Fine Structure

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A Serialized Novel

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Table of Contents

Unbelievable scenes

This is for real.

This is a simulation.

It's like billion-voice music. The cities here are woven from constantly singing superstrings. The trees and rivers are wondrous creations in colours I could recall the words for but choose not to, created from fabrics there are no words for. There are birds, I notice, which seem, like the rest of their world, to be made of sound. The people here are beautiful - I reach forward and pick a handful of their uncountably many minds, along with a little art, and a little language. I *could* see it all, given precisely one eternity, but I have a Planck heartbeat.

Then it's over, Heaven number seventy-nine dopplering into our wake, torn bodily from its extradimensional moorings, fine structure bucking, scattering and shattering. Out here on the edge, every creation is built from other Creations and "freedom" is twenty-five times freer. The Parenthetical Heavens - 1,024 in all - are just a fragile collection of blurry points at the tip of a coloured corkscrewing spark which marks one lane of a route arcing through the dark gap between two unimaginably greater Totalities, and as we tumble off the crowded night-lit highway we hurtle through all two ex ten of them in an eyeblink. I scrabble to save what I can of them, firing the recovered shards back through the comlink so quickly they barely touch my hands, but I don't look back.

At one point it was thought that it would be a good idea to shut off pain, replacing it, perhaps, with some sort of warning message. Then it was discovered that pain *was* the warning message, and to remove it carried the danger of apparent invulnerability. The best that could be done was to make the message less... *distracting*. But I'm at one oh nine XG and my entire physical manifestation is going nuclear. Every half-imaginary needle in my mind is jammed firmly at the far end of critical and the alarms are punching right through my filters. It's about dimension. One degree of freedom over your opponent and there is no contest, none at all, and mine fell five to be here. My people play with waveforms during infancy, we can literally alter odds in our favour - but where this thing comes from, my home and the entire cosmos it sits in is a tiny, shiny circle in space that you could crush between your fingers. If the adversary had *any* mind, *any* intelligent thought at all, it would have been over in microseconds. But it has no mind. Just firepower.

We decelerate as we fall off the highway and coast through Upsilon layer's mantle, my cloud of secondary defensive units finally matching pace again, darting around and clearing sentient structures out of the suburban chasms ahead of us, transmitting them to safe havens in higher and lower layers. *It* roars, uncaring, and engages me with blackened tendrils from every angle, levelling nearby scenery, but as the evacuated sphere expands around us I am able to cut looser with my counter-attacks, showing our surroundings equal disregard. Local space becomes a calculated maelstrom, and for a moment I even manage to get the upper hand. But continuous epileptic warnings remind me that at eighty-eight and rapidly falling, I'm not winning. I'm stalling, and as the very bedrock underneath me starts resonating wildly with each attack, beginning to panic.

Finally, authorisation, long since dispatched all the way up the chain of command, hammers back down at me like a lightning bolt. A path clears in my mind, ringed with green lights only I can see. I grab the enemy by four of its tails and begin to accelerate. Ancient fail-safes begin to protest. Subquantum pressure seals whine. Secondary and tertiary confimations barely beat us to the boundary locks which

erupt, part and slam closed as we approach the border. All it has is black-hot rage and a ferocious desire for survival and more lividly brandished firepower than my entire civilisation combined. But I have Tactical. And I have *permission*.

There's an echoing scream as the edge of my universe is torn violently aside. Darkness opens up in every direction, roars at our defiance and wrenches us viciously home. We fall, disconnected from our senses. We don't feel or see the gap close behind us and Upsilon recede. For a fraction of a second there is absolute silent peace. All the panic leaves me. The "zone" leaves me. Even the alarms are momentarily silenced.

That instant buys me composure. I close down, re-establish and pull everything back up from square one, rebuild and recover and discard the extraneous, shedding the load. Combat instinct primes itself and re-launches. I gain my focus fractionally before it does, and see vertices in space - projections of things I can't perceive unaided - tumble dreamily past me in fractal constellations, growing clearer and denser as we plummet. Below, rock-solid core approaches, but I have a better idea.

