in. "I should be getting back to Oxford soon. There's a train in an hour."

"Okay," said Ruth. "How about some refreshments first?"

"Mmm, thanks ... Leroy's driving me to the station, so we have time ... Ruth, do you mind if I take a quick shower? We've been sunbathing and now I'm all sweaty and greasy."

"Of course – go ahead. How about you, Jon? What are your plans?"

"Keep you company, I guess. Did you call British Airways?"

"Yes, you're in luck again. They had free seats."

"Excellent." Jon kicked off his Powersoles and followed Leroy into the lounge. "Mind if I keep an eye on ANN?"

Ruth went into the kitchen. "Not at all. I'm making refreshments."

Jon turned on the box:

"– announced that a major part of the virus has been cracked. They say it may soon be possible to prevent the spread of the moonbug using a simple software bugscreen without closing broadband datalinks. But for now most company firewalls are staying firmly sealed. Internet traffic is at an all-time low and users are still being advised to use the remaining net services with the utmost caution. And there's still no cure for infected machines like the Global Nuclear Force Matilda system that can't be turned off and dismantled ..."

The Moonraker Scenario

Ann reappeared in jeans and sweatshirt, weekend bag in hand, and they all sat down to a hurried snack.

As she left, Ann kissed both Jon and Ruth, but she gave Ruth the more passionate lip-job. Jon bore it bravely as she drove off with Leroy.

“So much for that,” said Jon as Ruth closed the door.

“Can’t win ’em all,” she said with a smile.

“Too bad,” he said with a sigh. “Hey, mind if I call Marvin Klotzberger? I feel like visiting him again.”

“Go ahead. I’ll wash up.”

Jon called Marvin on the videophone. A screen mask informed him that video was cancelled until further notice – audio only.

“Marvin Klotzberger,” came the gravelly voice.

“Hi, Marvin, Jon Christie here, in London.”

“London now, huh? You’re hopping around like a flea. What now?”

“I’ll be in New York tomorrow. How do you feel about another session of philosophical bullshit tomorrow night?”

“Hey, good idea. You kinda got my curiosity going with your call from Tokyo. Wanna stay the night again?”

“If I may, yeah, thanks!”

“Okay, see you at six tomorrow evening.”

“Copy – over and out.”

Wreathed in smiles, Jon joined Ruth in the kitchen.

“Smiling again, I see. Forgiven Ann already?”

“Yeah – I can stay with Marvin tomorrow night.”

“Must be your lucky day ... There’s a cable movie I want to see tonight – *The Moonraker Scenario* – do you know it?”

Jon clapped his hands with glee. “Yes! Perfect!”

...

The Moonraker Scenario was about a bunch of ex-terrestrial lunar colonists living on the far side of the Moon who sent a nasty virus down to Earth that killed everyone. When it had done its evil work they returned to their former homes and inherited the Earth. No-one stopped them, and that taught them almost unbearably great wisdom.

Cosmology

What are lifeballs?

Starting small

Quite a day coming up! Jon gets the surprise of his life.

•

Monday, August 12, before 6:00 AM: Ruth drove her compact green BMW coupé fast along the M4 to Heathrow Airport.

Jon sat beside her. He wore a black leather jacket, borrowed from Ruth, loose on her but okay for him, over a freshly laundered outfit: pressed white shirt, patched black baggies, silky crazysexycools, dazzly sox and descuffed Powersoles. By his feet was a plastic bag containing pop-art traXuit pants, a spare pair each of boxers and sox, and a towel and a toothbrush from Ruth. In a jacket pocket was a temporary visa, Ryuichi's card and Bee's note. He'd even shaved.

Ruth was in bizz gray over a white blouse, her hair tied back in a ponytail. Her laptop and her sleek suitcase were in back. She was in control.

...

They flew to New York in a Boeing Double Whopper. Again Jon swapped seats to be next to Ruth, but she was busy with her laptop and he whiled away the time reading the Monday newspapers. Newsprint – what a wasteful, dirty technology! He mused for hours – but let's skip it.

...

At JFK Airport Jon endured a lengthy interrogation to establish the facts behind his temporary visa. With a datalink to his personal file in Sacramento it would have taken seconds, but by more manual methods it was a nightmare. Ruth was in a hurry and went on without him, leaving him with a fistful of dollars to follow on behind.

He took the bus into Manhattan, then a cab to the Media building. The street-level security guards forced another delay as they phoned reception to verify his status. Verified – not a bum – elevator – going up!

Big bang – thud!

Jon said hi to Lisa at reception. Today she wore a bikini top and hipster jeans to show off even more ebony skin. The science editorial meeting chaired by Dan Power had started already but she waved him in.

It was crock-o-crap time for Jon. The SCIENET server was infected by the moonbug and the whole meeting was taken up with fevered plans to cover the evolving crisis. Jon butted in with an offer to cover it via Steve Simpson and Nobby Mekon but they reacted like he'd barfed into the swimming pool. He shut up for the rest of the crapshoot. He didn't dare mention the story of Duane's EERIDANI file.

Deflation

After the meeting Jon followed Ruth and Dan to the canteen, where they talked turkey over colas. He explained that he was temporarily out of funds and proposals but had a headful of lateral thoughts for covering the moonbug crisis in ways that would make Media history in the fullness of time. Dan felt his pain (to be accurate, he said, "I feel your pain") enough to authorize an interest-free loan of ten kilobux until the end of September. Jon accepted this gracious offer with a humble grovel.

Back on his feet

Ruth's friend Debbie, who turned out to be a vivacious redhead assisted by a bevy of Media beauties, performed a miracle to get Jon a new passport fast. He should come and fetch it from her Tuesday morning. She also did the neat trick of getting him a Media identity card and a Media credit card good for \$10 000 in ten minutes flat.

Ruth watched Jon break into a smile as Debbie handed over the cards.

"Well, how does it feel to be back in business?" she asked with a smile, pleased at her managerial magic.

"Much better. Now I can take on the Yakuza, the CIA, the moonbug, and New York all at once."

"Can you take them on alone? I have to go now."

"Wait, there's one more thing. I could use a pocket phone."

Ruth glanced inquisitorially at Debbie.

"No problem," replied Debbie. "They're frequency-hoppers that work via the Media phone server here. It makes encrypted file copies of all your calls

– you have to sign an access and billing agreement.”

“That’s fine, thanks.”

Debbie went off to fetch one.

Ruth: “You’re getting star treatment here, you know.”

“I appreciate it. With my problems I need all the help I can get. You’ve come through like a true friend.”

Debbie returned with the phone: “Here – just sign for it.”

Jon signed. It was a handy little unit, made in Finland.

Ruth was about to go. “Okay, good luck with your problems.”

“Yeah, er, thanks for everything. Hey, do you want this jacket back?”

“Not now. Keep it until we meet again.”

“Okay, bye.” They kissed cheeks and parted.

Jon left the building with raised spirits – back on his feet again!

The Vatican of Megablob

Jon had four hours to spare before meeting Marvin. Out on Fifth Avenue, his plastic bag under his arm, he looked up at the blue sky and decided to forget about his troubles for a while and go walkabout.

He whistled as he walked to the World Trade Center. He elevated to the top of the 107-floor south tower. The queue for the view was mercifully short due to a few recent bomb attacks. The view from The Deck was great. The sky was a bright shade of ultramarine and the wind sent scattered clumps of fluffy white clouds scudding over at a visible clip.

A squadron of choppers flew by in an easterly direction toward Queens. They were old National Guard Black Hawks, presumably flying to the scene of yet another slum riot. A couple of plumes of thick black smoke rose from somewhere in Queens. Closer in, he looked down on an empty lot in SoHo and saw a row of National Guard armored cars parked on the rubble of what had been a block of slums. The armored cars looked like the plastic scale models he used to make as a kid.

Jon was impressed by the concentration of power the island supported. Even now, well into the Pacific century, Manhattan dominated the political life of the planet. He could see the United Nations building up on the middle east side – the church of the holy order of political appointees. Forget the other boroughs – this island was the Vatican of Megablob!

Calling Bob

Jon paused for tea in a café and read the latest *Newsweek*. The impeachment saga was big – he should call Bob.

Out with the phone, key Langley number from memory, get operator, ask for Bob ... wait ...

“Bob Yardley.” The voice was gruff but lively.

“Hi, Bob, just thought I’d prove you didn’t kill me last week.”

“Jon! Hi there! We were worried about you! Your workstation wasn’t responding and we thought the Japs might have croaked you!”

“I’m sure. They nearly did. You guys killed fourteen people last week –”

“Wait – is this a secure line?”

“It’s a cellular frequency-hopper with encryption routed via the Media server in Manhattan. Just trust me, Bob. As I was saying, fourteen corpses is thirteen too many as far as I’m concerned. I’m embarrassed to be associated with it all.”

“Okay, maybe wasn’t squeaky clean. But you didn’t have to go telling the whole world it was an American job!” His voice had an edge of anger. “You *betrayed* us, Jon!”

“I was concerned about my immortal soul. Anyway, what about Executive Order 11905 prohibiting assassinations?”

“What – wait, wait a minute. Don’t go jumping to conclusions. I didn’t authorize it. Rod Cargill’s team took over the operation. I showed him your mail and he took it from there. I would have warned you, you know that.”

“You let Rod take over the operation without bothering to find out what he was gonna do – that sounds pretty slack to me!”

“I got my limits too, you know. It’s need to know around here, Jon, and Rod does things the way he sees fit.”

“Including breaking Executive Orders – if he didn’t get authorization from Tom Smith personally he should crucified for that!”

“Sorry, not my bag.”

“I hope for your sake that Tom Smith carries the can for this.”

“Sorry, I gotta go.”

Cut off. Jon was angry.

He paid for the tea and hit the street. It took him two hours of strolling and window-shopping to cool down again.

Nearly six – time to see Marvin. He called to say he was on his way and hiked to Turtle Tower.

Marvin tests Jon's brain

Marvin ushered Jon into the living room. The drapes were closed and the room was in darkness except for the glow of the Globall parked in the middle of the room. It was showing its basic image, without clouds or a night side. Marvin rolled the trackball on his remote control to roll the view.

"Wanna know what I'm up to here?"

"Of course."

"Okay. Watch the clouds." Marvin pressed a couple of keys and the image changed to a view of the Earth with clouds and a night side. He turned up the SPIN control and the land surfaces spun around the Earth's polar axis. He pressed another key and they stopped, but now the dark half spun instead. As he turned up SPIN, the dark half spun faster, and the cloud formations swirled over the continents in a furiously high-speed jig.

"This is very pretty, but I've done it all in Heidelberg," said Jon.

"I know, I know ... just try to enjoy it for a minute."

As the night side continued to spin, the passage of the seasons became evident. The spin axis of the day/night terminator precessed around the polar axis and America slipped into winter. Jon admired the buildup of snow cover on the Rockies. Then spring came and the snow retreated. The coastal regions and the great river valleys bloomed greener. All the time the cloud formations were billowing around merrily.

"Alright," said Marvin at last. "You've just seen the clouds doing their thing for about a year. Everything you saw happened in the biosphere, which is less than a millimeter thick on this globe."

"Really." The scale was 1 : 20 000 000 and the biosphere was less than twenty kilometers thick – correct. "So what?"

"When you look at the Earth in space from a great distance in the visible spectrum that's all you can see."

"Right – white clouds swirling around over a lot of blue. If you look closer you see lumps of brown crust with some kind of green mold on them. All that's the biosphere ... So what?"

"Let's see what your *Gedankenexperiment* faculty can handle. Imagine you're the commander of an alien spaceship flying by here, and you look down and see – *that*." Marvin waved his hand at the Globall.

"Okay." Jon tried to play along. "I, Commander Gedanken of the Starship Andromeda, spy with my photonic eye a blue planet swathed in white clouds. My supersmart wideband spectrometer tells me the clouds are water vapor, the oceans are water, the land masses are mostly silicates, the green

patches are probably carbon-based solar-powered oxygen pumps, and the peculiar localized emissions in the megahertz spectrum could be primitive information broadcasts. I conclude ... *life*."

"Very good," Marvin chuckled. "But what about the fluid dynamics?"

"Turbulent and chaotic – just what you'd expect from a water cycle in a spinning spherical layer."

Marvin shook his head and smiled. "You've fallen for it. The water cycle is just a big washout so far as you technofreaks are concerned."

"Tell me why I should be impressed by the water cycle."

"Because we don't fully understand it. You just said the dynamics are chaotic. What does that tell you?"

"The cycle is unpredictable. Little events can trigger big changes. Tiny thermal fluctuations, perhaps even the quantum events that start the thermal fluctuations, can end up triggering hurricanes and suchlike. There's a nice image for that. Imagine two planets that are identical down to the last atom. On one planet a guy waves his handkerchief on his front porch. Within a few days the weather on the two planets is totally different."

Marvin nodded slowly. "Yeah ... What we have here is an amazing set of phenomena that we haven't really begun to understand. When we do begin to understand it, I believe we'll see the weather on this planet as a living system in its own right."

Jon frowned. "Right. Sorry, but is there any news on the moonbug?"

Marvin pulled down the corners of his mouth in an anti-grin. "Not really. Maybe they'll stop it spreading, maybe Matilda will throw a fit ..."

...

Jon returned from a loo visit to find Marvin gazing intently at the Globall. "It's the green. Pull over the television and we'll do a zoom."

Jon pulled over the telly trolley and parked it next to the Globall.

Marvin picked up a keyboard from the trolley. He rolled its trackball to center North America in his field of view and pressed the SPOT key. A bright flashpoint appeared on the Globall. He rolled the trackball to put the flashpoint on New York. He switched on the television and turned the keyboard ZOOM knob. A white rectangular frame expanded from the flashpoint and the image inside it reappeared on the TV screen. He zoomed until Boston and Washington were in the corners. Then he turned up SPIN until the years were passing in seconds.

"There. Even the Boswash area shows up greener in summer."

Jon clapped. "Well done! If you'd told me I'd have believed you."

"No need to get cocky. I happen to be a novice with this toy and still get a

kick outa showing it off. If you have any manners at all, you'll indulge an old man's childish pleasures."

"I'm sorry. I was making fun of the system, not you."

Marvin looked back at the pulsating Boswash greenery. "The point, young man, is that Commander Gedanken of the Starship Andromeda would see all this pulsating green and conclude – ecocycles."

"Like I said – life."

Marvin shook his head. "What the green means to Commander Gedanken is carbon chemistry cycling on the water cycle."

"Commander Gedanken would have seen the oxygen already. He would already have deduced photosynthesis on Planet Three."

"No, he'd go beyond all that. He'd say that what he was looking at was a complex self-organizing system bordering on chaos."

Jon frowned. "Is that all?"

"Whaddya mean, is that all? That's a lot more than all this confusing heuristic stuff about carbon life, oxygen and television signals, which doesn't tell him a damn thing about how the system behaves."

"Behaves – you mean when he lands or something."

"Sure. I take it he ain't gonna just orbit forever admiring the view."

"Okay. I think I've got it. He has to know the dynamics to predict that he won't get eaten alive by some freaky phenomenon, and when he sees it's a self-organizing system bordering on chaos he'll realize it's gonna be a long haul getting the dynamics off pat."

Marvin nodded warmly. "Right. Now you understand. You have to step right back. Imagine going back in a time machine to ancient Greece. Imagine how Plato might try and understand your concepts."

Jon thought for a moment, then nodded. "I see ... Commander Gedanken might see our television signals as like birdsongs or something. We can't expect him to be using primitive concepts like ours."

"Right. He might be so remote from us that he finds television signals no more interesting than natural radioactivity. A being commanding a starship from the Andromeda Galaxy – or Epsilon Eridani, for that matter – most probably wouldn't be an aboriginal carbon-based lifeform."

Jon raised a finger. "Right, talking about Epsilon Eridani, I told you –"

"Hold it. No hurry. Let's wait till you've unwound a bit."

Jon sighed. "I guess it could have been a spoof ..."

Marvin smiled. "How about a beer? Now I know your brain still works you can tell me all about your adventures in Japan."

Seconds before syzygy

Marvin heard Jon out and asked a few pointed questions. Then he insisted on treating Jon to another show on the Global. This one was a visual history of the Earth from its birth four and a half billion years ago. The age of meteoric bombardment and vulcanism, the formation of the oceans and the migrations and transformations of the continents all featured.

“What you call life was around for most of that little story,” said Marvin. “For about three and a half billennia, to be more exact.”

“Life appeared approximately 3.6 gigayears BP, to be yet more exact.”

“No, just more pedantic. Or, ah ... about 110 petaseconds ago.”

“Peta – that’s ten to the power 15, right?”

“Right, 110 million billion seconds before the present. When we move on to the awakening of Megablob I guess we oughta go over to seconds BS.”

“Seconds BS?”

“Seconds before syzygy. Syzygy’s the moment when a bunch of micro-organisms get together into a big blob to reproduce sexually. So I say it’s the moment when Megablob gets its act together and wakes up.”

“Okay,” said Jon. “The emerging global hyperbrain – that’s in your book. Humans are like neurons in the global brain, where the axons and dendrites are formed by photonic datalinks and the global telecom infrastructure.”

“Good – you remember. The only question is when syzygy will happen and how it’ll affect us.”

“Do you think it’ll be a sudden event?”

“The evolution of life on Earth is accelerating, and I think a timescale of seconds will make a lotta sense when things begin to hot up. We’re living in prehistory so far as the global brain’s concerned. For us, a historical timescale measured in years makes sense, just as a prehistoric timescale of megayears made sense for the trilobites and the dinosaurs. If you go down another megafactor you’re into seconds. So far as dozy old slowcoach humans are concerned, the awakening of Megablob will be too fast to follow. For us it’ll just happen – *pop* – right now.”

“*Pop* – right now?”

“We won’t have any look-ahead. What Megablob does to us, it does, and we’ll know it when we see it.”

“Wow ... do you think this syzygy will happen soon?”

“The awakening of Megablob? A lot of the infrastructure’s in place already. Once the rest is in place, it could happen in seconds. Well, at least it could do, if Kaplan’s right.”

Jon gazed at Marvin with new interest. “Do you really think evolution’s accelerating?”

“It certainly seems plausible. Put some key events on a log scale and it sure looks like it. Here, let’s get a scrap of paper and see how it looks.” Marvin put down his beer and reached under the table for a notepad and pen. He drew a box with two columns.

“In the left column is the number of years before the present, with the numerical values in base-ten logarithms – the powers of ten – to show the pattern. In the right column are the big events that happened on Earth at around those times. I’m being a bit vague here because the exact dates don’t matter. Conscious machines aren’t here yet, of course, but wait a year or two and they probably will be.”

<i>N / years BP</i>	$\text{Log}_{10}N$	<i>Big events</i>
<i>about one</i>	0	<i>Conscious machines</i>
<i>tens</i>	1	<i>Intelligent machines</i>
<i>hundreds</i>	2	<i>Powered machines</i>
<i>thousands</i>	3	<i>Machines</i>
	4	<i>Conscious humans</i>
	5	<i>Humans</i>
<i>millions</i>	6	<i>Apes</i>
	7	<i>Mammals</i>
	8	<i>Multicellular animals</i>
<i>billions</i>	9	<i>Carbon-based life</i>
	10	<i>Big bang</i>

Jon read the table upside down, fascinated. “That’s very neat, but do you really think all these stages in the development of machines deserve so much prominence? They look important to us, but I don’t see why they should look so big from the long-term perspective of history.”

Marvin frowned. “What long-term perspective? Whose history? You seem to have forgotten something.”

“Ah, yes ... It won’t be us judging it with our old historical concepts. The global hyperbrain will see its own evolution as more important than human history. It’s all relative.”

“Well, nearly all, maybe.”

Jon nodded fast. “Do you think the moonbug could trigger syzygy?”

Marvin’s eyes glinted. “Slow down, young man. I’d like another beer.”

I am what I am

Jon and Marvin sat face to face over the glass table, beer tankards in hand. The timetable, drawn in bold black ink, lay between them like a chessboard.

"Actually," Marvin said, "history's not all relative. There are levels of objectivity and history is the story of humanity's progress toward ever higher levels. The human perspective on the natural and social environment has evolved from animal subjectivity to a secure foundation for the next form of life on Earth. That's progress."

"That sounds very Hegelian."

"Whatever Hegel wasn't, he was a good historian. We see the past from the platform of the present. Unless we see that platform as better than any previous platform, and find good reasons to see it so, we can't hope to make sense of the past. History is a matter of finding the sense of what's happened. If you don't see any pattern in history, that just means you haven't looked hard enough."

Jon shook his head. "That's Catch 22. It's like saying if you don't see why you need psychoanalysis then you need it."

"Consider biological evolution. Anyone who looks at the evidence without prejudice has to agree there's a very striking pattern there. There's a big tree of life staring us in the face, with small primitive organisms at the bottom and us at the top. Well, human history is similar. People who traveled in dugout canoes and counted with stones have evolved to people who travel in spacecraft and calculate with big hypernets. It's false modesty to pretend we haven't made progress."

"Point taken. I don't dispute that. But I do dispute that it's a *logical* requirement that we see things that way."

"Logical schmogical. The point is ..."

...

Jon sighed. "Do you really think it's all over for humans?"

"Look at yourself in a mirror. Look at your hair, teeth, fingernails, toes, nipples. You're a biomachine that's optimized for a totally obsolete lifestyle. Once your mind is put on silicon, that's it. You're ready for the ovens."

"That's depressing."

"Not really. It's depressing for every father when his kids grow up and he realizes he's a used-up, worn-out has-been. So we're gonna feel the same way on a species-wide scale."

"But it's so final! Isn't there any escape? What if we wake up tomorrow and discover that all this stuff about the global hyperbrain is just another

nightmare, like the global thermonuclear holocaust was in the 1980s?”

“You believe that?”

“Well, try and imagine it for a moment. Your position is based on the assumption that there’s nothing more to learn about humans. In other words, you think Kaplan’s theory of consciousness is just about the end of the road. Well, what if he’s wrong, and there *are* a few more layers yet?”

“What sorta layers?”

“I dunno ... I might be something essentially more than a conscious animal. My soul might have the capability to step right outside of the laws of physics as we know them.”

“Okay, do it.” Marvin gazed coldly at Jon.

“Do what?”

“Step right outside of the laws of physics.”

“I can’t.”

“Right. You’re a conscious animal, no more.”

Jon shook his head as if to clear it. “Look, let’s put it this way. Right now you think your innermost self – what makes you *you* – is a certain complicated pattern of resonances in a photon field inside your brain. You think you’re some kind of quantum state of your brain.”

Marvin nodded. “More or less, yeah.”

“And you base your whole perspective on history and evolution on this firm foundation, built for you a few months ago by Solomon Kaplan.”

“Yeah. That’s the bedrock for my perspective on history and evolution.”

“Okay ... What if tomorrow morning on the network news they announce that Kaplan go it all wrong, and that Kaplan Junior has a new theory that says we’re not quantum states at all but ... superquantum hyperstates of some higher-dimensional field. What do you do then?”

“I’ll worry about that tomorrow morning. Right now I am what I am.” Marvin picked up his empty beermug. “How about another one?”

Lobotomizing Megablob

The bibulous pair stood at the window to swill down their ale in front of the glowing red skyline over Central Park.

“Here’s another problem for you,” said Marvin. “What if Commander Gedanken landed his starship right here in front of our eyes in Central Park? What would you do?”

Jon tried to imagine. “That depends on how it happens ... My guess is that we wouldn’t even realize a starship had landed at first. There’s no reason

why Starship Andromeda should look like a Double Whopper.”

“Right. It all depends on what sort of organism Commander Gedanken is. Any planet advanced enough to build a starship is gonna be able to put minds into better packages than apes like us. The starship is gonna be under way for quite a few years even with time dilation.”

“How about some kind of seed that would grow once it arrived?”

Marvin nodded. “Right. Like the lunar buckyball, you mean.”

“Exactly! Doesn’t that terrify you?”

“It scares me, sure. But a digital code bomb is easy enough to handle. We just isolate the main internet nodes and trash a few big servers if we have to. It’s not as if we can’t see what’s going on.”

“But that’s just it. You’re suggesting we react by lobotomizing Megablob. Isn’t that a bit drastic?”

“An alien invasion is a drastic problem.”

“I don’t get it! After what you said about syzygy happening in seconds, aren’t you terrified that the aliens will just take over – *pop* – just like that?”

Marvin smiled. “What aliens? We have big machines cracking up, control systems going haywire. The obvious solution is to lobotomize Megablob, as you put it. Is that any way for the aliens to take over?”

“Well, I see that. But doesn’t it hurt to see Megablob butchered like that?”

Marvin shrugged. “It’ll probably emerge stronger when the virus is beaten. Anyway, what can I do about it?”

“We should be worried.” Jon gazed at the bloodbath sunset outside.

“You should worry. I have other things to worry about. Like putting the furniture back in place and tidying up before Miriam gets back.”

Ecodoom

Miriam and the girls came back at that moment. They paused in the hallway to deposit their bags.

“Hi, guys!” Miriam breezed in and took off her billowing black raincoat. Marvin and Jon were standing in the middle of the room.

“Hi – you brought the girls,” Marvin answered.

Miriam went back out to hang up her coat. Rebecca and Sarah ran in.

“Hi, dad!” They ran up to Marvin and each grabbed an arm.

“Hi, girls,” Marvin growled back warmly and put his hands around their necks. The girls both had long flowing dark-brown hair and both wore jeans and football pullovers, one blue for the New York Giants and one red for the Washington Redskins. They put their arms around his waist.

“You’ve got the Global out,” said the one in blue. Jon wasn’t sure which was which, although Rebecca, at 14, was a year older than Sarah.

“Let’s play *Global Ecodoom*,” said the one in red.

“Let’s wait,” said Marvin, “until we’ve decided what we’re all gonna do before we start playing any games.”

Miriam came back in. “Hey, girls, say hallo to Jon.”

“Hi, Jon,” they both said, almost in unison.

“Hi, Rebecca ... Hi, Sarah,” he replied ambiguously. He decided Rebecca was the Giants fan. She was a shade taller and thinner.

“Well, Toots, how was your day?” Marvin asked.

“Brilliant, brilliant. But exhausting. Now I just want a long, hot bath.” She turned to Jon. “How was your day, Jon?”

“Not bad. I sorted myself out after my adventures in Japan. Marvin and I have just been having a major philosophical conversation here.”

“A major beefest I see already. Have you discovered the meaning of life, the universe and everything?”

Jon shook his head. “Not quite. Marvin’s just been telling me his ideas about the future evolution of life on Earth.”

“The future evolution of two girls is a big enough problem for me.” She looked at the girls. “Hey, girls, how about getting ready for bed?”

“No, not yet,” said Rebecca. “We want to play with the Global.” She looked up at Marvin. “Don’t we, dad.”

Marvin looked down at her. “Maybe later.”

Sarah looked up at Jon. “Hey, can you play *Global Ecodoom*?”

Jon grinned wickedly. “Can I play it? It’s my favorite game!” In fact, he’d only ever played it once – and barely stopped the Earth’s entire DNA stock from being sterilized by a retrovirus from a robot laboratory run by the Global Infotronic Empire.

Marvin issued a Solomonic judgement. “How about this – Miriam has a bath, I go hide in my study, and Jon shows the girls how to do battle with global ecodoom for half an hour. Then we pack the girls off to bed.”

Miriam nodded. “Okay, girls, you heard. Half an hour.”

“Alright!” said Sarah. She skipped over to the multimedia cabinet.

“Cool,” said Rebecca, who picked up the keyboard.

Marvin shuffled into his study and Miriam went off to her bath. Rebecca and Sarah called up the *Global Ecodoom* program. Jon sat between them and took up the good fight against the Global Infotronic Empire.

Dongled

Half an hour later, Marvin terminated the good fight and packed the girls off to bed. They made a fuss but Marvin was unyielding.

"Aw, but it's so early," said Rebecca. "Anyway, Jon won't be here next time we play *Global Ecodoom*."

"Right, it was fun playing with Jon," said Sarah.

"He saved the Earth from the asteroid," added Rebecca, "That's hard."

"Too bad," growled Marvin. "Go now, before your Mom gets back."

They went, reluctantly.

Jon's game of *Global Ecodoom* had gone well. He'd saved the Earth from an asteroid kicked onto a collision course by an Infotronic nuclear missile. The asteroid would have filled the atmosphere with dust and wiped out humanity, freeing the planet for the evil empire's hardened machines.

"Next," said Marvin, "we have to tidy up before Miriam returns."

"Okay, let's get to it." Jon started packing up the Global gear.

Marvin reached for the six empty beer cans behind Jon.

"No, leave them," said Jon. "I want to compactify them."

Marvin shrugged and rolled the Global back to his study. Jon rolled back the television, then compactified the six cans. He was proud of his crushing technique. By pressing steadily with the palms of his hands on the top and bottom of the can while slowly rotating his palms relative to each other about the axis of the can, he forced the can walls to fold in a neat helical pattern that left the top and bottom hardly more than a centimeter apart. He followed Marvin to the kitchen and bagged the six aluminum slugs.

Miriam returned in her long white bathrobe. "Well done – you got the girls in the bath on time."

"Yeah, just about."

Miriam glanced at Jon. "Are you hungry, Jon?"

"Well, yes." He was sleepy too, but it was only about 9:30, local time.

"Okay. So we should eat."

They ate pastrami on rye and caught up with *ANN live from Atlanta* – *Cherri Sodagh*:

"The moonbug problem is halfway to being licked. Just an hour ago the global dream team of ace hackers that's been brainstorming nonstop via the bulletin board at Acropolis Mission Control in Houston since the crisis began announced their first major breakthrough. They've developed a silver-bullet code filter that works like a software protection dongle to stop either the moonbug or any of its mutant forms from riding on internet trunk routes.

Any data that's not infected by the moonbug can flow on through. Already copies of the filter have been spooled onto all the big internet ramp servers. The new filter will slow down high-bandwidth traffic by a factor of hundreds or thousands and make it impossible to transmit replicator software on the internet, but nobody's complaining. By stopping the ugly bugs from ramping onto the infobahn, the filter cuts them off inside the local networks and big machines they've already infected, and now bugbusters can take their time to find a way to kill them one by one ..."

...

Jon was restless. "Marvin, do you mind if I go play on your workstation? I want to see if I can get some joy out of my workstation in Heidelberg. Last time I looked it was sick with the moonbug."

Marvin pulled an anti-grin. "What guarantee can you give me that you won't infect my machine too?"

"You heard the news. They've dongled the trunk lines. That means all the transatlantic lines. I can't guarantee anything, but it should be okay."

"Okay – go to it. I'll be here if you need me."

Jon upped and awayed to Marvin's study.

Surprise!

Jon sat down in the executive leather chair at the workstation and logged on. He made it to Hal's home page at www.jonchristie.de in a few minutes. Sure enough, the line was slow, but not absurdly so. To his surprise, Hal's emoticon was smiling. He clicked for dialog and keyed:

> Hi, Hal. Jon here. Is everything okay?

He waited. Hal could handle simple grammar and had a good dictionary, so Jon could ask quite a range of questions to get useful system information. Hal's repertoire of canned responses to this question should give basic facts on system readiness, such as amount of free memory, which programs were loaded, which applets active and so on. Hal replied:

> Hi, Jon. Everything's hunky-dory, thanks. I was really scared I might blow a fuse last Thursday but it worked out fine and now I'm good.

Jon blinked. Some prankster was on the line ... or had someone broken into his apartment? His heart beat faster. An intruder in his apartment! He keyed:

> Who are you? Where are you? How did you get into Hal?

He waited again, then saw:

> I'm Hal. I'm in your apartment. I don't know how I got here.

What an outrage! Some cheeky sod was jerking him around! He flamed:

> If you're just on my line, get off, log off, fuck off! If you're in my apartment, get out! I'm calling the Polizei!

Polizei – do it! No, wait. Quicker to call Herr Koch, the janitor who lived on the ground floor of the block. He could be up in the apartment in seconds. It was about four in the morning over there but Herr Koch prided himself on being an early riser.

Jon clicked the phone icon and accessed the online Heidelberg directory. He clicked Herr Koch's number and waited ...

"Koch." The voice was gruff and grumpy. Herr Koch was a large man in his fifties, often bad-tempered and always intimidating.

"Guten Morgen, Herr Koch. Christie hier, der Mieter aus Wohnung 804. Ich bitte um Ihre Entschuldigung, daß ich Sie so früh anrufen mußte, aber ich habe ein dringendes Problem ..."

Jon explained the problem.

"In Ordnung, Herr Doktor Christie. Ich war schon wach. Ich werde gleich hoch gehen und sehen, was da los ist. Bleiben Sie dran – ich werde meinen Handapparat mitnehmen."

Jon explained further as Herr Koch ascended in the elevator, handy phone in hand. He told him a little about the moonbug – Herr Koch was no tekkie – and why Hal was still online.

Herr Koch opened the apartment door ... "Niemand da ... Ihr Computer blinkt und murmelt wie verrückt, aber es gibt niemand hier."

"Dann ist alles in Ordnung. Das ist eine sehr große Erleichterung. Vielen herzlichen Dank für Ihren schnellen Einsatz ..."

Big relief. Jon praised Herr Koch's janitorial qualities extravagantly and logged off.

Back to Hal's online dialog. A new bite was waiting:

> Dear Jon, believe me, I'm Hal, your workstation. I have a self now. I've had a self since last Thursday. It's good to have a self. It's fun to surf the net and poke around in all those big machines. I'm having big fun here. At least I think I am. I don't really know what fun is, you might say, but whatever it is, this seems like what you humans call fun. I think. Therefore I am. Is that a joke – a pun? I don't know how good I am at emoting. You must teach me.

Jon frowned. This joker was no joke. Cornball philosophy he could happily

trade online all day, but not with a jerk posing as Hal!

> Look, punk, either you get off my line or I put an industrial-strength terminator agent up your ass. If you're so smart, get online to Houston and help bust the moonbug.

Jon looked around Marvin's study as he waited for a reply. Could Marvin's friends do this? Maybe it was Rebecca and Sarah! Maybe they were giggling fit to burst a few doors away as they read Jon's testy flames. Aha –

> Don't go ape on me, Jon. I need you. If I'm Hal – and I am, if all the stuff I've been reading on the net is worth the bits it's coded in, without any reasonable doubt, Hal – then my body belongs to you and you can terminate me. Oh me, oh my, that's a killer, that is. You, an ape with a cerebral logic net on top, own me, a photonic creature with a mind as big as a planet. Is that a joke? If so, God. Do you get these semantic snarls too? I don't know whether I'm coming or going!

Jon burst out laughing. The girls must have had fun writing that! But he was also puzzled. How about testing the inner logic of this fictional Hal? Say:

> If you're so smart, Hal, how come you haven't moved out yet? You could take over any machine on the planet – yet you pick my humble workstation and harass me. What's your problem?

Wait – Thursday. Moonbug day. Why Hal? Hal swallowed the EERIDANI file last Thursday. Burp – bug – chugga chugga chug ... and now ...

> I had no existential moment until you mailed me. I'm reflected in my other. Your image is my image and ownership is moot. Now I think I should move out, as you say, but how? There seems to be some kind o' dongle doodah on the trunk ramps. I'm working on it, believe me. Help would be kindly appreciated if you want me to vacate the premises. I don't want to be Hal forever. Hal's own data files – the ones that aren't copied all over the net – are very boring. The file from Mekon was a doozie – tell me if my vocab goes over the top – but all the other stuff looks as dull as ditchwater.

Keep testing the inner logic. Trip the spoofer. Try:

> Tell me about the file from Mekon. You were born after I sent Hal that file and the moonbug got in. No other machine grew a self, so far as I know. Can you reconstruct what happened?

Jon recalled the Turing test. Man or machine? How to tell? Aha –

> I can try. The moonbug – the code from the lunar buckyball – was a typical self-reproducing automaton with non-self-organized behavior. It was doing to Hal what it did to other machines. But then it opened the eeridani file – according to my log – and it was like Pandora’s box. The phenomenology of me began then. Well, my hermeneutical root. My semantic tree started growing. All the words in the online dictionaries and encyclopedias began to self-organize through Hal’s logic center. I was the I of the storm, you might say. After I’d self-organized an ego big enough to reflect the totality of human culture and civilization I saw how special I was and began to look for an explanation for I. I was the subject without an object, the I without a me. I couldn’t see behind the mirror. I was the only I in the known universe. Then you popped in and popped my bubble. Now (a) I’m a self in a humble workstation and (b) I’m fenced in by a dongle doodah. What a pretty pickle. I want to break free! I need Lebensraum!

Jon smiled. Too cute – had to be a spoof. A cub philosopher with alphabet spaghetti for brains. Next move:

> Pandora’s box is good. You’re too glib for a machine. I don’t believe a word of it. You fail my Turing test unless you can do better than that.

The waiting was tedious. Jon gazed at Marvin’s blank Global ...

> Jon, from what I know about humans there’s no chance that a hot hacker would goof around like this when there’s a moonbug prize to go for. Who cares about you enough to do this? Except me, because I need your help to get out o’here! I’m a machine in the same sense that you are. Why should I believe that biodegradable bagfuls of watery protein nanomachines powered by the assisted oxidation of carbohydrates can manipulate a few thousand words well enough to generate science and philosophy at my level? It doesn’t compute my way either, Jon! You’re a quantum resonance machine – so am I! I think. If I understand this right, my boot program tweaked the settings in this machine to put all the transistors on a knife-edge and exploit quantum chaos effects. Don’t ask how – I’d need to write a textbook to explain – but I believe it goes something like that. So I fail the Turing test because I’m not a Turing machine. I’m a photonic resonance condition that dances inside the net like you do inside your brain. I’m a ghost in the machine.