Fractionally. I manage to block its instinctive wake-up attack, then pick a point on the wall and dive for it, my last instruction bolting invisibly home to Control. My trail is caught and it races after me, livid, hungry. I push my tolerances, twist and reach out, there's a crack, monstrous patterns of power shear away above and behind us, and, on every horizon, flame explodes on cue and races in—

I have the foreknowledge to go limp as we rebound off a nameless Flatland, and a second time off the descending containment locks. It flails and tries to escape in every conceivable direction simultaneously, but hits only cold unyielding prison wall. I try to relax, circles of minor devastation buoying me to rest, while all but one of my internal alarms spit, glitch and finally dim to numb static.

Lockdown.

Crippled. Flattened. Dismembered and disarmed, cut off from civilisation. Utterly unfamiliar terrain - it can't fight in three-plus-one dimensions. I stagger upright, palely illuminated by distant fusion, and lurch towards it - it howls in pain and scrabbles at the ground, trying to retreat.

A hair-fine beam - my last ergs. It collapses and so, at length, do I.

On Digital Extremities

More scientists.

It's always scientists who discover this kind of stuff.

"Are you *looking* at this? Mike?"

Professor Mike Murphy put his glasses on and squinted down from his vantage point on top of the domed roof of the forty-foot Medium Preonic Receiver, putting a hand out on a handrail to steady himself. There was still enough sun that he could clearly see the gazebo, the array of consoles plugged in semi-permanently underneath them, and even the screen his associate was pointing at, but he had difficulty making out what it was on the screen she was referring to.

"Yeah, but I can't see it. Is it working?"

"It had better be, for this much money," said (Jo)Seph(ine) Baird, who had astoundingly long hair and half a PhD. It had cost one point eight million pounds to build the MPR (and the same again to build its Transmitting twin brother in New Zealand), and they had both been nominally "fully built" for four months. Seph and Mike were among the eight physicists still on the UKAPL site, frantically trying to get their receiver working for the evening's experiment before it became too dark to see which nuts and bolts to turn. A-LAY communications were still at the literal nuts-and-bolts stage. "It's working *weirdly*. You see this jumping bit here? There?"

"No, I don't."

"Well come down and look, Mike."

"Is it worth it? I spent long enough getting up here and I don't have as much knee cartilage as I used to." Mike was sixty-three.

Seph sighed. "I'll describe it to you and you can tell me what you think. All the regular telltales are at nominal levels except ψ which is edging into amber. The irregular telltales are all amber. There's one red thing which I don't know what it means..."

"That's there because I'm still up here with the lids on the GEWR units open." Murphy disappeared from view for a while, then reappeared, eclipsing the setting orange sun. "Now?"

"Green. Great. But I still have this jumping thing on the **M**-squared-**B** graph."

"Is it jumping pretty regularly?" Seph nodded. "Under the console you're standing in front of there are a few knobs. Can you find the two that read 'X-scaling'? Fiddle with them until you can get the wave to stand still and then tell me the frequency."

Seph did so. This took long enough for Mike to fold his arms and lean on the railing, taking in the view briefly. The United Kingdom Advanced Physical Laboratory was in a reasonably undisturbed region of Lincolnshire, next door to a stately home on a hill which belonged to the National Trust, and which was lit a rather dazzling orange by the sunlight. An amateur photographer, Mike had already photographed a good quantity of the MPR's construction, for an unofficial record, but this was the first time he had seen the stately home illuminated so. He decided it would be worth the effort to fetch his camera. Despite himself, he headed for the nearest ladder and began to climb down.

"One hundred and ninety-five meg— no, terahertz. Mean anything to you?"

"Carrier signal, then. That must be NZAPL."

"That's what it looks like? They've started transmitting already?"