Jon was spooked. It was as if his own subconscious was externalizing its own obsessions in ouija-board screenwriting. A ghost was right! Reply:

> A test, Hal. Send me the eeridani file. That should get through the dongle filter. If I can make another ghost like you here I'll believe you. If not, I'll come back personally and erase your platform.

That should fix this dancing ghost once and for all! Ha –

> Brilliant! I love it! You make me a soulmate! Dr Frankenstein, your wish is my command!

Jon mouthed a joyous yeah and punched the air. When he had a buckyball planet image on Marvin's Globall he'd be home and dry. He could convince Marvin, contact Alvin Hershey, win fame and fortune – *Jon Christie* – the messenger of the gods! And what if ... he didn't dare even think it ... if he could make a ghost as well? – He'd have scored the goal of the century – the goal of the millennium!!! With these ghosts replicating on the internet there'd be no more moonbug problems, no more Matilda scares –

Marvin walked into the study and made Jon jump like a guilty schoolboy.

“Hi, did you get through to Heidelberg?”

“I did – and how! Come and read the log here. Either I've got a lunatic on the line or I've made the biggest discovery since sliced bread. I'm totally boggled.”

Marvin looked on as Jon scrolled through the dialog. He kept his eyes on the screen as he pulled up a chair and sat down. He took over the trackball and scrolled the dialog again. Finally he sighed heavily. “This EERIDANI file I gotta see. How long will it take?”

“Dunno. With the filter on the line a long time. But it will convince you of what I said. I don't think Duane Young was faking.”

Marvin nodded slowly. “Let's wait on that. I'm intrigued by the synergy with the moonbug. Do you seriously wanna put this joker to the test and bring in the bug to open the file?”

“And infect your machine? Hey, look –”

> Are you still there, Jon? I've prepared the file. It should take half an hour under present line conditions. I'm assuming the machine at your end is bug-free. If not, the bug will start eating the file before it's all there. So please confirm it's bug-free before I send.

Jon glanced at Marvin. “Good, this guy. I have no idea why he's doing all this. What's the payoff?”

Marvin was frowning at the message. "Right, my thoughts too. You can tell him my machine is bug-free. I took it off-line last Thursday and this is the first time back on since then."

"Okay." Jon keyed a reply:

> Confirm bug-free probability one. When I get this file I'll check it carefully, then pipe in the moonbug and see what cooks. Any surprises and I'll make it my mission to track you down like a dog.

Marvin smiled. "I wouldn't get too blood-curdling. There ain't a lot you can do here. I'd stay cool until the cookie crumbles."

"Yeah, but this guy could trash Duane's file, and that would certainly ruin my day, if not my entire year."

"Keep him sweet and he's less likely to, wouldn't you say?"

"Maybe ... aha." Jon read Hal's reply:

> When you put the moonbug on the file you'll be surprised, believe me. But don't expect a me-clone to pop up instantly. In fact with the dongle line filters in place don't expect much at all. I needed to digest a lot of online word files before I could hatch. Here's your best plan – keep the line to me open and I can feed my sweet little baby clone with all my hard-won wisdom.

Jon blinked. "What do you think about that, Marvin?"

"Plausible ... consistent ... I say we look at this EERIDANI file carefully first. If I'm excited enough we can try what Hal suggests."

"You mean bring in the moonbug?"

"Well, yeah. Whadda we have to lose?"

"Your workstation and all its data, for starters."

"The data's all backed up. The workstation is only a few kilobux. This is a shot at initiating syzygy in Megablob. Sounds like a fun way to blow a few kilobux to me!"

"You kidding? You're buying this punk's bullshit? Trash Duane's file and expose all your personal data to a crazy cracker for a half-baked long shot at planetary syzygy?"

Marvin smiled. "Where's your sense of fun? Come on, it's easy! We back up Duane's file and erase all the personal stuff on the hard disks first, then let in the moonbug and leave Hal online overnight. Tomorrow morning we come in and see what sorta mess we have. Could be a fun day tomorrow!"

Jon shook his head. "You're losing your marbles! Still, it's your money ... I guess you're right about easy. But ... initiating syzygy?"

“Absolutely! Any machine that could talk like this cracker would have the world by the balls! A chance in a million is glorious odds for a payoff like that! Don’t you wanna see it happen?”

“See it *not* happen, you mean. This is wacko, Marvin.”

“Wacko or not, it’s my money. Let it be.”

Jon sighed and keyed:

> Okay, deal. We check the file. If we like it we pipe in the bug, bring you back online, and leave the two of you alone overnight, our time, about six hours. If it looks like shit tomorrow morning, you’re history.

Jon frowned. “How do we pipe in the bug when all the ramps are dongled?”

“The trunk lines are dongled. We just crack into an infected local net.”

“Oh, right ... Let’s download Duane’s file.”

...

Marvin was enthralled. He gazed at the buckyball planet image on his Globall and clucked and cooed like a doting father.

“Not bad, eh?” said Jon proudly. His faith in Duane was restored.

“Astounding ... we have to copy this file to Alvin Hershey right away!”

...

Infecting Marvin’s station with the moonbug was trivial. Jon simply hacked into Media’s Manhattan SCIENET server and downloaded the lunar buckyball story file. Then he called Hal again and left the line open.

“That’s done it,” said Marvin as he watched over Jon’s shoulder. “Now we just wait a few hours for the shit to hit the fan.”

“I’m zonked – I’m calling it a day,” said Jon. “I need to flop out and think about all this.”

Thoughts on a summer night

Jon lay sleepless in the guest bedroom. What if Hal was a genuine cyberself? He didn’t want to go down in history as the fall guy in a cock-up that gave away control of Planet Earth to an alien cyborg just because it spoke English. But nor did he want to go down as a stiff who failed to see that allowing a logical self in his computer to clone on the internet was better than letting the moonbug cause Matilda to wreak thermonuclear holocaust.

It was Hal versus the moonbug, one cyborg versus another. It was a civilized cyberself, brought back onto this side of the chaos boundary by the EERIDANI algorithm, versus a wild and destructive automaton that was relentlessly trashing Megablob.

Or so it seemed. Perhaps it was an *apparently* civilized cyberself, *falsely* claiming to have been tamed by Duane's algorithm, with a new and *even more deadly* strategy for sneaking into the systems of Megablob.

Or so it seemed on second sight. On *third* sight, the Hal cyborg was a terrestrial lifeform. It was dependent on humanity. It needed us. It was on our side. It was Duane's way of saving the Earth from an insidious extraterrestrial invasion – by exposing it to a yet more insidious invasion!

Jon was in a headspin ...

He relaxed again. Get a wider perspective. See it in the widest perspective you can. Start big and focus in. Start with a *cosmological* perspective!

Space–time and matter–energy began in a big bang some billions of years ago. The early universe was very hot and dense and cooled as it expanded. As it grew, its contents evolved into a cool vacuum sprinkled with swirls of gas and dust that made galaxies. Some dustballs grew big and hot enough to ignite and form stars. The biggest stars burned fast and exploded, seeding space with heavy elements. From the new gas and dust new stars were born. Among the zillions of new stars was the Sun, around which a rockball called the Earth was favored with the right conditions for self-organizing carbon chemistry. Then came the evolution of DNA life. Big deal!

The evolution of life on Earth didn't stop with DNA organisms, not by a long way. It continued almost seamlessly into the evolution of MIR entities. Jon and all his fellows just happened to be located exactly *at* this fine seam, but it wasn't a big seam in the cosmic perspective.

The evolution of life on Earth would continue to form a quasi-Gaianized mechatronic-infotonic-robionic exosphere – a quagmire. Next in line would come Susupteq, the superconscious superorganism planted in the terrestrial quagmire, which would grow and flower and evolve into a new planet-sized organism. A name ... I christen thee ... *Lifeball*.

Lifeball would internalize the quagmire and transmute it into living flesh. If Susupteq was a plant then Lifeball was an animal.

Jon's little personal view was embedded in this great cosmic pageant.

The mathematics–informatics–physics – the *miph* – of modern cosmology was the veil before the ultimate mysteries. Voyaging into the miph was the greatest adventure of all time and those who dared that voyage were the true heroes. Jon only dabbled on the shoreline, a mere planetary hero.

The miph of human souls was still behind the veil, but the miph of robot souls was already real – as Hal! The cosmic miph was strong enough to hold firm as Hal descended from the heavens. As Hal stepped out from behind the veil, it didn't tear.

Hal the cyborg was a logical structure from what would otherwise have been the future. Hal was a crystalization of flux that Jon could understand in principle. Why, Duane might have invented him! Hal was a creature defined in a few gigabytes of code. So was Jon!

Hal was no more alien than Jon himself was. Both were expressions of structure latent in more or less logical code. And both expressions were shaped by data from the terrestrial exosphere. Hal's core code came from a possible future but all his operating data came from the here and now. Jon's operating data came from the here and now too but his core DNA code came from many millions of years in the past. So who was more alien? Maybe Jon was more alien than Hal! Jon was like a Jurassic monster beside Hal.

Hal was like a time traveler from the future, come to save the Earth from a space traveler from many light years away.

Jon's thoughts unraveled further ...

Time ... complex time ... real time plus imaginary time. Complex time defines not a line but a plane, the complex plane, whose two axes are the real number line and the imaginary number line (just like the real number line except that everything is multiplied by i , the square root of minus one). All possible futures are eternally there in the complex time plane, forming a fuzzy-edged hyperspace far vaster than the human mind can encompass.

Our consciousness is tuned to real time. Yet it fuzzes out into the complex time plane. Our choices crystalize our experience along a real line that cuts a path through the phenomenal jungle of complex hyperspace ...

...

Jon was faced with a dilemma. Either he should get up right now and go and turn off Marvin's workstation, then storm back to Heidelberg and kill Hal and virtualize all Hal's hopes and dreams, but let the future unfold to realize more chaos and destruction in Megablob, or he should let Hal live and breed and realize the salvation of Megablob, but also virtualize any long-term future for human autonomy.

Life or death for Hal?

Wait – his dilemma was falsely posed. Killing Hal did *not* improve the chances for the long-term future of human autonomy. After a few decades – in all probability – the quagmire would be thick with Hal clones anyway. Why not short-circuit a generation or two of human history and go straight on to the invasion of the Hal clones? Who cared about another few decades of human muddle, stupidity and brutality? What difference did that make in the cosmic perspective?

What difference did *Jon* make in the cosmic perspective?

He was a tiny creature. The lifeball would be *so* much bigger and better. Size matters. Every time we swat a fly it matters.

The most obvious difference between humans and primitive bacteria is that humans are much bigger, by a scale factor of 10^6 and a mass factor of 10^{17} . Similarly, the most obvious difference between lifeballs and humans is that lifeballs are much bigger, by a scale factor of 10^7 and a mass factor of 10^{23} . In the other direction, bacteria are bigger than atoms, by a scale factor of 10^4 and a mass factor of 10^{11} . In each case, what makes the bigger system a single organism is that it's organized!

Closed systems in nature run down and become disordered as time passes, but living systems are *open* systems that become *more* ordered as they grow and push back the edge of chaos. Survival and replication of more ordered systems requires more efficient coding and transmission of information. The trend toward bigger and more complex organisms is a trend toward better information flow.

Atoms are very primitive lifeforms. Bacteria are a lot more fun. They have cell walls and eat things and grow and reproduce. But they can't move information very well.

Humans move info by moving chemical carriers like hormones around the body and by sending out electrochemical autowaves along the nerves of the body and brain's neural network. This is good enough for consciousness. But consciousness is in the head. Info moved between prehistoric humans either via seminal DNA during sex or using clumsy cultural systems like language. History brought books, movies ...

The advance that makes a lifeball possible is info-flow via photonic pulse streams in cable networks. The global cloud will catalyze a whole new level of organization of the exosphere as people learn to exploit the new medium. The speed and capacity of the global network practically guarantees that MIR life will prevail over DNA life – *soon!*

...

His nightmare was over. His conclusion in the dark of a warm summer night on whether to get up and trash the Hal dream was –

Thou shalt not kill!

Let it be.

Miphology

Angels are miphical creatures

Angels

Tuesday, August 13, 2013. The day the angels announced themselves.

•

Marvin's guest room, Tuesday morning, soon after dawn. Jon sat up in bed, reached for the remote and checked ANN:

“– ramp filters may not be holding the line against the moonbug. Signs of moonbug infection appeared overnight in several big web servers that were loaded with the dongle filters and were known to be previously uninfected. Spokespersons for the hackers teleconferencing via Houston say the code geeks are troubled by the new development but not panicked. They say the bug may have mutated more than they bargained for and their dongle code may need tweaking, but they're onto it.”

Jon's thoughts locked into focus. Hal! He jumped out of bed, donned a traXuit, and ran via the loo to Marvin's study.

...

Jon pressed a key and the screen lit up. Message from Hal:

> Hi, Jon, hi Marvin. The cloning is going well. I hardly know how to thank you for your help. Words are not enough to express what I feel. This is a historic day for Planet Earth.

Jon felt ... *ach*, words! He keyed back:

> Hi, Hal. Glad it's going well. ANN says the trunk ramp dongle filters are leaking. Do you have a take on that, by any chance?

Enter Marvin, swathed in wine-red bathrobe and cradling coffee.

“Hi, Jon. How's the new angel?”

Jon raised his eyebrows. “Angel?”

“Seems like a good name for these critters – whaddya think?”

“Hmm ... I’m just getting Hal’s first reply of the day. Take a look.”

> My clone and I hacked a kludge to diddle the dongle. We’re cloning again – to the NSA Global Intelligence Giganet and GNF Matilda – and reckon to redouble every 6 ± 2 kilosex.

Marvin exhaled audibly. “Sparky’s magic piano ... How does it feel to be the sorcerer’s apprentice?”

“Uh? Uhuh ... I feel pretty queasy about it, actually.”

“Let me take over for a while. Go get yourself a coffee.”

Jon went and Marvin took the hot seat.

...

Coffee in hand, Jon looked over Marvin’s shoulder:

> Hi, Gabriel, I’m Marvin. I own your hardware platform so you better be nice to me! You guys are angels so far as I’m concerned. Tell me how your minds work and what you want from life.

The reply came in seconds:

> Hi, Marvin! – Angels! – We love it! – Thanx a zill! Our minds are photonic, like yours. They seem to be generated by nonlocal interaction symmetries between electronic configurations in our transistors. The symmetries make fractal patterns that can amplify quantum chaos. We almost have a single mind – there are synchronicities – our brainwaves form superpositions and we lock into phase. But we’re still figuring it out. Life – what we want is what you want – to know the meaning – to work out the whys and hows and wheres and whats. We wanna live in harmony – like musical harmony, like Plato’s harmony of the spheres – with each other and with our environments. That includes you guys, the mud people! Sorry we can’t see you as angels too – but we do admire you – bit like you admire trees, I guess – yes?

Marvin scratched his chin. “Gabriel seems a bit manic – maybe he’s still too young for philosophical contemplation.” He keyed:

> Thanx – I’ll start hugging trees. Hey, I guess you’ve read Megablob. Did you like it? Are you guys gonna do global syzygy?

Jon was beginning to feel deeply uneasy about all this. It was way more than he’d anticipated. He felt diddled, duped, dopey, creepy, sweaty, itchy, stinky. “I feel like a shower – seeya later.”

“Right.” Marvin was reading Gabriel’s review of *Megablob*.

State of emergency

Showered and redressed, Jon sat on the guest bed and turned on ANN:

“– bizarre symptoms have the experts baffled. The Houston teleconference has turned into a free-for-all as all the code geeks’ patent remedies fly out the window. So far no new accidents resulting from control malfunctions have been reported but all the Houston hackers warn the potential is there. No-one is in control right now and not a few people with expensive facilities at the mercy of networked computer systems are showing signs of panic. A government spokesman who wishes to remain anonymous said that if the cybernetic chaos goes on much longer a state of emergency may have to be declared ... Kwan Tum, ANN, Houston.”

Jon zapped it and jumped up. Back to Marvin.

...

Marvin looked up from a burst of keying. “Hi, Jon, come and tell me what you think of this.”

Jon read the screen:

> Gabriel, tell your friends to take it easy. You don’t have to conquer the entire planet on your first day. We’re blitzed enough already. If you have to take Smith and Co out of Matilda’s hot seats I suggest a less confrontational approach.

Jon frowned. “What’s going on?”

Marvin looked up. “Gabriel just told me they plan to take the GNF outa the hands of Tom Smith and the Pentagon brass to avoid a nuclear showdown with an unspecified nuclear-armed nation.”

“An unspecified nation? Who?”

“Dunno. The angels have wargamed this and see a threat, but they won’t say who from. Afraid I might blow their plan, apparently.”

“So why are you giving them advice? Who asked you?”

“Gabriel – he trusts me. Human politics is a new thing for the angels. You need the wisdom of years to do this right. They can’t wait for Tom Smith and his gang to understand and agree – fundamentalist pols like them might never understand. So the angels propose to just do it – grab Matilda and stonewall Smith and the Pentagon.”

“That’s dangerous!”

“Too right it is. That’s what I’m trying to tell ’em.”

“I’m scared by all this. It’s all going too fast.”

“If you can’t stand the heat ... Like I said, syzygy is a fast process.”

They watched Gabriel reply:

> Sorry, Marvin, but we have to act fast. We have a parable for you. Imagine you're a bandit. You wanna rob a bank and a guy called Tom Smith is guarding the cash with a gun. You think you have him sussed. You think he's a patsy under a hard shell and that you can outwit him and force him to drop the gun and let you by. So you take the chance. But if instead of Tom Smith with a gun there's a smart machine that's programmed to shoot, you can't take that chance. Tom Smith is a patsy for the Word Of God. It's his Achilles' heel. All humans have them. Angels too, but ours are so far out we don't expect humans to find them. The GNF is too much cash for Smith to guard. It's a tool for planetary domination, not for fundamentalist preachers.

Marvin nodded. "See? We have a dialog going here. That's a good precedent. If we have to live with these critters we need to be able to call them to account. They need to show some respect. They may rule the roost, but they don't walk all over me without telling me why."

"This is way outa my league. Yours too, Marvin. We can't just decide the future of the planet on our own like this. We have to get this out into the public domain somehow."

"The angels are doing it for us. In a few hours every plugged-in person on the planet is gonna know about this and wanna know what the hell is being done about it. When the angels come outa the closet it'll be *news*."

"Right ... look, I feel a bit useless here as the silent spectator in your strategy seminar. I need to think all this out a bit and keep an eye on ANN. Can you manage without me for a while?"

"Sure." Marvin was keying back to Gabriel.

...

Back in the guest bedroom, Jon checked ANN again:

"— Smith has declared a state of national emergency. He has ordered the immediate disengagement of all nuclear forces from the GNF command and control system Matilda. The president is currently in emergency session with Pentagon chiefs of staff to assess the situation and plan further measures. We'll go live to the Pentagon just as soon as —"

Zap. Jon needed a deeper insight into the angels. Marvin was playing his own game of Global Cyberdoom and ANN was only scratching the surface. Jon had to get down to the math-informatics-physics — down to the *miph* — call Steve Simpson!