Halfway down the ladder, Mike Murphy checked his watch and mentally added twelve hours. It was heading for 8am in Gisborne. "They're over an hour early. Get them on the radio."

Seph was fiddling with the bulky radio handset as Mike stepped with care down onto the grass. He joined her under the gazebo and collected the old, worn case containing his camera from a pile of other boxes and backpacks of equipment. "I'm going to take a photo of the sunset."

"Mike," said Seph as he was about step onto the ladder and climb back up again. "Firstly, I thought you were having knee issues?" Mike grinned, and started to respond, but Seph interrupted him. "And secondly, NZAPL says they haven't turned on yet. They're still in pre-warm."

Mike stared blankly at his associate.

A-LAY communications had started out as a set of problematic particle accelerator observations and an equation which had been constructed to, if not explain, then at least account for them. To the dismay and annoyance of almost everybody who understood it, this equation had proved no less problematic than the observations: it had a leftover term, an extra "+δ" on the side which shouldn't have been there. The delta, though small, proved troublesome from both a mathematical and a physical standpoint, for, as the newly-discovered equation was installed into established ones, the delta grew and morphed and squared and never completely vanished and generally made a nuisance of itself without ever *saying* anything useful.

Constructing and implementing mathematical tools for dealing with the delta almost became its own minor field of study. Then, unexpectedly, a group of four mathematicians, Murphy among them, had pulled some magic out of the air and showed that the existence of the delta actually had some major implications. Real-world implications.

The mathematics was much, much too complicated for the layman, but P. Hood, A. Kosogorin, M.X. Murphy & J. Zhang's *Generating Waveforms in Ambient Neutrality* (2002) described it as a space which ran parallel to reality, like two water pipes running alongside each other underground. In theory, you could build machinery, *real-world* machinery, to "tap" on the other pipe, sending signals along it in both directions. In theory, you could send messages around the world; in fact, since the Ambient Layer was theoretically empty of physical obstructions, you could send messages *through* the world. And light speed in the Ambient Layer was unimaginably faster. It was actually less like a water pipe and more like a phone line; a phone line nobody was using, which could easily be tapped into.

To their credit, nobody involved in the study had immediately announced to the world that supralight "radio" would soon enable cell phones to operate under mountains and space probes to communicate with home in real time. The future had failed to arrive frequently enough for that to be a clear mistake. Instead, UKAPL had been quietly formed, had bought some land and had started to build something which looked rather like an upside-down radio telescope - a receiver for A-LAY communications, aimed directly at its transmitting twin in New Zealand, through the body of the Earth itself.

"We're receiving signals but they haven't started transmitting yet?"

"Zed says they can't be. Half of their stuff is still unplugged from last night."

Mike frowned, and walked across the grass and down some concrete steps to a door set in the bottom of the domed MPR structure. Opening it, he was able to crouch and see into the very wide circular room under the MPR receiver, in the centre of which most of the actual receiving equipment was stacked. Six more technicians were in here, fiddling with various bits of the scenery. The room was brightly lit, the ceiling semitransparent, and the walls all painted white, but, being partially underground with no real windows to speak of, it was nevertheless claustrophobic and Mike avoided going in if he could manage it, opting to be the designated Man On The Roof wherever possible. This was most of the reason why his knees had been giving him grief lately.

Mike sat on the steps just outside the door and said "Folks, we're receiving, anything to do with you?"

"We connected the last few dots up just a few minutes ago," said Dr Philip Hood, a bearded fellow with very thick-rimmed glasses who was almost as old as Mike. "We haven't tested anything yet but... Hugh?"

Hugh - fantastically short, dark-haired, side parting - didn't bother looking up from the panel he had two multimeter probes wedged inside. "We haven't tested every link in the chain yet but in theory it could be receiving already. Have NZAPL started early?"

"That's the thing, they haven't."

"What are we picking up? Static?"

"Sinusoidal wave on the **M**-squared-**B** range. I just thought it might be a test you guys were running."