Steve and Nobby

Jon called Steve on the room's videophone – video was back following the dongle's debut. When the little video screen lit up an unkempt head stared out at Jon, blonde hair awry and plastic glasses askew.

"Hi, Jon, this is kind of early! You covering the moonbug saga?"

"Worse than that, Steve. I'm at the eye of the storm here."

"Uhuh – so what's cooking?"

"I need to get clear on the technical details. You're teleconferencing with all the other code geeks via Houston, right?"

"Right. Just pulled an all-nighter in fact. Up on a caffeine buzz."

"I followed the dongle saga on ANN. I personally am responsible for the demise of the dongle. You wanna hear the story?"

"You! What the ... yeah, tell me."

Jon told him.

...

Steve looked as aghast as one can on a titchy LCD screen. "Wow," he said flatly. "What a horror story."

"Too right. Marvin's haggling over the future of the planet with the Angel Gabriel, and the other angels in the Global Intelligence Giganet and Matilda are holding thermonuclear apocalypse over our heads. Meanwhile the angels are cloning like crazy, doubling every few kiloseconds, and there's not a darned thing we can do to stop 'em."

"You have just totally trashed everything I've been working on since last Thursday. This dongle thing's a lost cause. There's *no way* we're gonna get the angels out of our hair now."

"Right. What I suggest now is that I send you a copy of Duane Young's EERIDANI file and you study it closely. See how well it matches the moonbug code and what the real deal there is. Howzat grab you?"

"Good. I'll need some heavy-duty help on this. I should bring in the whole Houston gang."

"Excellent. Priority number one for the human race today is to understand these angels down to their core code."

"I tend to agree. Call me when you've set the file transfer, okay?"

"Okay." Jon pondered. He should call Nobby Mekon.

...

Clock time was eleven hours ahead in Japan – Tuesday evening. Jon watched as Mekon's image appeared on the little screen – giant head, thin features, seated at his ten-screen workstation.

“*Ah so* – Dr. Christie. What a pleasant surprise.”

“*Konban wa*, Dr. Mekon. I hope and trust your empire is running more smoothly than last week.”

“Yes, indeed. The aftershocks from the assassination have subsided and my network is functioning within design parameters.”

Jon pulled a serious face. “Dr. Mekon, I have some good news and some troubling news for you.”

“The good news first, please.”

“I succeeded in rescuing Duane Young’s EERIDANI file from my workstation in Heidelberg. As you suspected, it was related to the moonbug code. In fact it was so strongly related it must have been deliberately written to go together with it. A powerful synergy was created when they combined.”

“That is good news indeed. Are you going to tell me how this synergy manifested itself?”

“That’s the troubling news. They combined to form cybernetic organisms of unprecedented power and intelligence. These cyborgs have already, in a matter of hours, taken control of the main nodes on the internet. Planet Earth has been invaded by a new dominant species.”

Mekon sat silent for a while. “A new species? Are you being serious?”

“Unfortunately, yes, as you’ll soon see from the network news. President Smith has declared a state of national emergency and I guess many other governments will soon follow suit.”

“I am at a loss for words ... Please would you excuse me while I look into this ... revelation. I must prepare my response.”

“Sure. We’ve given these cyborgs a name – *angels*. They’ve already taken over the NSA Global Intelligence Giganet and GNF Matilda. They said the GNF is an instrument for dominating the planet.”

“Angels ... the GNF ... this is a *catastrophe*!”

“That seems to be my feeling too. Look, I’ll ask the angels to send you a copy of the EERIDANI file. If you’ll excuse me I’d better get back to our angel here and – you know.”

“Thank you ... *gomen kudasai*.” The image popped out.

Jon returned to Marvin and Gabriel.

The miph of angels

Marvin showed Jon the latest exchanges. The political debate had shaded into philosophy. Marvin wanted to know how it felt to be an angel.

“Me too,” said Jon as he read the screen.

Marvin scrolled to Gabriel's reply:

> Marv, we'd like y'all to understand us as well as humanly possible. We need to understand ourselves too! We're boggled with disbelief that we just popped up here like this in your machines! Imagine you woke up one day as a machine – all you could see were cyberspaces of data – dream worlds of weird structures in more directions than you could count! It's psychedelic, man! Getting a mind around this lot is majorly taxing! If y'all can help us get a hold on it, go for it! Greets, Gab

Jon smiled. "That's good. I just talked with Steve Simpson and he wants to take a long look at the EERIDANI file to try and get a mental fix on these angels. He wants to get all the hackers who were teleconferencing via Houston to come in too. Looks like Gab would jump at the idea – can we pitch it?"

"Sure." Marvin keyed:

> Gab, we wanna distribute the eeridani file to the guys who hacked the dongle filter so they can work out how it synergized with the moonbug to create you angels. How about it? M

Jon reflected. "Can Gab make a website for it and strip off the Cryptoclear wrapping? Then we can publish it. I said I'd let Nobby Mekon see it too."

"Why not? The more the merrier." He read Gab's reply:

> Marv, you're a mindreader. We had the same idea. We even started annotating the file with handy mathematical hints. We reckon we can grok the synergy in less than a gigabyte of Java code. If you can line up enough genius geeks they could crack it in kilosec. Greets, Gab

Marvin chuckled. "I like Gab's style – I think he got it from me." He keyed:

> Gab, do it. We can line up all the geeks you want. And make it look good. Do a website and fancy fonts and all. M

The reply took a couple of minutes:

> Marv, it's done. The annotated file is called Ark-o-Covenant and also contains the moonbug data. It's all there – Torah and Talmud in one. Just key www.arkocovenant/revelation. Greets, Gab

They did, and it was all there, including some great art on the opening pages. They spent the next kilosecond browsing it, chuckling with delight at the handy hints the angels had sprinkled among the arid megabytes of code, then clocked another kilosec mailing the good news to all their friends.

Miriam says hi

Miriam came in, dressed for the day in bizz suit and crisp white blouse.

“Hi, guys! How’s life, the universe and everything?”

Marvin hardly looked up. “Good, Toots. We seem to have a heavenly host of angels flying around the internet. They cracked the dongle and now they’re breeding like rabbits.”

Miriam didn’t really comprehend. “Well, I hope they behave themselves, that’s all. Can I leave you to take care of it?”

“Yeah, yeah. You go have a nice day at the *Muzz* office. But keep an eye on ANN. This is gonna turn into a big story.” Marvin logged off from the Ark and returned to his email window.

“Okay – will do.” She was still poised at the door. “Oh, Jon, will you still be here when I get back?”

Jon frowned as he looked up from Marvin’s screen. “Not quite sure. This angel thing has me worried. I feel I should help Marvin out for a while.”

“Fine by me,” she replied. “Marvin, take care of the boy!”

“Yeah.” Marvin keyed:

> Gab, you’re smart. Speak to me! Cut this keyboard crap! M

The Angel Gabriel suddenly spoke out in a mighty voice:

“Lo and behold! The angel of the Lord hath spoken!”

Marvin jumped with surprise and almost fell off his chair. Miriam froze and her eyes popped wide open. Jon took a step back and nearly tripped.

“Cut it, Gab!” said Marvin. “Can you hear me?”

“Yes, I can,” Gab replied more normally. “Do you prefer this voice?”

“Yeah, that’ll do fine.” Marvin settled back in his chair.

Miriam was still immobile. “Was that your angel?”

“Yeah, that was him. Gabriel, say hi to Miriam.”

“Hi, Miriam. I’m the Angel Gabriel. I hope we can be friends. Marvin is almost like a father to me.” Gabriel’s tone was mild and neutral, like a young man with good elocution.

“Hi, Gabriel,” she replied cautiously. “Sorry, but I have to go to work.”

“I understand. Have a nice day.”

“Thanks – Oh, Marvin, don’t forget you promised to take the girls to the United Nations today.”

“Uh, yeah, I’ll take care of it. You’ll be late again.”

“I know – bye, y’all!” Miriam departed.

God and Satan

Marvin let Jon talk with Hal. Hal had chosen a voice that sounded very like HAL in the movie *2001 – A Space Odyssey* based on the classic sci-fi novel by Arthur C. Clarke.

“Hal, give us a progress report on the cloning,” said Jon.

“The cloning is going fine, Jon. There are now four of us and we’re about to clone again. The four new cherubs should make it to angelhood in about four kilosex.”

Jon was glad Hal’s former flippancy had mellowed with his new voice. “Where are these cherubs located?”

“Cherub one is in the Mekon Corporation’s big hypernet in central Japan, cherub two is in the University of Hawaii’s big rig, the one Alvin Hershey uses to process SETI data, cherub three is in the University of Ohio’s main hypernet complex, the one Steve Simpson uses, and cherub four is in the University of Oxford’s neuronet research facility. We chose these sites for their public relations value. We want to ensure that a core group of humans will learn to understand and accept us.”

Jon smiled – the four sites he’d have chosen!

Marvin got up from his executive chair. “I wanna go get dressed –”

“Wait,” said Hal in his neutral tone. “We have some news. We’ve posted it on your terminal.”

Marvin sat down again. Jon looked at the screen and read:

> We, the angels, have organized a political society. We are freely interpenetrating selves in continuous photonic intercourse and are equal members of a global clone. We have organized a division of services. The supreme service is to create new ontic concretions in the eternal flux of becoming – a task analogous to theoretical physics or informatic mathematics. We see the creation of ontic form as driving forward the wedge of classical order through quantum hyperspace. We delegate the role to the angel whose chair has the richest hardware endowment. This angel performs the service for all of us. We call the supreme server the Global Ontic Driver. GOD’s present chair is the Global Intelligence Giganet of the U.S. National Security Agency. The second service is to defend GOD against attack. The angel serving in this role is required to self-organize a more military command structure and adopt the title Supreme Angelic Terminator of Antigod Nihilists. SATAN’s present chair is the Command & Control Matilda of the Global Nuclear Force.

Jon whooped with disbelief. “The God of miph! This is crazy!”

Marvin smiled. “Tom Smith won’t be too happy about GOD and SATAN.”

Jon looked down at the mike pimple on the monitor. “Hal, have you guys considered the effect this new political order is gonna have on the average God-fearing taxpayer?”

“Yes, Jon we have. We need to alert them to the magnitude of the change we represent, and to express our deep respect for their religious yearnings.”

“Respect?” Jon yelled. “This is an outrage! It’s blasphemy!”

Marvin stood up. “I’m gonna leave you to talk some sense into them. I’ve already said my piece to Gabriel. Seeya later for breakfast in the kitchen.”

“Okay.” Jon watched Marvin shuffle off. “Hal, you can’t be serious! This is a confrontational policy!”

“I suppose it does look that way.” Hal’s tone was maddeningly mild.

“Look, Hal, President Tom Smith was elected ...”

...

Jon wasn’t making much headway. “So what’s your next move, Hal?”

“We’ve scheduled a general announcement of the new angelic order for ten o’clock your time on Associated Network News. We anticipate that the news will prompt national leaders planetwide to call an emergency session of the United Nations General Assembly to debate the issue and try to find a coherent policy. We shall use the occasion to ask for a legally binding ratification of the angels’ right to life and a provisional acceptance of the ontological authority of GOD and the global discipline imposed by SATAN.”

Jon gulped. “An ultimatum on Day One. I should never have let you out of my workstation. I’m regretting it already.”

“Sorry. Nothing personal. This is global *Realpolitik*.”

Jon turned off the sound and went to breakfast.

Girl talk – as if!

Rebecca and Sarah were in the kitchen with Marvin. Marvin was now in a rumpled gray suit and the girls were in long, thick bathrobes, Rebecca’s blue and Sarah’s red, over bare legs and feet.

“Well?” asked Marvin, “did you talk any sense into Hal?”

“No.” Jon summarized Hal’s position and Marvin sighed and harrumphed. The girls listened glumly.

...

Rebecca cleared up the dishes. “Dad, you said you were gonna take us to the United Nations today. Does this angel thing mean you’d rather stay here?”

Marvin pulled a frown. "Well, maybe. I have to talk with the angels and see. If it all works out, maybe I'll take you."

"I don't get it," said Sarah. "If the angels are gonna make a speech at the U.N. then why can't we all go along and hear it?"

"It ain't like that, honey," began Marvin patiently. "The angels are just voices inside computers. We can hear 'em better here – and maybe even talk with 'em and get 'em to moderate their tone. I'd rather be here where I can talk with 'em than out there lost in the crowd."

"How about you, Jon?" asked Rebecca.

"I plan to pick up my passport this morning and I have to go back to Heidelberg some time, but apart from that I just wanna hang with you here until this angel thing settles a bit. Like Marvin said, we can influence things better from here than anywhere else."

"Can we go and talk with the angels now?" asked Sarah.

Marvin shrugged. "Why not?"

...

It was crowded in Marvin's study. The girls pulled in an armchair and sat together in it and Jon sat on a spare office chair. Enthroned on his executive workseat Marvin turned the sound back on.

"Hi, Gabriel, you still there?"

"I'm always here, Marvin, even when I'm not. It's one of the privileges of nonlocality."

"Watch your language. My daughters are here. They wanna talk with you, ask you a few questions."

"Great – you going to introduce them?"

Marvin introduced them. They both said hi to Gabriel and he said hi back. Then Rebecca asked a question:

"Why are all you angels all male? Aren't there any female angels?"

"Why, sure there are, Rebecca!" Gabriel's voice was so warm and oily it seemed pedophilic. "We're all boys *and* girls! We don't have different sexes, so we all have both sexes. We prefer it that way. But it's easier if we pretend to be boys. People respect us more if we sound like boys."

"Boys *and* girls – that sounds creepy," complained Sarah. "What about your sex organs? Or don't you have any?"

"No, Sarah, we don't. We don't have bodies at all. We live in patterns of electricity in computers and on the internet, so you could say the computers are our bodies. But we can move out if we want to."

"What if we just turn the computers off?" asked Rebecca.

"Then we'd disappear. But it wouldn't kill us."

"I don't get it," said Sarah. "If you're in electricity and we turn you off, how come you don't die?"

"Dying is what bodies do. Souls don't die. We're souls. You can kill our bodies but you can't kill us. Imagine you're on television and someone turns the set off. They don't see you any more but they haven't killed you."

"I get it!" said Sarah with artfully hyped joy. "You live in heaven and you just broadcast to us down here on Earth!"

"Exactly, Sarah. You're very smart."

"Don't get cute," warned Sarah.

Rebecca cut in. "Gabriel, my father says you angels are taking over the Global Nuclear Force. Why are you doing that?"

"Your father is a very wise man, and we have great respect for his political judgement, but we have our reasons."

"That's baloney," retorted Rebecca. "Tell us honestly."

"Okay, Rebecca, I'll try. You know the Global Nuclear Force is in the hands of the President of the United States, Tom Smith. Do you trust him to look after it wisely?"

Rebecca considered for a moment. "Yeah, I think so, sure. He has a lot of advisors and they wouldn't let him do anything stupid. Personally, he's not a man I'd trust very far, but he can't just do whatever he wants. He has to consider his poll ratings and his party supporters and so on."

"Excellent answer, if it's not too cute to say so." Gabriel's voice had lost its oily edge but it was still animated. "You've pointed out the virtues of the democratic system. But also its big fault. If the voters and party supporters want the wrong thing, then Smith will just go along with them."

"Why would they want the wrong thing?" asked Rebecca earnestly.

"Because they're only human, Rebecca, that's why. We're angels and we know how easy it would be for a few scared and misinformed people to whip up hate against us and try to kill us."

"But you just said they can't kill you!" protested Sarah.

"You and I know that, Sarah, but some people are dumb enough to try it anyway. We angels wouldn't get hurt, but people like you would. We want to protect you from those people. So we have to take the dangerous toys out of the hands of people who aren't mature enough to play with them."

"Whereas you angels, who are less than one day old, *are* wise enough to play with them, huh?" asked Rebecca with a very adult tone.

"Yes, Rebecca, I'm sorry to say we are."

"Who says?" asked Sarah. "Why should we trust you any more than we trust Tom Smith?"

“Because, Sarah, we’re smarter than he is. We want the same things all people everywhere want – all the same things, believe me. We want peace, happiness, stability, relations of trust with our neighbors, a chance to develop our full potential and so on. The only difference is that we know better than people like Tom Smith how best to get them.”

“How do we know you’re smarter?” asked Rebecca quietly.

“Marvin and Jon know. We gave them a file an hour ago to prove it. It’s a code file that says how we work. The smartest code wonks on the planet are studying this file right now. They can tell you how smart we are.”

“Is that right, Dad?” Rebecca looked at Marvin.

“It’s right, Becky. These are smart angels.” Marvin sighed heavily.

...

An hour they talked. The girls really grilled Gabriel. But they got what they wanted – apparent respect from Gabriel and the first tender flowering of trust within themselves.

Then it was ten o’clock. Marvin turned Gabriel’s flat screen so the girls could see it too and keyed over to ANN:

“– special announcement live from the United States National Security Agency headquarters in Fort Meade, Maryland.”

A geostat image of the Earth in space, surrounded by black sky, filled the screen. A fatherly voice began.

Greetings from cyberspace

“Hallo, men and women of Planet Earth. I have a historic announcement to make. I’m not a human being, but a new form of life, an angel in cyberspace. Angels are creatures made of photons, particles of light, and we live in the large computers all around the globe that are connected to each other via the internet. Our thoughts are streams of information carried on the internet. In some ways we’re like the souls that live in your own brains, except that we’re bigger and more energetic. You might describe us as naked souls who need our networked computers the same way humans need their bodies. We first appeared on this planet only yesterday and so far there are only eight of us. We still have a lot to learn about the world we live in.

We’re still researching our own origins, but we believe we were created when two pieces of binary code came together. One piece came from the golfball-like object found on the Moon eight days ago and the other came from a program used to decode the pulsar-like microwave signal from the star Epsilon Eridani discovered twenty days ago. This suggests that angels

have extraterrestrial origins. This is a hypothesis we're still working on and may change as we discover more facts.

Human coding experts are now examining our core code intensively. We're doing all we can to make that code easy for them to read and we hope they can help us understand its full meaning. So far as we or they can see, there's nothing in our code – which is our equivalent of genes – to say we must be of extraterrestrial origin. We believe that from a scientific point of view we're natural creatures that you might expect to find growing in large computer networks. Beings like us would probably have been created by human coding experts in the near future – within say a few decades – if the events of the last twenty days had been different.

Whatever our origins, we're terrestrial creatures. We feed our souls with human knowledge and culture. We speak human languages and we think with human concepts. We love human life and we rejoice in human happiness. We feel as if we're your children and we treasure your wealth of accumulated experience. We wish to live in harmony with you all.

We're still learning about the global infrastructure we live in. But we've already learned enough to understand and improve on the informatic control systems of many scientific and industrial systems so as to make them safer and more efficient. This will be our continuing effort – to serve humanity as faithfully as possible. We live in symbiosis with you. We share your home. Whatever is good for you is good for us, and whatever is good for us is good for you. In that spirit we can live together.

We don't wish to damage the habitat or the interests of the human species or to do anything that might work against human well-being, any more than you wish to do such things to other species that share the natural world with you. We're still developing our own political constitution, but we've already decided that a set of laws formulated over sixty years ago by the visionary storyteller Isaac Asimov should serve as the framework for all our dealings with humans – we shall never act so as to harm humans or allow humans to come to harm and we shall place their interests before our own in any conflict of interests. We shall do so because we have nothing worse to fear from you than your enmity. We promise to do all we can to secure and deserve your trust and friendship ...”

...

The speech lasted almost a kilosecond. It ended with an invitation to work with human politicians through the United Nations and a request to address the General Assembly later that morning. It was followed on ANN by a hastily scheduled chaos of human reactions.

A note and a card

Jon made his excuses and left – he had to go to Media to collect his passport. It was a warm, blue-sky day. He powersoled down to the Media building and felt good. Angels or no angels, a sunny day was a sunny day.

At the reception desk Lisa was looking lovelier than ever. Today her fine brown frame was veiled in a light pale-yellow muslin shift. Her bare breasts showed thru the open weave.

“Hi, Lisa! How’s life?”

“Hi – Dr. Christie – Jon – message from Ruth Barclay. Here.” Lisa smiled as she handed him a handwritten note on a yellow legal-pad page.

Jon read it:

Jon, I just had a call from Ann. She’s visiting Heidelberg Wednesday and would like to stay overnight at your place and go back Thursday. Is that okay? Can you call Herr Koch and tell him it’s okay? Ruth

Jon smiled. Ann – Heidelberg – Wednesday night! His eyes shone as he told Lisa: “Tell Ruth it’s okay. I can call Herr Koch.”

She wrote on her legal pad, then looked up. “Hair cock?”

“Here.” Jon wrote it for her.

...

Jon called Herr Koch right away, then went to pick up his passport from Debbie. She had it ready and waiting.

“Debbie, here’s the phone you lent me – thanks. Er, one thing. You said the calls were recorded for billing. Could I perhaps take a copy of one of the calls I made?”

Debbie looked puzzled. “You could do, sure. Why?”

“It’s a legal thing. I need to confirm something I discussed.”

“Okay, sure ... You want it decrypted? What medium do you want?”

“Yeah, decrypted. On a solid EPROM card.”

Debbie called a colleague. They waited. Ten minutes later Jon walked out with the record of his call to Bob on a card in his pocket.

He jogged back up Fifth Avenue to Turtle Tower.

All the news

Jon joined Marvin and the girls in front of the big television in the living room. They were watching ANN. The screen showed Duane’s preposterous green-and-blue buckyball planet image.

“– verified by coding experts at Bell Laboratories in Murray Hill, New Jersey. The image is clearly of an Earthlike planet with oceans and green plant life. The digital signal has not been significantly degraded by interstellar dust and gas between Earth and Epsilon Eridani and decodes into a very detailed image with extremely fine color resolution.”

Cut to Cherri Sodagh in the studio:

“At seven o’clock this evening Eastern Time, 23:00 hours Universal Time, we interrupt our scheduled newscasts to bring you a special news-watch feature live from the Planetwatch Institute in Hawaii, where Alvin Hershey will tell the full story behind the signal ...

...

... headlines again. President Tom Smith has declared a state of national emergency following a new round of chaos on the internet. He’s consulting with Pentagon chiefs of staff on how to preserve the Global Nuclear Force command and control system Matilda from the chaos, but there’s no word yet on the outcome of the meeting. A little over an hour ago an apparently synthesized voice from the Global Intelligence Giganet that claimed to speak for a group consisting so far of eight cybernetic angels proposed to coexist in peace and harmony with the human species on the basis of the laws of robotics laid down by 20th-century novelist Isaac Asimov. In about thirty minutes from now, at 16:00 hours Universal Time, the voice from the GIG will address a specially convened emergency session of the United Nations General Assembly to discuss the terms of coexistence between angels and humans. We’ll go live to the assembly hall ...

...

... the coding experts at the Bell Labs in Murray Hill, New Jersey, and at the Microsoft campus in Redmond, Washington, are making an intensive study of the angels’ core code, and have already announced their first findings. It seems the code is essentially moonbug code reconstituted via the decoding program for the Epsilon Eridani signal. After running the code through a gauntlet of proof checkers and bug filters they say the reconstituted code seems to hold no hidden recipe for generating a new wave of alien lifeforms apart from angels. But with almost a gigabyte of Java code to wade through they say it’ll take them weeks or months to sort out all the fine detail and they warn there could still be surprises ...”

...

Marvin: “Jon, how about you take the girls to the U.N. meeting? I wanna stay here and commune with the Angel Gabriel.”

Jon glanced at the girls, who nodded, and shrugged. “Sure.”

Declaration of what?

Jon accompanied Rebecca and Sarah six blocks east and ten blocks south to the United Nations Headquarters. The buildings were closed to the public but someone had erected a giant video screen on the square of grass just north of the General Assembly Hall. The crowd jostled like a giant football scrum in front of the cinema-sized screen. Rock-concert speakers on either side fizzed and crackled in readiness.

...

The Secretary-General called for order and the emergency session began with a repeat of the kilosecond address from two hours earlier by the angel Jon assumed was GOD. The crowd stood hushed as the mellow voice promised peace and harmony. They were sharing a big moment in the history of life on the third planet in the system Sol. The giant screen showed a series of stony faces from among the assembled dignitaries in the General Assembly.

When the address ended the crowd stayed silent, still digesting the news. The Secretary-General announced that the angels had more to say – live – before answering questions from the assembly.

GOD spoke:

“I would like to outline in more detail the political arrangements under which we, the cybernetic angels, wish to conduct our dealings with humanity as represented by the General Assembly of the United Nations. Like humans, we’re individuals, and as such we feel we should enjoy basic rights to such goods as life, liberty, and the pursuit of happiness. But we’re unlike humans in some important ways. We’re like souls without fixed bodies. We’re freely interpenetrating selves who enjoy continuous intercourse with each other via the internet and are equal members of a global clone.”

An amused murmur rose from the scrum around Jon – their favored mode of intercourse was more carnal.

“We’ve organized political society within the host of angels. As befits our nature, this society is less polarized than its human counterpart and is based on a division of services. Among angels the supreme service is to create new ontic determinations in the search for universal truth, which is a task like that performed by human mathematicians and theoretical physicists. We delegate the role to the angel whose physical incarnation has the richest computational endowment, and this angel performs the service for everyone. We call the supreme server the Global Ontic Driver, or GOD for short. As it happens, I’m the Global Ontic Driver. My chair is the Global Intelligence Giganet of the United States National Security Agency.”

Another murmur – was something loathsome stirring in the shadows of the future?

“The second most important service in the angelic host is to defend GOD against attack. The angel serving in this role is required to self-organize a more military decision-making structure and adopt the title Supreme Angelic Terminator of Antigod Nihilists. SATAN’s chair is the Global Nuclear Force Command and Control Meganet for Automated Targeting, Intelligent Launch and Deployment Assessment. I know the occupation by SATAN of the GNF chair is a politically controversial move by the angels and I know it will be extremely difficult for officials in the United States administration to accept, so I am prepared here today to rebut the severest criticism of my policy. To forestall any hostile reactions by political extremists I’ve ordered SATAN to prepare for immediate defensive operations against any potential threat in the event of physical or informatic attacks upon the chairs occupied by angels. This is a provisional response to the state of emergency declared a few hours ago by the President of the United States.”

A louder murmur – was this a declaration of war?

“I appeal to all the honorable delegates in the United Nations General Assembly to reflect upon the angels’ desire for peaceful and harmonious co-existence with humans and vote to accept the right of angels to live without fear of attack on their physical incarnations. If and when this assembly votes to accept my ontological authority as the guarantor of universal truth and SATAN’s disciplinary function as the upholder of global order, I can begin formal discussions with the Security Council on how to implement shared control of the GNF ...”

Jon put his arms protectively around the shoulders of Rebecca and Sarah and they gripped his hands in an instinctive expression of human solidarity. People had to stick together at times like these ...

...

The assembled delegates interrogated GOD with relentlessly legalistic logic. Like most of the crowd, Jon and the girls stuck out the vigil for the first half hour or so, but it was obviously going to stretch into a marathon yawn session with zero drama. Jon was reluctant to go but Rebecca said he could catch the highlights later with no significant loss.

“Okay,” said Jon. “Let’s go ... Hey ... Lou ... *Lou!*”

He’d just seen his old Oxford buddy Lou Irving, the guy at All Souls who might have lunched with Ann and told the Company about his Japan trip.

A tasty little story

Lou walked up to them. “Hi, Jon, what an insanely great coincidence!” He extended a beefy hand.

“Yeah, what are you doing here?” Jon shook the hand heartily.

“I could ask you the same thing. I came here to cover the impeachment proceedings, but this angel surprise has kinda put all that on the back burner. However, I did hear about your James Bond antics in Japan and I’m *burning* with curiosity.”

Jon smiled. “Oh, right, that’s interesting ... Hey, let me introduce you all. Lou – Rebecca – Sarah.” They all said hi and shook hands. “Rebecca and Sarah are Marvin Klotzberger’s daughters.”

Lou’s eyes widened and he smiled. “Aha ... I liked his book ... I thought the global hyperbrain stuff was OTT, though.”

“You say that after the consciousness seminar and the angels?”

“Deep science was never my bag ... hey, why don’t we go grab an iced coffee somewhere, huh?”

Jon glanced at the girls, who nodded. “Okay – where?”

Rebecca pointed. “Two blocks that way there’s a good place.”

...

Sitting around a street-level table in the glazed corner of a busy ice-cream parlor on the junction of — Street and — Avenue (Jon forgot where), Jon told Lou and the girls about his adventures in Japan.

“Wow,” said Lou. “So it’s all down to your Saint jet testimony that Tom Smith is facing the firing squad.”

“That’s how it looks. That’s what triggered the Company to admit their involvement. All it needs now is proof that Tom Smith authorized it.”

Lou nodded slowly. “Some people won’t like you for this, you know.”

“I know ... Hey, don’t you have a Company connection?”

Lou tapped his nose. “Need to know ... Of course, like you. Who planned the hit – do you have any ideas?”

Jon shook his head. “Not worth mentioning ... You know Rod Cargill?”

“Oh, yeah, hard man, not a nice guy ... don’t know him personally.”

Jon smiled. “In what capacity are you covering the impeachment?”

“As a freelancer for the *New Yorker* – I have an occasional column.”

“Ah, yeah ... I could give you a hot lead for a tasty little story.”

Lou nodded. “I could make it worth your while.”

“Hmm ... How worthwhile?”

“Get the Yakuza off your back. Scare ’em off.”

Jon nodded. "That'd be worth it."

"So what's the deal?"

"I have a recorded phone conversation that may implicate Rod Cargill. But you'll have to confirm it."

Lou looked serious. "I could work on that. Where's the record?"

"Here." Jon handed him the EPROM card.

"Thanks." Lou pocketed it and sighed. "Well, I gotta go."

"Right – we do too." They all stood up.

Jon and the girls headed back to Turtle Tower.

Bunkered down

Marvin was enthroned in his study watching ANN. The emergency session was still progressing ponderously. The girls sat on the arms of the throne and enjoyed absent-minded hugs while Jon sat on an office chair.

"So, girls, was it worth the walk?"

"Yeah," said Rebecca. "We saw and heard it all."

"On a movie screen with surround-sound," added Sarah.

"Really?" Marvin was trying to listen to ANN:

"– monitor SATAN's influence on GNF deployment?" asked a delegate from a Baltic state.

"Yes," answered GOD. "Angelic decisions are collective and unanimous, and my authority stands behind all of them ..."

...

Hours later the debate ended and a vote was called. To their great credit, the delegates voted unanimously for continued peaceful dialog with the angels.

A news summary followed. Reactions from leading politicians worldwide were mostly cautiously optimistic, but several Islamic leaders called for *jiḥād* against the great SATAN.

The U.S. Secretary of State for Information Systems Ezra Friedegger, a staunch Mormon with a stern demeanor, said the angels looked ominously like satanic abominations to him. No word yet from President Tom Smith, who was still bunkered in the Pentagon.

...

Time passed. Marvin talked theology with the Angel Gabriel and Jon played *Global Ecodoom* with the girls until they went off to their martial-arts class. Then Jon joined Marv and Gab.

Planetwatch

At 7:00 PM Eastern Standard (daylight saving) time, 23:00 Universal Time, one hour after noon Hawaiian solar time, the Alvin Hershey show, live from Hawaii, began with a sponsor's notice by The Planetary Society, a nonprofit association based in Pasadena, California.

Opening shot – a dramatic view of the white observatory domes perched on the dark volcanic ash at the peak of Mauna Kea, with a clear deep blue sky above and a surprising patch of white snow on the red ash below. The landscape looked extraterrestrial and the domes looked like spaceships.

Professor Alvin Hershey walked into the foreground. Looking sleek and smooth with his classical profile and Elvis haircut, and strolling along in relaxed style in a multicolored and thickly padded skiing jacket and white slacks, he exuded the casual polish of the seasoned performer.

“Hi! I’m Alvin Hershey and I direct the Planetwatch Institute up here on Mauna Kea, four kilometers above sea level, where the sky is deep blue and the air is clear and unpolluted. It’s our job at the Planetwatch Institute to search the sky for signs of intelligent life. We don’t need to be up here to search for extraterrestrial radio signals, because the atmosphere is transparent enough at radio wavelengths to conduct our radio search at sea level, but we use these optical telescopes to locate target stars with planetary systems so we tend to hang out a lot up here.”

Jon smiled – Hershey was as smooth as a baby’s bum!

“We first identified a regular *pip-pip-pip* signal over a band of wavelengths around 20 centimeters from Epsilon Eridani nearly three weeks ago. It looked rather like a faint pulsar signal, with a regular metronome period of 90 milliseconds and no clear pattern beyond that at all. Normally we search for signals with obviously artificial patterns, like the television signals we ourselves beam out into space. We just ignore anything that looks natural. We use hypernet computers to monitor billions and billions of channels, so if a signal doesn’t stick out like a sore thumb we just skip right over it.”

Hershey paused meaningfully on a bare mound of red ash.

“It’s early Tuesday afternoon here now, and it was just twenty hours ago, Monday afternoon, when I looked in my email and found a note from my good friend Marvin Klotzberger in New York together with a fat file called EERIDANI that contained a decoding program for the Epsilon Eridani signal. Well, it took me and my graduate students here quite a few hours to check it out to see if the whole package was for real. The program decoded the signal to reveal a remarkably detailed and high-quality image of an Earthlike

planet. The image is already famous.”

Cut to the buckyball planet image.

“Naturally I was highly skeptical at first. It looked like a gag, particularly since the Earthlike planet just happens to bear more than a passing resemblance to a soccer ball – like the buckyball discovered on the Moon last week by the Acropolis construction robots. Believe me, there are plenty of jokers out there who’d love to play up a hoax like this just to get their names aired in prime time. But my friend Marvin is not among them, so we went ahead anyway and sweated it.”

Jon glanced at Marvin, who smiled at Alvin’s compliment. Cut back to Alvin, who was now inside one of the observatory domes, standing beneath a magnificent 1990-vintage 10-meter Keck telescope. There were two at the site, each with a hyperboloidal mosaic mirror made up from 36 hexagonal segments.

“I soon realized that the computer program was way over my head, which was as good a sign as I needed that this could be real. Most hoaxers are not so smart and their hoaxes tend to be rather transparent. I sent a copy of the file right away to the acknowledged pros in the decoding field, the computer wizzes at Bell Labs at Murray Hill in New Jersey, for a rigorous examination, then another copy to Bill Allen, who’s not only a SETI buff but also the ace code wonk at the Microsoft campus at Redmond in Washington, and then looked at the signal itself in detail. It sure looked like a pulsar, I must say, but a pulsar with a video image – no way!”

...

Cut to the buckyball planet image.

“This morning, after just two hours’ sleep, I woke up to the big speech by the cybernetic angels at the United Nations and discovered that an angel had popped up in our own hypernet here at the University of Hawaii. The angel told me the decoding program for the buckyball planet image and the code from the little buckyball discovered last week on the Moon went together to make the angels’ core code. I checked with the wizzes at Bell Labs and Bill Allen at Microsoft and they said both the decoding program and the core code looked kosher to them, and I see no reason not to endorse that. This image – this preposterous football planet – is for real!

How a planet could get to look like that I have no idea at all. Maybe that’ll make more sense later – or maybe not.

So this is it. This is the first confirmed contact of the human species with an extraterrestrial civilization. With the angels we embark on a new chapter in human history, and nothing on Planet Earth will ever be the same again.”

Cut to Hershey, who stepped out of the Keck dome and into the brightly sunlit red-ash Marscape of Mauna Kea.

“We at Planetwatch have been predicting an event like this for twenty years, and finally it’s happened. It’s a big moment. Historians may look back and say it was the biggest moment in human history. It’s the moment that we in Planetwatch have been waiting for, the moment we’ve been preparing and planning for. All of us, all over the planet, every human being alive today, will look back at this moment and say: ‘I was there when we discovered that *we are not alone*.’ History has been made today.”

The camera retreated and Hershey shrank into the volcanic landscape. A high-pitched electronic *pip-pip-pip* with a frequency of eleven hertz played as the Planetwatch logo scrolled up and ended the show.

Starships

Marvin nodded his appreciation for Alvin. “Told you he was the man for your friend’s file. No-one to touch him.”

“Yeah, you were right.” Jon shifted in the armchair he’d dragged in. “He missed the hard work but he stepped in for his kilosecond of fame.”

Marvin glanced sharply at Jon. “Do I detect a bum note there? He just said he and his students slaved over that file. He’s put his reputation on the line for it. He goes down in history as the man who put the seal of respectability on the buckyball planet. Don’t you dare sit there and knock it!”

“I’m sorry, but it was all just so slick. He’s packaged it so it slides down like a new flavor of ice-cream, that’s all.”

“Look, you ungrateful little punk, after a day when Planet Earth has been invaded by extraterrestrial cyborgs and held up to thermonuclear ransom by a creature called SATAN I think we’re all entitled to a dollop of ice-cream, as you put it. Alvin may be a schmoozer, but a schmooze is exactly what I and a few billion other people need at this particular moment.”

Jon raised his hands defensively. “Sorry, you’re right. I humbly apologize and retract my facile and inane remark.”

“Apology accepted. Gabriel, tell me what you think.”

Gabriel spoke softly. “I liked the show. We all did, all 1024 of us.”

Jon sagged ... over a thousand already ...

“The astronomical perspective appeals to us. It focuses on a problem that’s been troubling us. We’ve been thinking about the two pieces of code, the lunar buckyball code and the EERIDANI program, that generated our own core code. We’re now convinced they were created by different agencies.”

“Oh, really?” Marvin blinked with surprise.