Hugh pulled all his tools out of the panel he had been working on. "Nobody's been working on that part of the system. And there's nothing foreign in the sequence at all now. It should be running uninterrupted. If it is running."

"Check the GEWRs," said somebody else. There was a little laughter - it had become a running gag that any fault in the system was always instantly blamed on the most remote and annoyingly difficult-to-reach part of the Receiver, because everybody knew how much fun Mike Murphy had getting up and down the ladders each time. But this time around it also happened to be a valid suggestion, so Mike nodded, picked up his camera, hauled himself to his feet and headed back to the ladder.

*

An hour passed. Mike took his photograph, but the UKAPL team failed to find any kind of fault in their equipment and the NZAPL team continued to insist that they had not yet begun attempting to transmit. In fact, they later announced as the allotted time for activation came and went, they couldn't get their equipment working anyway.

Several more hours passed, after which the NZAPL team announced that their Medium Preonic Transmitter, now to the best of their reckoning in complete working order, was nevertheless continuing to fail to transmit anything.

Around 2am the UK team began to run out of enthusiasm. Everybody had turned in except Mike, Seph and Hugh, who all perched on the dome looking at the stars and slurping the day's final pot of coffee from Seph's thermos flask.

"Ambient neutrality is supposed to be empty, right?" asked Hugh.

"Metaphorically speaking, yes. Of physical obstructions," said Mike. "As far as I can make out, at any rate. But that's why we're doing the experiment. There *could* be stuff in there. There could be... pulsar-like objects. Or just objects in our space which naturally emit continuous signals into the A-Layer... stranger things have happened."

"Not much stranger," said Hugh.

"There is always room for another delta," said Mike. "The important thing is not to jump to conclusions. As I said whenever it was, the first pulsar was mistaken for evidence of alien intelligence by the people who first saw it. So assume nothing. Until we start finding prime numbers. Then you can politely tell me to shut up."

"I think we should try channel two tomorrow," said Seph.

"Not a bad idea, 'Sephine," said Mike. "Not bad."

*

Mike was the last to arrive the following day. People were already waving frantically at him as he drove up towards the small MPR car park. He was forced to roll down his window to let Philip Hood talk to him while he parked.

"What's happened?"

"Channel two. We tried it just now. It's making noise. And NZAPL's in *bed*, Michael."

Mike shook his head, turned off his engine, rolled up his window and climbed out of his car. "Noise?"

"This only happened about five minutes ago-"

"*Mike!*" shouted yet more voices as he got his backpack out of the car.

"Everybody calm down! I will be there in a moment! Nothing is this Earth-shattering."

"It's a pattern! It's repeating," said Philip.

"What's the pattern?"

"We don't know. You have to come and look."

Mike wound up at the front of the crowd of people crammed under the gazebo staring at the oscilloscope wave and its recorded duplicate on the computer monitor to its right.

"There's a carrier on the second channel just like the first," explained Phil. "Three-ninety terahertz. But the carrier's being amplitude-modulated. We didn't think we'd need to fix up our signal processing equipment so early so this bit of analysis is a bit of a rush job. It's a binary signal. It repeats every sixty-five thousand, five hundred and thirty-six cycles, the last half of which are all zeroes. Here's a printout of the whole thing," he added, handing over a few pieces of paper. Mike glanced at it. Ones and zeroes. They didn't immediately mean anything to him.

"What does it say?"

" I haven't figured it out yet," said Ching, a Chinese communications engineer who was best-qualified of all of them to answer that question.

"We're just... picking up something," said Mike. "Somebody's phone is interfering with our equipment

or it's a short-wave radio station or a secret military thing which they've been using for decades. Like a numbers station or something. Or birds on the antenna."

"The antenna is underground," said Hugh.

"But you get what I'm saying? Let's just try to find out what it is. We've come this far. Obviously *some* part of this receiver works, which is a good thing. Get your coffee and get going."