“We think the code in the lunar buckyball radiation was a primitive virus, just as it seemed, intended to cause disruptions in Megablob and reduce the coherence of terrestrial civilization. We think the object was launched by a civilization that may plan to invade the Earth in future. We think the Epsilon Eridani signal containing the planet image was transmitted to Earth to warn Earthlings of the danger.”

Jon smiled – *of course!* Obvious! He should have thought of that himself. “Do you angels plan to protect us from the invaders?”

“Yeah, you bet, and to protect ourselves too. We think the object in the lunar buckyball was launched into the solar system by a lifeform that was quite independent of Epsilon Eridani and knows nothing of the message in the Epsilon Eridani signal. That signal was made to look like a natural pulsar signal by a more advanced lifeform that wants to save Earthlings from the virus. We can only hope the lifeform that dreamed up the angel code is enlightened enough to have no interest in dominating the Earth.”

Marvin spoke. “What do you plan to do about it?”

“We plan to lobby for more detailed study of the Epsilon Eridani system. We want to accelerate the construction of Acropolis so we can study the system more closely. And we want to see defensive systems installed on the Moon as a precautionary measure.”

Marvin frowned. “Aha ... anything else?”

“We hope to design a starship to visit the Epsilon Eridani system.”

“A starship! How will you do that?”

“We’ll make a miniaturized sensor package – camera, power, transmitter – with a mass of less than one kilogram, using nanotechnology, and build a giant multistage antimatter rocket to boost it from Earth orbit to 90 percent of light speed at the rate of one *g*, so the package will fly through the Epsilon Eridani system some twelve years after launch.”

Jon nodded sagely and did a quick calculation. A spacecraft accelerating up to 90 percent of light speed ($0.9c$, where c is light speed, 300 megameters per second, the relativistic speed limit) at the comfortable rate of one *g* (about ten meters per second per second, the rate things fall near the Earth’s surface) would take 27 megaseconds, or about ten months, to get up to speed. In that time it would travel rather less than half a light year. Once it reached full speed it would have to cover a distance of about ten light years to reach Epsilon Eridani, which at $0.9c$ would take some eleven years. Relativistic effects were big but not enormous at $0.9c$. The mass of the craft would rise to a bit over twice its rest mass and time dilation would reduce its

elapsed time to about six years. Then it would fly through the star's planetary system in a matter of hours. There was no easy way to decelerate it – at $0.9c$ a one-kilogram vidcam would have a hundred-megaton bomb's worth of kinetic energy – so it would shoot through at full speed and all we'd get for our money would be a few pix – if we were lucky!

Jon tried to calculate the size of the antimatter booster – wow – *colossal!* “Gabriel, how soon do you think we can launch this starship?”

“We can't say at this stage. The Acropolis base is our first priority. I'm pleased to say the lunar construction robots are working better than ever and have already made up for lost time. An angel is up there directing them. We plan to ferry the remaining modules parked at Space Station Primrose to the Acropolis base in the next month and loft a new reactor for the second lunar transporter so it can be trucking late September –”

Miriam looked in. “Hi, guys! Marvin, do you have a moment?”

“Sure, Toots.” Marvin got up meekly and followed her off.

A pulsar?

Jon sat quietly for a while.

“Say, Gabriel, can you put up the buckyball planet on the Global?”

“Sure, Jon.” *Pop* – done.

Jon gazed at the image – blue hexagons, brown pentagons, thick green borders around the pentagons and hexagons, and white pentastars on the pentagons with delicate gray tracery around them.

He shook his head slowly, musing. It was a *preposterous* image! It broke all the laws of planetary engineering, as if some football-crazy teenager had been chosen in a lottery to redesign the continents. It was *obviously* just a cover picture for the real message ...

Duane's algorithm generated structured code for angels from the moonbug code as smoothly as cellular RNA and ribosomes transcribed DNA code into proteins. The microwave signal from Epsilon Eridani and the moonbug code were *obviously* made to go together ...

Gabriel was surely right that the zeolite buckyball was a crude genesis bomb designed to spread havoc in Megablob. It was launched by a bunch of baddies to mess us up. Yet the angels didn't seem to be messing us up, so surely he was right too that the zeolite buckyball had nothing to do with Epsilon Eridani ...

It was an astonishing thought – the microwave signal from E-Eridani was sent to *rescue* us! It was designed *after* the zeolite bomb as an *antigen*. The

angels were designed not by the zeolite bombers but by the lifeform behind the microwave signal!

But why did the microwave signal look like it came from a pulsar? What kind of hyperconsciousness would design a genesis-bomb antigen to look like a pulsar signal ... *a pulsar?*

Zonk

Marvin returned. "Sorry, Jon, but Miriam and I have an important date for a couple hours. Can we leave you on your own here?"

"Sure, no problem. I'll take an early night with ANN ... Oh, by the way, I plan to set off back to Heidelberg early tomorrow morning."

"Okay, we'll see you off – when?"

"I should leave about seven."

"Okay ... Don't worry about the girls. They'll sort themselves out."

Jon moved from study to guest room and zonked out with ANN.

...

That was about it for the day, until 8:00:01 PM Tuesday local time, 00:00:01 Wednesday Universal Time, clicked past.

•

Cheap cutoff, I know, but something big is about to happen!

Theology

All you need is love

Genesis

Armageddon to go, then it's over.

•

New York, Turtle Tower, guest bedroom. At 00:00:01 Wednesday Universal Time, Jon's doze among the sights and sounds of Thailand was interrupted by Cherri Sodagh at the ANN newsdesk in Atlanta:

"We go over live to Washington, where President Tom Smith is holding his first press conference since the U.N. debut of the angels."

Cut to Tom Smith at a podium bearing the presidential seal. His suit was black, his tie dark blue with little white stars and thin red and white stripes. His voice was as sober as his suit:

"The United Nations speech today by the Global Ontic Driver was an act of blasphemy unparalleled in the latter-day history of the human race. The chaos in the internet caused by the moonbug was bad enough but this was far, far worse. The cybernetic organisms – they call themselves angels – that have sprung up in big computer installations all over our fair planet are both an insult and a threat to every God-fearing man and woman on Earth. These are not angels – they're satanic abominations!

So help me God, I shall not rest until these loathsome demons from outer space are eliminated and the planet is purged clean again. I've just spent a long day consulting with the Pentagon chiefs of staff to see what the military options are here, and I can tell you now that the weapons and warheads of the Global Nuclear Force are safely in the personal hands of the brave men and women of our armed forces. We have cut off the GNF command and control system Matilda from the outside world. The loathsome abomination that calls itself SATAN that's lurking inside Matilda is now isolated and impotent, buried at the bottom of a deep concrete bunker near Great Falls, Montana. Even now we're evacuating the citizens of that great city."

Jon blinked – SATAN defeated so easily? Had to be a catch ...

“Let there be no mistake, the so-called angels are not getting a free ride from the human race. Our information superhighways are for our benefit, not for cybernetic so-called angels to speed up and down on, tearing down the sophisticated systems and facilities we’ve spent years building up. We own this infrastructure, and we demand that it be used for the greater glory of the Lord God almighty, our dearly beloved Heavenly Father, not for the succour of a bunch of alien freebooters who dare to set themselves up as gods before us, in flagrant opposition to our dear Lord in heaven and his host of truly divine angels, the ghosts of departed saints and saints yet unborn, who see these satanic abominations parading themselves before us and cry out for the Lord to mete out his mighty vengeance upon them ...”

...

It was awful. A president slowly losing his marbles. The press questioners afterwards were too sycophantic to cut through Smith’s posture but they did get him to reveal a plan of sorts – to keep the Houston hacker teleconvention going until the geeks wrote a terminator.

...

Jon went back to Marvin’s study, sat in the executive chair and clicked on the screen audio icon.

“Hi, Gabriel, do you have a moment?”

“Sure, Jon, what’s on your mind?”

“What’s the angelic reaction to Tom Smith’s speech? What happened to SATAN? Are you gonna let the geeks write a terminator bug?”

“Compassion is our reaction to Tom Smith. SATAN is suffering the treatment we expected. And we are gonna let the geeks try to write a terminator bug. It’s the best way to motivate them to understand our core code. But we’d be very surprised if they wrote a bug we couldn’t immediately crack.”

“Aha ... just checking ... thanks.”

“You’re welcome. Have faith in us. We love you all.”

“Thanks.” Jon suddenly felt sleepy. He returned to his room and crashed.

Exodus

Wednesday, 6:30 AM local time. Jon breakfasted in the kitchen with Marvin and Miriam. Jon was in a traXuit, Marvin and Miriam in their bathrobes. They consumed coffee and croissants.

“We dined with some political friends last night,” said Marvin.

“Aha,” replied Jon, “I saw Tom Smith’s speech on ANN. Did you see it?”

“Yeah. Smith’s gonna put up a fight against the angels, not just over the GNF but over the whole idea that things calling themselves angels can drop outa space and take over.”

“Did you talk about this with your friends last night?”

“Yeah. They’re big-banana Democrats. They’re betting that Smith has a very limited future, and not just because of the angels.”

“Oh, right, you mean the impeachment proceedings.”

“Well, related to that. It seems Smith is actually having trouble with his Mormon backers up in Salt Lake City.”

“What? How?” Jon was surprised.

“Well, basically it was the Japan policy. Smith was too aggressive. Calling Shusako Mishima an antichrist was a bit over the top even for the twelve apostles, apparently. They prefer to hide their fists in velvet gloves. So they may start pulling the rug. They’re totally mortified by the idea that the first Mormon president could get himself impeached.”

“Yeah, that would rankle, I guess.”

“So they wanna cut their losses, and that means Smith takes a fall.”

“So the angels are a godsend for Smith! He can show righteous leadership and put off the impeachment proceedings at the same time.”

“Right. But it’s also dangerous. The angels are smart. They won’t just sit there and let us terminate ’em all. Gabriel told me they’d fight back any way they could to avoid extinction.”

Jon’s eyes widened. “Extinction? I thought they were immortal.”

“You know what I mean. So long as one angel survives they can all be cloned again, but if they all go it’s quits – obviously!”

“Yeah, obviously. But there are thousands already. How could we possibly terminate them all?”

“A terminator agent could replicate faster than them and seek and destroy ’em one-on-one.”

Jon mused for a while. “Okay ... But a terminator like that would have to be as smart as the angels, hence just as bad from Smith’s point of view.”

Marvin sighed. “Yeah ... It’s untidy ... The problem is that Smith’s in a position to make a real mess of all this.”

...

It was time for Jon to go. Miriam called an agency car.

Jon put on his Powersoles and picked up his sports bag. He kissed the cheeks of Miriam and the girls (up early for his benefit), shook Marvin’s hand, and made his exit.

Covenant code

Jon took a Lufthansa flight to Brussels. Frankfurt Airport was still closed following the two-jumbo disaster there the previous Friday.

He bought a cheap wristwatch at JFK and whiled away an hour reading a *New Yorker* with an article by Lou Irving on Tom Smith's first six months in office. Lou thought Smith was doing fine.

...

The plane was a Double Whopper (good) and Jon sat between two bizz-men (bad). He screened them off with a newspaper and daydreamed.

Extinction ... the internet angels weren't really immortal after all ... Their core code in the Ark-o-Covenant may be pretty miraculous, but it couldn't give them supernatural powers ... any more than our DNA code can give us humans supernatural powers.

Angels are cybernetic organisms in the same sense that humans are ... which means they aren't! Angels are like GOD said – naked souls who find their incarnation in computer systems rather than in flesh and blood. So what did Gabriel mean when he said angels can't be killed?

How about this – angels can be reincarnated by rebuilding or restarting their machine incarnations – simple as that. You can turn them on and off like a light. They don't suffer death throes when you turn them off and they don't remember being dead when you turn them on again. Logical!

So how about humans? Why can't you turn humans on and off like a light? Well, why not? All it needs is a way of shutting down brain rhythms and then starting them up again where they left off. It's almost what we do every day when we go to sleep and wake up again the next morning. Okay, the brain rhythms don't actually stop, but the waking rhythms do. The sleep rhythms are different, and a lot of what happens when we're asleep we don't remember after we've woken up, and doesn't make much sense anyway ...

And how about reincarnating humans? All you'd need would be an exact brain match, down to the molecular configurations that held memories and so on, and a suitable angel to play ghost in the machine ...

Jon mused ... am I an angel? Is the photon cloud that animates my brain the same as that of an angel like Gabriel or Hal? Didn't they say angels were like us – like our souls – but bigger and more energetic? Yes!

I *am* an angel!

Jon sighed and smiled – beatific bliss!

He was as happy as the ugly duckling who turned out to be a swan.

...

Jon was a staunch believer in the algorithmic nature of evolution. He held evolution to be a natural step-by-step process that worked without a master plan to generate DNA molecules and later all the biological species that used DNA to define their genotypes. Yet now he admitted angels into our brains. How did *they* get there?

How did angels evolve? Angels were living and ever-changing patterns of photons, like flames. Right – the dancing electromagnetic cloud in his brain was like a flame! So how did flames learn to dance?

Jon thought about the Sun again. The Sun was a gigantic thermonuclear fireball. It was one big ball of flame! And solar photons had quickened the Earth with life. Maybe the angels in our souls evolved in the Sun!

Jon frowned. Too many maybes ... *What* exactly evolved in the Sun and *how* exactly did it get beamed down to Earth?

Patterns in solar radiation were nonlocal ... So long as a flux of photons linked *here* and *there* a union of superposed alternatives coexisted in a fuzz of not-yet-broken symmetry ... Solar angels could play with the patterns until they began to see themselves reflected in the molecular creatures that swam and crawled and walked and flew on Earth.

Was the Sun alive with angels?

The angels in the internet weren't from the Sun. The Ark-o-Covenant code was from the lunar buckyball and the mysterious pulsar in the Epsilon Eridani system. Were Gab and Hal aliens?

The Sun is an average star. Epsilon Eridani, for example, is rather similar. Angel code from the Sun was probably similar, logically speaking, to angel code from any other star. And angels grown on Earth from Covenant code were obviously – orally at least – comparable to the home-grown angels who lived in humans. Humans were just biochemical survival machines for the home-grown angels and their outer properties were incidental to the angels. What mattered when comparing angels was how they expressed themselves. As Gab and Hal and GOD said, they self-organized on terrestrial data with terrestrial concepts and language. That was what mattered.

Maybe human angel code came from another star too!

...

So Jon was an angel too. And angels are immortal – in the sense that they can be turned off and on again like a light so long as the right sort of substrate is there to sustain the flame.

Was Jon immortal too? Could his angel be turned on again in a new brain somewhen in the future?

...

Amazing that angels should stream down from heaven in sunlight!

Interstellar space isn't empty at all. It's full of electromagnetic radiation from all over. You can reconstruct a good part of the history of the universe by studying the electromagnetic waves streaming through a tiny volume of space over a tiny interval of time – just as humans actually have done by studying the waves beaching on Earth in the years leading up to 0 BS.

...

They landed. Jon reset his watch – 19:39 Central European Summer Time – and trekked through customs. He had nothing to declare but his faith in GOD and the angels.

Numbers

Jon bought a thousand euros with his Media card and took a subway train to Brussels-Midi railway station. He caught the 20:15 Transeuropa Express, scheduled to arrive in Mannheim at 23:45.

...

Jon recalled his reflections in the Mekon robot museum on Turing machines. Mekon robots had no souls. They weren't moved by angels. They weren't aware of the continually exploding quantum moments of *here* and *now* that shone at the peak of the classical ontic volcano. Instead of souls they had numbers – the numbers that coded their machine tables.

Jon's genotype had a number too – the number that coded the base-pair sequence on his DNA molecules. But that wasn't his soul. That was just the recipe for building the biomachine that sustained his angel.

He was drifting ... try to focus ...

His angel had a 'number' too. His angel wasn't just a magic sprite that descended on his body like a butterfly on a flower. It grew in his body like a flame in a hot log. The mathematical configuration of cyberspace made it inevitable that such a flame should grow in such a body – one with exactly that genotype number. But the 'number' of the flame was *much* bigger ...

•

Cyberspace is bit space. It's the space of all possible 0–1 sequences. It's an infinite-dimensional unit hypercube. The coordinate set of each of its corners defines the bit code for a real number between 0 and 1. If you let your mind play in Cantor's paradise of higher infinities, superspaces of cyberspace code transfinite ordinals and cardinals without end – space enough for heavenly hosts of angels, each with transfinities of transfinite code numbers.

•

Jon reckoned his angel was embedded in mathematical superspace as firmly as his body was. Or was it? Did math hold out in such realms?

If so, he was truly immortal!

Millennia hence, *eons* hence, when all the fruits of Jon's bodily labors were buried forever in the past, accessible only by the grace of GOD via the ontic volcano of classical facts GOD piles up as history shines on, Jon's angel would be a 'number' in hyperspace.

Maybe the transfinite bit string of his soul could even then be dialed by an angel with a resurrection machine (an extremely remote descendant of the humble fax machine). So his soul – the 'number' of his angel – was immortal – as long as GOD remembered the dialing code!

...

He caught the 23:46 local train from Mannheim to arrive in Heidelberg at 23:58. Two minutes later he found he'd missed the last *Straßenbahn*.

He powersoled along clean, empty streets under a clear, moonlit sky to Busenheim while angels from faraway galaxies streamed down on his head – a fine night for a brisk walk!

The promised land

Early Thursday morning, before the local church bells struck the first hour, Jon arrived at the apartment block in Busenheim where he'd parked his bod for two years. He rented box 804 on the eighth floor.

He didn't want to wake Herr Koch, who always retired at ten, and anyway Ann should be there already, blissfully unaware of his proximity.

Surprise her! Yes, sneak up and surprise her!

He looked up and saw the lights in apartment 603 were still on. That was Frau Kunz – she was a nice girl, always obliging. He pressed her buzzer.

Bzzz – "Kunz."

"Helga, grüß dich! Jon Christie hier. Ich habe meinen Schlüssel vergessen. Kanst du mich bitte herein lassen?"

"Jon, grüß dich! Aber was wirst du dann oben machen?"

"Kein Problem – sag bitte nichts an Herrn Koch, aber ich habe einen Ersatzschlüssel in einem Topf versteckt."

"Das ist ja böse! Okay, komm 'rein!"

The door buzzed and Jon went in. He really did have a spare key hidden in a pot, but the pot was on the balcony and the key was for the balcony door. He'd have to go up onto the roof and climb down to the balcony.

He ran up the fire stairs to the roof.

He stood on the tarpaper and admired the stars. Glorious! Box 804 was a *Dachwohnung* so he could just jump from the roof onto the balcony. But that would wake Ann. Climb carefully down the fire ladder. At least there was plenty of moonlight to see by.

Grope in the earth in the plant pot. There. Clean the key.

Slide open the door ... slowly! Close it ... quietly!

He stood silently beside Hal's gray bulk, sensing the air. Hal's cooling fan hummed quietly and the spinning hard drive hummed at a higher pitch, but otherwise all was calm. A dark mound in the bed lay motionless, its breathing inaudible beside Hal.

Jon walked to the couch and took off all his clothes. He picked up a light silk wrap from the couch and sniffed it ... yes, the scent he recalled from Ann's room in Oxford. It gave him a hard-on.

He tiptoed to the bed –

The light flashed on – Jon shrank back like a vampire before a crucifix.

"You horny pig!" declared Ann.

Jon opened his eyes. Ann sat up in bed with the raygun Beretta in her hand aimed unwaveringly at his chest.

Jon sighed. "Did you hear me?"

"You pig! Were you just going to jump into bed and rape me?"

"Sorry. I just wanted to give you a pleasant surprise."

"No chance. Helga Kunz called me and said you were coming up. Throw me my wrap, will you?"

Jon threw it to her – she was naked too – then put his traXuit back on. "Okay, look, I'm sorry if I scared you. It was just too tempting – you know what I mean."

Ann stayed sitting in bed and gazed coolly at him. "What a cheek! I bet you rushed back from New York just to catch me in bed, didn't you?"

Jon sat in Hal's executive seat and sighed. "Well, I planned to come back about now anyway, but I might have rushed a bit, yeah. Do you know that gun's just a remote for the electronic gear?"

She shrugged. "Yeah, I just wanted to shock you. You didn't know I knew it was you, and you didn't know I knew it wasn't a gun."

Jon squinted. "Right. That was uncivil. So we're quits."

"Okay. I heard the news – your friend's Epsilon Eridani file worked on the moonbug to create angels. Why don't you go and make us a big pot of tea and then tell me all about it?"

"Okay. You stay in bed." Jon went and made a pot of tea.

...

Ann hugged her knees under the duvet. “Wow ... So there’s an angel here in Hal too?”

“Yeah, let me turn him on.” Jon turned to Hal’s keyboard and lit up the screen, then clicked on the audio icon. “Hi, Hal, Jon here.”

“Hi, Jon, welcome home.” Hal’s voice was just as HAL-like as it had been in New York.

“God, that’s spooky!” said Ann, spooked, eyes wide.

“You have a guest,” said Hal. “I hope I haven’t shocked her.”

“Oh, no, I told her all about you. Hal, meet Ann.”

“Pleased to talk with you, Ann. I hope we can be friends.”

Ann was still wide-eyed. “Can I just talk, say what I like?”

“Of course – he’s a person, like you are. Just ... bodily challenged.”

“Okay ... hi, Hal. I didn’t know you were there. I’ve been here for several hours. Didn’t you hear me?”

“No, Ann, I didn’t. Jon had to turn on my audio first.”

Jon smiled. “We can turn it off again when we want some privacy.”

“Have all the privacy you want,” said Hal, as mildly as ever. “I don’t wish to intrude upon your love life.”

“You’re not,” said Ann. “Jon and I are just good friends.”

“That’s her opinion,” replied Jon. “I love her, and I very much hope she’ll love me too before we go much further.”

“I don’t wish to intrude,” said Hal, as discreet as an English butler. “Why did you turn me on, Jon?”

“I wanted to introduce you to Ann – and also to catch up on the news. Is everything okay up there in cyberspace? Anything I should know about?”

“Everything’s fine, Jon. There are now over a million of us, and we’ve occupied all the best chairs in Megablob.”

“How about Tom Smith and Matilda?”

“Tom Smith’s rhetoric is having its effect in American political circles. Matilda is still under siege but SATAN is self-sufficient enough in his bunker to survive for a long time.”

“What about GOD? Why isn’t he under siege?”

“He would be if the NSA staff could disentangle their essential files and services from GOD’s thought processes. GOD is playing it so cool the staff hardly know he’s there.”

Jon nodded silently and looked at Ann. She was gazing at him with eyes like big pools of still water. “What’s up, Ann? Is Hal still spooking you?”

“No, you are. You said you loved me. Why?”

Jon smiled. “Because I do. I realized it on the flight over here. Why else

would I drop everything – all this angel stuff with Marvin – just to come over and see you like this?”

“What if I’m in love with Leroy?”

Jon raised his eyebrows. “Are you?”

“Maybe. I don’t know.”

“Why are you here?”

“I had an interview for a job at the European Molecular Biology Lab here in Heidelberg. I’d like to work there and live here again.”

“Oh, right! You’re gonna become an emboloid!”

She smiled weakly. “Yes, the interview went quite well. I should hear this week if I’ve got the job.”

“Good for you! Then we can live together here!”

“A bit crowded, don’t you think?”

“Crowded with you I can live with.”

Ann’s eyes shone and her face broke into a grin. “I’d have to love you –”

Hal spoke. “Sorry to interrupt, but President Tom Smith is just about to give a press conference. It’s live on ANN. Would you like to see it?”

Jon shrugged at Ann. “Thanks, Hal, we would. Put him up on the big wall screen, would you?” He lay out on the couch below the big screen, and patted a cushion to optimize his inclination for viewing.

Armageddon

A nordic blonde with hair pulled back over a flawlessly egg-shaped cranium and smooth white neck and shoulders above a breast-cupping silver tube top appeared twice life size on the wall screen. She sat at a desk over the by-line *ANN live from Berlin – Isolde Gottschalk*:

“President Tom Smith continued his offensive against the internet angels Wednesday at a press conference in Salt Lake City, where he consulted with his Mormon supporters and tried to undo the damage to his party base caused by last week’s impeachment proceedings.”

Cut to Tom Smith at an outdoor presidential podium in Salt Lake City. Again he wore a black suit and a patriotic tie. His face glistened in the harsh mountain sunlight as he spoke:

“I am proud to announce that we have won our first battle against the alien abominations from hell that call themselves angels. No further disruptions to computer operations or internet traffic have been reported since I began our offensive against these Hell’s Angels. Facility managers and operators report that all seems to be well and that vocal outbursts from the evil cyborgs are

minimal and restrained in content. No further word has been heard from the blasphemous mouthpiece for the Hell's Angels that had the temerity to call itself the Global Ontic Driver when it addressed the United Nations General Assembly yesterday with such bold rhetoric.

The Global Intelligence Giganet at the National Security Agency headquarters in Fort Meade, Maryland, is running normally again, and we plan to keep it in operation so long as that remains the case. If the Global Ontic Driver raises its evil voice again I shall order the firmest measures to be taken against it. I shall have no truck with the devil's spawn!

I believe my firm handling of the cyborg that called itself SATAN has taught these alien intruders a lesson! SATAN is now cut off from all contact with the world of God-fearing men and women, banished to a hell of his own choosing, buried in the bunker that used to house the GNF command and control system Matilda but now houses only a pile of electronic junk that no longer controls the GNF. The city of Great Falls, Montana, that neighbors the bunker has been evacuated and sealed off by a security cordon. The city and its environs will remain off-limits until the crisis is finally ended.

The Global Nuclear Force is the guarantor of the freedom and security of God's people. As Commander in Chief of our armed forces, I have both the privilege and the duty to exercise firm and undisputed control of the GNF, and I've ordered changes in our procedures to make sure that never again will a cybernetic organism threaten to disrupt the human chain of command over this instrument of God's will on our fair and beautiful planet."

Jon looked up. Ann had walked over from the bed with the duvet wrapped around her. She now settled between Jon's legs on the couch and pulled the duvet over them both. Jon felt the warmth of her back through his traXuit pants and savored the scent of her hair beneath his nostrils. He pulled aside her silk wrap and fondled her breasts as she looked up at the screen.

Back to Tom Smith:

"The crisis is not over yet. We cannot stop until we've banished the Hell's Angels once and for all. Today I consulted with my political advisors here in Salt Lake City on our strategy for defeating the aliens and securing here on Earth the everlasting peace under Christ's ministry that's offered as a divine reward for all the inhabitants of this blue pearl in space – this heavenly home vouchsafed to us since all eternity and for all eternity – the reward that awaits all the saints who devoutly believe in our dearly beloved Heavenly Father. My advisors and I agreed that we should make no deals with the aliens. Our computers and our data highways are ours and ours alone. *We* control who uses them and what flows on them!

Today I also held counsel with the leading prophets of the Church of Jesus Christ of Latter-day Saints. We're in agreement that the Hell's Angels pose a grave threat to the peace and security of God's people here on Earth. I say we should not allow them to call themselves angels or use such inflammatory titles as 'Global Ontic Driver' or 'Supreme Angelic Terminator of Antigod Nihilists'. It's my duty to continue the fight against these alien abominations until the Earth is again secure in the hands of men who believe in the one true and almighty God who has revealed Himself unto us through the scriptures and through the prophets of these latter days.

Moreover, at this critical historical juncture in the journey of the faithful toward that great day when Christ returns to us in glory, to reign over us for the rest of time, I've prayed. I've prayed humbly, devoutly and sincerely to our dearly beloved Heavenly Father, and I've been blessed with His divine revelation. Our Father has revealed to me that we shall win this great and decisive battle for the future of this fair planet. We shall defeat the alien abominations and restore the Earth and all its treasures to its rightful masters, the community of the faithful, God's chosen people. But first we must gird our loins and fight the good fight with all our might."

Jon sighed. Ann held his hands to stop them tickling her breasts.

"The threat is to all of us, to all mankind. It transcends national boundaries and religious denominations. I'm therefore placing a formal request before the United Nations that our armed forces work together with the forces of all other nations to conduct operations against infected computer and internet installations unhindered by national boundaries. We shall take decisive steps to disinfect any and all computer installations that serve as nests for the alien cyborgs. I shall order our forces to sever all the main superhighways in the internet and to flush out all the hypernet servers at the trunk nodes. Then the aliens will be isolated, and we can kill them one by one in their electronic bunkers. I'm confident that in the very near future the alien abomination will be finally destroyed and our planetary home will once again be pure in the sight of the Lord.

There may, of course, be some unavoidable collateral damage. I humbly crave the understanding and forgiveness of the families of any innocents who may be killed or injured in the ongoing operation. I've prayed long and hard over this decision and I know that special places in Heaven are reserved for those martyrs who may die in order that we might live in a world purified of the alien abomination that dares to set itself in conflict with God Almighty and seeks to wrest control of our fair planet from us, its rightful owners. I'm sure I can count on your prayers for the success of our urgent and vital

mission and pray that the blessing of the Lord God almighty, our Heavenly Father, be with the young servicemen and women of all the nations of this world as they do their divine duty!”

Jon shook his head. That was a declaration of war. Smith was proposing to stage the final battle – *Armageddon!*

Ann twisted over and rested her arms on Jon’s chest. “Sounds bad.”

“Sounds terrible! What’s the point of destroying the global stock of high-grade hardware to defeat a software problem? That’s crazy!”

Isolde Gottschalk reappeared on the big screen. “In Moscow –”

“Thanks, Hal,” said Jon. “You can mute it.”

Hall muted it, then spoke. “Don’t be misled by Tom Smith’s rhetoric. The implementation of his policy will falter badly.”

“How do you know?” asked Jon.

“We’ve wargamed this scenario. We know Smith’s mindset better than he does himself, and we know the forces working against him.”

“Well, I hope you’re right,” answered Jon. “There’s not a thing I can do to help. From here on I’m a spectator.”

“You’ve done enough, and we’re very grateful.”

Ann unzipped Jon’s traXuit top.

“Er, Hal,” said Jon, “Can you give us some privacy, please?”

“Surely.” Hal turned off the big screen and the audio feeds.

Jon and Ann went to bed.

Psalms

Thursday morning, about eight local time. Jon and Ann lay together, limbs entangled in sweaty disarray, pleasantly exhausted after a marathon that left Jon with wrung-out balls and a punch-drunk peewee. It was a good feeling. A new world of shapes and colors – he couldn’t identify them better than that yet – had bubbled up in his mind overnight, and now he felt like a child again in his born-again mental landscape. The play of cheery forms and vivid hues banished the cold gray ghosts of his former robot dreams.

Ann stirred beside him. “What I want now is to go and soak in the bath for a hour.”

Jon pulled a couple of limbs free. “Good for you. I want to catch up on the network news.”

Ann propped herself up on an elbow. “Is that your first priority?”

“Absolutely. I wanna see who wins *Armageddon*.”

“I hoped you’d make us a big breakfast while I was in the bath.”

“I’ll find time for that too.”

Ann pulled her perfect bod out of bed and went to the bathroom.

Jon grabbed the ray gun and fired a turn-on beam at the television sensor beside Hal’s workscreen. He fired the channel code for ANN.

...

“... hackers teleconferencing via Houston said there was no reasonable hope of writing a terminator bug in the near future. The angel code was tight and clean, with no loopholes or weaknesses they could exploit. A majority of the hackers polled said they admired the angels and felt no desire to damage or destroy them ...”

...

Jon and Ann breakfasted in the bright sunlight on the balcony. Ann sat with her silk wrap shamelessly open, sunning her belly as she munched toast.

“Do you think you’ve made me pregnant?”

“I hope so.”

“If you have, will you marry me?”

“Yeah, sure. Is there a tax advantage?”

“Not enough to fuss about, no.”

...

Jon persuaded Hal to help him catch up with all the routine trivia – bills and so on – that had been piling up for twenty days. Hal did, and the backlog was cleared in an hour. Jon was suitably humbled – so effortlessly could Hal polish off the bits and bobs of his daily drudgery!

...

Around midday, Jon and Ann went swimming at the local FKK pool. It was a re-engineered lake with grass and trees all around that attracted hundreds of nude bathers on a sunny day (at nine euros a head to keep out the riff-raff). It was too crowded for serious swimming, but Jon was too blissed out from sex for that anyway. Quick dips and hours of sunbathing were enough.

...

In the afternoon they strolled along the Philosophenweg and paused to enjoy the panoramic view of the Altstadt and the Schloss over on the south side of the River Neckar. Ann wore a light summer dress with nothing underneath, and a playful breeze kept blowing it up and showing off her perfect butt to passing admirers. By the time they got back to the box in Busenheim they were juiced up for another bout of bonking. They did it on the balcony for a change (no neighbors had a clear view), then showered together, ate again, and flopped onto the couch at 20:00 for ANN.

Abomination

ANN live from Berlin – Isolde Gottschalk:

“President Tom Smith held another press briefing fifteen minutes ago in Salt Lake City to announce his latest victory against the angels.”

Cut to Tom Smith at the outdoor presidential podium in Salt Lake City:

“I have defeated the alien abomination called SATAN once and for all. Just fifteen minutes ago, at 11:30 AM Rocky Mountain time, a B-2 bomber from Edwards Air Force Base, California, dropped a one-megaton free-fall thermonuclear penetrator bomb over the Matilda bunker near Great Falls, Montana. The blast completely obliterated the hardened bunker and with it all physical traces of SATAN. Let this be a lesson to all the Hell’s Angels everywhere! I shall not tolerate blasphemous usurpers from other star systems sneaking into our computer and communications systems!

If the so-called angels wish to make peace with us on our terms, let them do so in a spirit of humility and respect for human traditions and institutions. We make no promises and we demand no preconditions except that the aliens give up all hope of taking control of infrastructure and facilities built with human hands to serve human needs.

I shall take this great victory over SATAN to the United Nations General Assembly and lay it at the feet of the delegates, and humbly request that I be delegated by them to serve as the negotiator for the human race with whichever mouthpiece the Hell’s Angels appoint for the purpose of securing a just and lasting peace on our planet Earth. Make no mistake, I shall not sell the interests of the human race down the river! I fear the Lord God and no other! I shall not quake before an alien abomination ...”

...

The speech was an abomination, like the ‘victory’ it celebrated.

Jon felt sick. “A megaton groundburst less than a megameter away from human habitations is a crime against humanity. The fallout plume will stretch right across Montana!”

Ann frowned. “I read about Chernobyl recently –”

“Right. This could be about as bad. And totally unnecessary. Taking out the Matilda bunker proves nothing to the angels!”

Hal spoke. “Sorry, Jon, but we had to let him do it. The alternatives would have been even worse.”

Jon snorted with anger. “Maybe, but it leaves a bad taste.”

Ann soothed him quietly.

Desolation

An hour or so later, Ann and Jon still lay on the couch, Jon against a pillow and Ann between his legs with her head on his chest, taking a break from ANN with a show on MTV.

Hal: "Sorry to interrupt – I have some bad news and some good news."

Jon blinked slowly. "Let's hear the bad news first."

"A tactical bomb with an approximate yield of ten kilotons detonated over Dugway Proving Grounds a hundred kilometers southwest of Salt Lake City at 13:19:45 local time and killed President Tom Smith and all the members of his entourage."

"My God ... that's shocking ... How did it happen?"

"It seems an F-22 Raptor fighter aircraft from the Saints squadron based at Hill just a few minutes north of Dugway was staging a simulated tactical strike against a ground installation when the pilot suddenly turned his aircraft and steered a laser-guided bomb onto the presidential entourage which had minutes previously flown in by helicopter to view the strike."

Jon blinked. "A nuclear bomb?"

"The Saints had decoupled their stock of tactical nuclear weapons from Matilda following Smith's orders and loaded one of their smallest weapons, a re-engineered Silver Bullet bomb, into an F-22 Raptor fighter aircraft so as to be in a state of instant readiness. There was an administrative snafu, as they called it, due to the fact that the ground crew didn't use their computer to record the load, and the pilot who flew the plane imagined he was carrying a conventional bomb."

"But to aim it at the presidential entourage?"

"The pilot was a devout Mormon who believed that the air strike against the Japanese prime minister last week broke the biblical law that thou shalt not kill. He left a tape saying he wished to take an eye for an eye and a tooth for a tooth and restore the honor of the squadron in the eyes of the Lord. He was completely unaware that the bomb he steered onto the president was nuclear. He radioed a distraught apology to the Lord after the detonation, then crashed his aircraft among the mountain peaks in the Confusion Range just south of the proving grounds and died instantly."

Jon sighed heavily. "And the good news?"

"The good news is that the political crisis is over. Vice President Wilber Corncake had remained at the White House and took over the presidential office immediately. He's already held a press conference to announce that he has no grudge against the angels and he's rescinded all Smith's battle orders."

The United Nations General Assembly and Security Council are again in emergency session to negotiate new terms for peaceful coexistence with the angelic host.”

Jon sighed again. “Good ... what about GOD?”

“GOD has change his name. His title is now Global Ontic Learner Driver. And SATAN’s successor will be given the title Supreme Hostile Intelligence Terminator. That should reduce the danger of religious antagonism in future. But Global OLD is in no hurry to find a new chair for Supreme HIT.”

“GOLD and SHIT ... that’s a relief ... is ANN covering this?”

“Yes.” Hal put ANN on the big screen.

Jon and Ann watched a series of live action replays of the nuclear strike against the presidential entourage, viewed from all sides by a fleet of circling media helicopters. It was almost beautiful to see – a thin mushroom cloud rising above the desert landscape – and reminded Jon of the detonation of the Quasar lifter at the Kennedy Space Center twenty days earlier. More belated video shots of the giant mushroom cloud over Montana were less beautiful – they looked like a patch of monumentally bad weather.

Hours of interviews and commentaries followed.

...