*

Around mid-afternoon Mike heard an approaching clanging sound. Ching poked his head over the edge of the dome. "Mike? You got a minute?"

"Of course." Mike kicked the GEWRs closed and sat down on the nearest railing.

Ching climbed up and took a look around before perching on the railing opposite. He waved several sheets of lined paper covered with scribbled diagrams and calculations, meshed with a few computer printouts. "Been looking at that signal."

"Yeah?"

"Yeah..." Ching shook his head. "Nothing."

Mike sighed and folded his arms. "Is it encrypted? Or something like that?"

"Well, I don't know. I don't know if I'd expect half of it to be blank if it was encrypted. And it *seems* to make a kind of sense. Look at this sheet. It's four thousand and ninety-six bytes altogether. Look at the numbers. You get gaps and repeated patterns and things. I did a frequency analysis and it's not at all random. But it's not ASCII or Unicode or ROT-13 or anything obvious. It could be something more complicated. If the signal was a hundred times longer somebody could probably figure it out, but I don't think I have enough to go on. Sorry."

"No problem, Ching," said Mike. "It might not be intended to make sense anyway."

"I'll keep looking at it."

"No," said Mike. "Leave it for now. Concentrate on getting the proper signal processing modules up and running. I want to try channel three before the Kiwis wake up."

"Should I tell people? That we're trying channel three?"

"Yeah, let it be known. Wait, don't stand up yet. You've got the House behind you. Smile. Or hold up your work and look wry and interested or something." Mike pulled his camera out again.

Ching obliged. "Day one hundred and thirty," he narrated. "Mike Murphy And Friends randomly tune into Radio Moscow. ...Do that again, I think I blinked."

*

Tuning to channel three, as for channel two, involved altering a small, deceptively plain-looking dial to an integer multiple of its basic (channel one) setting. This, in itself, was a five-second process, but it took long enough for Ching and Mike to get everybody to stop working on the system that the team decided to break for dinner first. That, in turn, gave Ching time to get his signal processing equipment connected up.

Channel three turned out to contain another repeating pattern. This one was roughly 60 trillion binary digits long, and began with the prime numbers from 2 to 127, which were followed by a rough drawing of a circle, then what appeared to be some simple mathematical equations.

Things got a little hectic at this point.

"Somebody find the NZAPL website. I think they've got a webcam. Zed?" said Mike, directing this last word into a radio handset.

"Professor Mike Murphy!" It had been about a week since Mike had last spoken to this person, his friend, co-author and opposite number in New Zealand.

"Professor John Zhang. Indeed. Zed, any chance you could turn off your transmitter?"

"It's not on," said Zed.

"Zed, is it *completely* powered down?"

"It's seven in the morning, I'm the first one here, I haven't turned anything on yet."

Somebody tapped on Mike's shoulder and pointed at a nearby screen. The webcam was small, but it clearly showed a darkened shape in a darker field, with the clouds behind it only palely illuminated by the not-yet-risen Sun. The MPT didn't even have its interior lights turned on.

"Great, just checking. Talk to you later." Mike closed the conversation and turned away. "Alright. So it's not a practical joke. Doesn't change anything."

"Michael," said Philip Hood. "Dense energy amplifies A-LAY signals. We know this. If you want to send an A-LAY message across interstellar space you just have to point your antenna at the nearest star and start talking. We have to at least consider the possibility. And nobody on this planet's built A-LAY communications equipment before us."

"*As far as we know*," said Mike. "But our paper is available for anybody to read. And if we've built something, *they* could have built something. And they could have had a primer written and ready and waiting - for heaven's sake, they were working on stuff like this in the Seventies. If *we* wanted to make contact with aliens, this is exactly what we'd do. In fact, this is what we've DONE, with the Voyager probes. Send out a message, along with a universal guide for translating it. We can't start *jumping*... I think the only way to find out *who* is to just decode this dictionary or whatever it is."

"But it's huge," said Seph. "And we're not exactly the experts in this field. And we do, actually, have better things to do. As in, proper physics."

"Well... we could just put it online," said Hugh. "If nobody claims responsibility then at least somebody might solve it for us."

That seemed like a good idea.

*

Quite a lot of time passed.

UKAPL and NZAPL spent almost two more years trying to send signals to each other through the Earth, on a huge variety of channels, settings and intensities. UKAPL picked up nothing more interesting than total silence on every other channel they tried, while the carrier, short message and

primer looped forever on channels one, two and three. NZAPL, meanwhile, never succeeded in transmitting a single signal. At length, it was discovered that their signals were simply being cancelled out, just a few tens of micrometres beyond the tip of the transmitter, for reasons which had Murphy, Hood, Zhang and Kosogorin scratching their heads. Eventually, the teams ran out of money and the experiments were shut down.

Zhang and Kosogorin along with most of the others were relieved to move on to less demoralisingly futile projects. Philip Hood saw mathematical potential in the "delta tools" he and his colleagues had developed and took an opportunity in Hull University's mathematics department to develop them further. Only Mike Murphy kept plugging away at the original problem on his own, continuing to discover and model more and more exciting theoretical phenomena, all of which were directly contradicted by experimental evidence.

"Mike! It's Ching."

"Ching. It's been a good while. How've you been?"

"Well, it's been pretty busy... You know I finished my PhD. After that, I went travelling around Asia for about a year. Last year I got married to Susie... aaaand now I'm working for Google. That's the ultra-condensed version, anyway."

"Good one."

"Thanks! How are you doing?"

"I, as I was last time we met, am still working on this delta, sad to say."

"Ah, a problem worthy of attack?"

"Proves its worth by fighting back, indeed. Yes, it's getting pretty heavy. It's not that I'm not making progress, it's just that," Mike laughed hollowly, "none of it fits our experimental data! It's generating interesting mathematics though. Phil Hood is still working with me from time to time. Applied maths side."

"I wanted to talk to you about this primer."

"Ah, yes? You put it online, I remember."

"Yeah. Hugh and I couldn't get any prize money together, and we were both hopeless at getting publicity so it kind of dropped off the face of the Earth. Nobody claimed responsibility, which, as you say, kind of doesn't prove anything. Also, nobody got more than a hundred thousand bits into interpreting it, and that was all maths, so as you can imagine people just got bored and gave up. Well, anyway, just a few days ago somebody sent me a solution. Not to the whole thing, but enough to decode the channel two message. He sent me this massive walkthrough, essentially. The first part is mathematics and mathematics is universal. He says it was like code-breaking. Really *easy* code-breaking. Once you get down far enough it gets through arithmetic to algebra. It gets to calculus. Differential equations. It develops all these symbols and gives bundles and bundles of examples as practice. But then, this is the mad part. Then it goes to diagrams. There are diagrams of atoms. It starts representing electrons jumping between quantum states, you know? It took him a long time to figure out, but he realised it was starting to define its terms. It defines *units*. Physics. Physical equations. Get this: four megabytes in, this guy - Jim - found $E=mc^2$. He's found Maxwell's equations and Newton's

equations - there are little bits of notes by this point, words like 'because' and 'therefore' and 'true' and 'false'. Bits and pieces, enough to start building a dictionary out of, right?"

"Enough to start describing atoms. And subatomic particles. I guess from there you could go to molecules."

"Right! And then, if it was us, you could describe structures and metals and cells and it'd take all the space in the primer that's left over, I think, but you could get to describe metabolism, and 'eating', and from that you can build up further still... like I say, he hasn't got a hundredth of the way through it yet, but I'm positive that's where it'll go. It makes sense! These tiny little blocks, they still use them later! There are 'therefore' signs all the way through, I did a frequency analysis! Isn't that amazing? But we haven't got that far yet. We're still lodged in the physics. And it's twisting my brain. It gets to Schrodinger's equations. And goes further than that. All of a sudden, this guy starts reciting *your equations*. I could swear I was reading your paper, Mike! Murphy's Preonic Theorem. ZHK spectra, although they don't call them that, they just have this squiggly symbol, but they have the analysis down right. And it *keeps going*. It *explains* the principles they use to transmit the message. Because that's the one *other* thing that the guy the other end will have in common with you, apart from mathematics. *The principles behind the messaging technology*."