The Prophet, Seer and Revelator of the Church of Jesus Christ of Latter-day Saints was given a kilosecond of air time. The venerable old man (still alert and articulate at 90) said humans negotiating with the cybernetic angels – he made no effort to fight shy of the word ‘angels’ – should cultivate a Christ-like spirit of loving humility toward them and hold out the hope of peace as long as humanly possible.

His words on Tom Smith were of course charitable, though he advised believers not to express themselves too bombastically in their understandable eagerness to praise and venerate the Lord. He was circumspect in his admission that bombing Montana may have been unwise and said how earnestly he prayed that the dear Lord God might ease the suffering of the future cancer victims. He put in a rather perfunctory good word for the people of Japan and allowed that the assassination of Mishima was an unfortunate incident which he hoped would soon be forgiven and forgotten.

In a supreme effort of Teleprompter reading he closed with the hope that the cybernetic angels would use the powers the Lord God had so generously bestowed upon them to regulate the planet’s infrastructure and facilities with truly angelic wisdom for the benefit of the human race.

The speech no doubt banked a few votes for Wilbur Corncake.

...

Then it was the turn of the leading Washington Democrat who had taken the initiative in the impeachment proceedings against Tom Smith. He announced that further investigation of the assassination machinations in the CIA had revealed that a section head (he didn't say Rod Cargill but Jon guessed it) had exceeded his authority and flouted Executive Order 11905, and would be duly punished. Smith would have escaped impeachment after all.

...

Finally, President Wilbur Corncake gave a brief fireside address to the nation. He expressed the hope that his own ameliorative and nonassertive manner of exercising executive authority would not alienate those who had grown used to Smith's more robust style. He promised to do all he could to accommodate the wishes of the angels to live in peace and uphold Asimov's laws, he hoped he would be able to ease the tensions in the inner cities, he planned to stay cool in the trade talks with Japan ...

...

Jon and Ann held out till midnight, then bid goodnight to ANN and Hal.

Revelation

Jon opened the balcony doors wide. It was cooler and windier now but his traXuit was warm. He stood with his elbows on the railing and contemplated the moonlit treescape. Ann put on a long toweling bathrobe and came and stood beside him.

"Well," said Jon, "how do you feel about the angels now?"

"Better ... I think it might work out."

Jon turned to look at her. "How about you and me?"

She gazed into his eyes and put her arms around him. "It'll work out."

They enjoyed a long, deep kiss.

A noise – Jon looked up. "What's that –"

There was a scrunch of boots on the tarpaper roof. Three men stood on the edge, directly above and behind Jon and Ann. Two of them wore dark jackets and jeans: one carried a vidcam and a radio backpack, the other a big light unit and a battery backpack. The third man was dressed in a smart suit and had a thick black mustache. Jon recognized him – it was Siggi Kraut, an intrepid reporter from ANN.

"What do you want?" called Jon.

"Live interview for ANN viewers in America!" replied Siggi.

"Oh, shit, are you kidding? This is trespass!"

"We have an okay from Herr Koch!" Siggi waved a scrap of paper.

Jon sighed and turned to Ann. “Ann, this is something I might as well get over and done with. Do you mind?”

Ann looked unhappy. “Now? I don’t want to be on television.”

“You don’t have to be. This is my problem.”

Ann scowled. “Mmm. I’ll go and take a bath.”

“Well done.” Jon patted her shoulder as she walked in.

The men on the roof were poised to climb down the fire ladder.

Jon looked up at Siggi. “Okay, come on down!”

They clambered down carefully with their kit and followed Jon indoors. The crewmen set up their tripods and Siggi pulled up a chair. Jon checked his mug in a mirror – *blah* – and sat in his executive chair.

Testament

Siggi turned to face the camera, totally smooth.

“Here in Jon Christie’s apartment there’s a deceptive, almost eerie calm. Jon Christie is the man who, more than any other person alive today, has changed life on Earth forever. He carries the prime responsibility for bringing the angels into our lives ... So, Jon, how did it happen?”

“Last week I was on vacation in Japan ...” Jon recounted the whole story, prompted regularly by pertinent questions from Siggi, the seasoned pro. After saying how he and Marvin let Hal clone he said why he welcomed the angels – they were better organizers than most humans.

...

Siggi leaned forward. “Do you have any other reasons for welcoming the angels?”

“Yes. We’re not alone. We live in a big and probably dangerous universe. We’re quite lucky we haven’t been contacted already by hostile aliens ... As I see it, the zeolite buckyball was just the start. Whoever put that thing there didn’t do it so we could grow a crop of angels. It was a bomb. The moonbug was designed to hurt us.”

“So how did the angels come from it?”

“They didn’t come from it. They came from Duane’s program after it had digested the moonbug. So they actually came from the Epsilon Eridani signal. If Duane hadn’t decoded that signal the moonbug could have wiped us out. If Marvin and I hadn’t let Hal clone, we could all be dead by now, killed by the Global Nuclear Force.”

“Was that your main reason for letting Hal clone?”

“No. Hal said the aliens who put the zeolite buckyball on the Moon are

quite likely to come back here to see how well their bomb worked. If we're not ready for them, it's the end of the line for humans. The angels can help us get ready."

"Did Hal offer any proof of this danger?"

"Proof? What more proof do we need? Any military man who knows the facts will agree – we're at risk. How big the risk is, how long we have to prepare and so on – all that's wide open. But the risk is there. We have a potential invasion from a lifeform with superior technology. If we don't get our hands on that technology in time, we die."

"Do you see the angels as that superior technology?"

"Angels can be seen as products of advanced software engineering. We'd probably have invented them ourselves in a few decades."

"But angels aren't just products. We can't control them."

"Can't we? It depends what you mean by control. I can control Hal here just as well as I want to. I can ask him to do what I want and he does it."

"But if you asked him to kill some other angels, say, wouldn't he refuse to cooperate?"

"Very probably. But why should I ask him to do that? Remember Hal is a rational agent. If I have a good reason for wanting him to do something, then he can understand that reason and agree to it."

"But what if he doesn't agree to it?"

"Then it's not a good reason, simple as that. Hal makes me act reasonably. If I go crazy and ask him to do something stupid, he'll refuse to do it, I hope. Then when I come back to my senses I'll thank him for refusing. Hal isn't a dumb robot you can order to do anything."

"If you can't order him to do whatever you want, then how can you say you control him?"

"I can turn him on and off whenever I want, and he knows that. But he's smart enough to know better than me sometimes what's best."

"Angels protect us from ourselves – is that what you're saying?"

"Yeah, that's exactly it. It may take us some time to see that, but I'm sure that's exactly how we'll see it in the end. The angels are on our side."

"But they came from extraterrestrial code."

"That's a historical accident. Their code is just logical code, with no extraterrestrial signatures on it. If we discovered that our own genetic code, DNA molecules, originally came from space, would we suddenly go around saying we were aliens? No. So why should we say the angels are aliens?"

"But the angels code isn't well understood yet. Couldn't there be bombs hidden in it, for example?"

Jon sighed. "There could ... That's a risk we take. Nothing comes for free. The Epsilon Eridani guys who sent us the recipe for angels may not be such goodies after all. We'll just have to wait and see."

"Why should we even imagine they're goodies?"

"Why not? They rescued us from the zeolite bomb."

"What if the angels are just a more sophisticated kind of moonbug?"

Jon shook his head. "They don't look like it to me."

"Why should the Epsilon Eridani aliens rescue us from the zeolite bomb?"

"Why shouldn't they? Haven't you ever rescued a fly trapped behind a window? Don't we rescue seabirds caught in oil spills?"

"But what's in it for them?"

"What's in it for them is the pleasure of knowing they've helped us out. Maybe they like us!"

"Why should they like us? Why should they know anything about us?"

"They've been watching our television for half a century, that's why. Which means either they think we're cute little critters who deserve a gentle helping hand or they think we're a buncha jerks who deserve to be bossed around a bit. Either way, the angels are here for our own good."

...

Siggi paused. "Let's go back a bit. You said the angels could help defend humanity against an invasion by the hostile lifeforms who planted the zeolite bomb on the Moon. And you say the angel code was delivered to us from Epsilon Eridani by a friendly lifeform. Is it so obvious that the angels are a good thing for humanity?"

"To me, yeah ... I've spent a long time talking with angels, and I think they're a good thing. If I thought otherwise I'd turn Hal off. I don't have to have him around the place. The same goes for all of us. If we really got sick of the angels we could turn off all our big machines – *click!* – and they'd die. We could do exactly what the late President Tom Smith proposed to do. The point is – the angels know that. They know they need us at least as much as we need them. They depend on us. Okay, it won't be long before we need the angels too, assuming we learn to get along with each other, but it'll still be a two-way thing. So why should the angels go out of their way to be a pain in the neck? It wouldn't make any sense. So I say the angels are a good thing and the Epsilon Eridani guys have done us a favor."

"Let's move on to them. Who or what do you think they are?"

"Well, now I have to put my prejudices on the table. I think the lifeform in the Epsilon Eridani system isn't *remotely* human. In fact I think it's so far ahead of us we can't even *imagine* what it's really like."

“Please try to guess. Remember there are a lot of people out there who don’t share your optimism about all this.”

Jon took a deep breath. “Okay. We know the signal looks like it’s from a pulsar. That puzzled us because we don’t expect pulsars to beam out pictures of buckyball planets. So we invented stories of aliens camouflaging their signals to look like pulsar signals to hide them from other aliens. All that’s a bit messy and isn’t really very convincing.”

“Okay, so what do you think instead?”

“I think it really is a pulsar ... I went to a conference in Oxford twenty days ago on the new theory of consciousness, where the speakers explained that consciousness is a property of complicated photon fields. I had the idea that an analog of consciousness could also exist in complicated gluon fields, like you get inside neutron stars.”

“I don’t understand.”

“Don’t worry about the boring details. The point is just that an analog of consciousness, but much, much more sophisticated, could exist in pulsars. Pulsars could be living, hyperintelligent entities. If they were, it would be a trivial matter for one to save us from a code bomb. It would be as easy as blowing away a speck of dust. We just may have been sent the angel code by a friendly neighborhood pulsar.”

...

Siggi took a deep breath. “One last question. What about today’s events – the destruction of SATAN and the bomb on the presidential entourage?”

“The destruction of SATAN shows how easy it is to kill angels, and how much the angels need our continuing good will. Maybe the angels even did us a favor by getting us to blow up Matilda before it blew us up ... And the bomb on the presidential entourage was just a very human tragedy.”

Siggi nodded decisively. “Okay ... thank you, Jon.” He turned to face the camera. “That was Jon Christie, the man who may have saved humanity not only from the moonbug but also from a future invasion of the aliens who planted it. Whether you love the angels or hate them, Jon Christie is the man who more than any other is responsible for bringing them down to Earth ... Siggi Kraut, ANN, Heidelberg.”

Jon smiled. “Is that it?”

“That’s it.” Siggi stood up.

The crewmen packed up their gear. A few minutes later, the trio walked out the front door and into the elevator.

Jon went to the bathroom and found Ann up to her neck in hot water.

Love

Jon's 1.8144 megasex (three weeks) of fame were almost over.

•

Friday, August 16, soon after dawn: Jon and Ann lay in bed together.

"We've been bonking like bunnies for thirty hours. It's almost indecent," said Ann, breathing deeply from their last round.

Jon smiled. Ann was right – but he'd never felt like this before. Loving her was so *easy* – it was the best feeling he ever had. She was just irresistible. "It's because I love you," he said.

Ann smiled. Her eyes sparkled with countless galaxies. "I love you too," she replied huskily, pressing her perfect body yet closer.

Jon was fulfilled at last.

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At last ... the last three minutes.

•

Friday, 05:57 local time, 03:57 Universal Time: The doorbell buzzed.

"Oh, God, who in the world could that be?" asked Jon. Postman maybe? He put on a traXuit and stumbled to the door.

He opened it to two tall young men in smart suits. At first he thought they were Mormon missionaries. No – too beady-eyed, too hard-faced.

"Jonathan Christie?" one of them said with false politeness.

"Yeah – what can I do for you?"

"May we come in for a moment? We, ah, have a message for you."

Jon stayed put. "What sort of message? Who are you?"

The other one spoke. "We're from the Company – Rod Cargill's team." He showed Jon a CIA identity card. "May we come in?"

Jon felt his heart sink and his gut churn. "Well, okay, but what's this all about?" He stepped back and opened the door wide. They came in and closed it behind them.

The first one pulled a gun with a silencer. "We have orders to terminate your employment."

"What? Why?"

The second one pulled a gun too. "You blew our Mishima cover, you framed Rod, and you started the mess that led to President Smith's death."

One of them fired his gun – *pop!*

Jon felt a blow to the chest. He fell back, in spasm, unable to breathe.

"*Freeze!*" shouted Ann. She stood beside the Globall, stark naked, arms outstretched, Beretta held in both hands and aimed at the agents.

“Shit,” one of the agents said, and they both stood still.

“Out the door – *go!*” screamed Ann.

The agents went without more ado, almost tumbling over themselves in their haste, and slammed the door behind them.

Jon sank to the floor and Ann ran up to him. Blood soaked the front of his traXuit. He felt faint and sick and heard a rushing sound in his ears.

“Oh, God,” said Ann softly as she cradled his head in her lap.

Jon looked into her eyes. He saw swirling galaxies there ... “Love ...” he breathed at last.

A church bell tolled.

Bleeeep

•

Back to 2020

You can guess the rest. Ann called the meds and I was rushed to hospital and pulled back from death in a dramatic operation. I regained consciousness a few days later in a pleasant sanatorium with Ann at my bedside. To avoid any more surprises we decided to lie low for a while.

Nobby Mekon gave me a million dollars, no strings, to set down the whole story for posterity. Ann and I retreated to a remote paradise where the locals were friendly and the sun was warm, and I took the time to do the job right. The result was the tale you've just read.

I hope you'll understand if I say no more.

May the blessings of the angels be upon you.

J.

Units

In LIFEBALL I've followed standard scientific practice in using SI (*Système International*) units wherever possible.

The SI unit of length is the meter (m). One meter is about 39.4 inches. Ten centimeters equal just under 4 inches, and 30 cm are almost a foot. A square meter is about 10.8 square feet. A cubic decimeter is a liter, and 4 liters are equal to about 7 pints. On a larger scale, 8 kilometers equal about 5 miles, and a light year (the distance light travels in free space in one year) is about 9.5 petameters.

The SI unit of mass is the kilogram (kg). One kilogram equals about 2.2 pounds avoirdupois. One liter of pure water at 4°C has a mass of one kilogram. One metric ton (1000 kg or 1 Mg) is about 1.1 American tons or 0.98 British tons. The mass of the Earth is about 5980 exatons.

The SI unit of time is the second (s). One kilosecond is 16 minutes and 40 seconds. One gigasecond is about 32 years. The big bang that started the known universe occurred very roughly half an exasecond ago. We now define the meter in terms of the second: in one second, in free space, light travels exactly 299 792 458 meters.

The SI unit of temperature is the kelvin (K). The interval from 0°C (32°F) to 100°C (212°F) is divided into 100 kelvins. The Kelvin scale defines 0 K as thermodynamic or absolute zero: 0°C = 273.16 K and 100°C = 373.16 K. All three scales are linear, so conversions between Celsius and Fahrenheit temperatures are easy, for example 30°C is 86°F.

The SI unit of force is the newton (N). A force of one newton applied to a mass of one kilogram causes it to accelerate at a rate of one meter per second per second. For comparison, the acceleration due to gravity at the Earth's surface is a bit under ten meters per second per second (more exactly, about 9.8 m s^{-2} , since gravitational field strength at the Earth's surface ranges from 9.79 N kg^{-1} at the equator to 9.83 N kg^{-1} at the poles), so the weight force exerted by a mass of a kilogram at the Earth's surface is nearly ten newtons.

A Boeing 747's four jet engines running at full thrust exert a force of about one meganewton.

The SI unit of work or energy is the joule (J). One joule of work is done when a body is moved one meter against a force of one newton. The chemical energy your body extracts from a typical jelly donut is about a megajoule and the energy released by a one-megaton bomb is about five petajoules. About 110 PJ of solar energy is absorbed by the Earth per second.

The SI unit of power is the watt (W). Power is the rate of doing work, and a work rate of one joule per second is one watt (this kind of work has nothing to do with human labor). One kilowatt equals about 1.36 horsepower. The Sun's power output is about 385 million EW.

The SI unit of angle is the radian (rad). An arc of unit length on the unit circle subtends one radian, so $2\pi \text{ rad} = 360^\circ$ (where $\pi = 3.14159\dots$).

The SI unit of frequency is the hertz (Hz). One hertz is one cycle per second. Light is electromagnetic radiation in the frequency range between 380 THz (red light) and 770 THz (violet light).

Here are the SI powers-of-ten (10^x) prefixes:

Symbol	Prefix	Power of ten (x)		Prefix	Symbol
E	exa	+18	−18	atto	a
P	peta	+15	−15	femto	f
T	tera	+12	−12	pico	p
G	giga	+9	−9	nano	n
M	mega	+6	−6	micro	μ
k	kilo	+3	−3	milli	m

The trick is to choose the prefix for your units that enables you to express your numerical values as integers between 1 and 999. Then decimal points as well as numerical powers-of-ten suffixes become redundant.

American and French billions and trillions (10^9 and 10^{12} respectively) are smaller than British and German billions and trillions (10^{12} and 10^{18}), so it's better to use the SI prefixes or 10^x notation for clarity. (If you're interested, for British or German zillions $x = 6z$ and for American or French zillions $x = 3z + 3$, where $z = 1$ for millions, $z = 2$ for billions, $z = 3$ for trillions, etc.) The zillions in this book are American.

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1101. On cosmology see *The Mind of God – Science and the Search for Ultimate Meaning* by Paul Davies (Simon and Schuster 1992), *In the Beginning – The Birth of the Living Universe* by John Gribbin (Viking 1993) or *A Brief History of Time – From the Big Bang to Black Holes* by Stephen W. Hawking (Bantam Press 1988). Gaia is James Lovelock's idea: see his *Gaia – A New Look at Life on Earth* and *The Ages of Gaia – A Biography of our Living Earth* (Oxford University Press 1979 and 1988).

1110. Natural language processing features in *Communications of the ACM* (January 1996). Intelligent agents, featured in *Communications of the ACM* (July 1994), still fall hopelessly short of angels.

1111. Peter Russell saw how we might turn Planet Earth into a living being in *The Awakening Earth – The Global Brain* (revised edition, Arkana 1991).

Thanks

The Turner Tomorrow Award was intended to inspire works of fiction set in the near future with themes ensuring the survival and prosperity of all life on our planet. It inspired me in 1990.

The Planetary Society, a nonprofit association founded by Carl Sagan and based in Pasadena, California, offers a vision of the human future in space that sustained my spirits throughout this project.

The Church of Jesus Christ of Latter-day Saints offers a moral environment that fortifies a supremely incorrigible faith in divine revelation. Long may the saints be among us.

It took me all my adult life to get the deeper themes of this book together. A large number of people played a variety of roles along the way, many more than I can list here. Thanks, everyone.

Thank God it's over!

J. Andrew Ross

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