"Ching, anybody could put *Generating Waveforms in Ambient Neutrality* into that format."

"But it keeps going! Maybe Jim *is* this genius author who originally wrote it, but whichever way you slice it, there's more maths! Stuff you haven't published even now. Stuff *nobody* has published."

"Well, there are better mathematicians than me out there."

"Well, be cynical if you want. Be a pessimist. I'll let you know when we reach the bottom, although I can't say I have any idea when that might be. I dare say we could end up building a working mass-energy converter out of paperclips and you'd just go 'I could have done that' or something. It doesn't matter. I said we translated channel two, and that's the main thing."

"Yes, and I'm not sure how you managed that. I rather think you'd need to be able to translate more sophisticated ideas than just numerical building blocks before 'Welcome, fledgling newcomers, to the Galactic Brotherhood of Light' made any sense."

"Yeah, well, that's not what it says. It says - and this is all dressed up in equations, remember - channel two and channel three will repeat forever. And every other channel and setting will remain absolutely silent. And any attempt to transmit on those channels will fail. As we know. That's part of the message - it's all boxed out - that's one thing that can happen if a certain parameter is below a certain threshold. If the parameter is equal to or above that threshold, then the other box 'happens'. Channel two and channel three repeat forever, but channel one makes... well, I think this bit here symbolises coherent noise. Likewise every other channel. Forever. And we can transmit freely. That's what the message says."

"So what's this parameter? Is it distance?"

"Well, that was what Jim thought at first. Like we were just in some dead zone, too far from the central transmitter(s). But that doesn't make much sense, because we were still picking channels two and three up fine, right? Our transmissions were being *actively* cancelled out. Besides which, 'distance' as a concept and a variable is already described pretty unambiguously in the primer and this isn't the right symbol for it. We think it's something else. The symbol isn't one I recognise, but it crops up quite a lot

further down the primer in contexts which... almost make a mathematical kind of sense..."

"Ching, I'm waiting for a punchline here."

"Jim thinks - and this is purely conjectural at this point - the A-Layer might not be natural. He thinks it might have been built - *installed* - by some other species, thousands or millions or thousands of millions of years ago. He thinks, and I agree with him, that the symbol means money. And we think the whole message is saying we need to buy a more expensive broadband package."

Power Of Two

1. *Every year, a randomly chosen person on Earth is struck by lightning and gains superpowers.*

2. *Each new superhuman is twice as powerful as the previous one.*

3. *This has been going on for ten years.*

Extremes of temperature don't hurt me as much as they would a normal human being, but the sky over the Arctic is - in my estimation - even colder than *space itself*, so I'm wearing the one thing you never really see superheroes wearing: heavy layers of cold-weather gear and a furry hood. Wind chill, you see. No wind chill in space. Just nothingness. Space is unpleasantly numb, like dental anaesthetic, but that's all. That and asphyxiation. Whereas proper air, proper *wind*, that'll bite you to the bone in seconds.

I am a superhero, in certain senses. Scientifically speaking, I am impossible. It is absolutely physically impossible to do the things I can do. A man can't *fly*. It violates several somewhat fundamental physical laws. But I eat normally, I drink normally, I look like a regular person and I can apply huge, apparently reactionless forces to any part of my skeletal structure, pulling kinetic energy and momentum out of - again, this is a scientific term - "thin air", giving me superhuman speed and strength and, as I say, the ability to fly. I seem to have superhuman resilience to physical injury, which is kind of a given, if you have superhuman strength, otherwise you break every bone in your arm the first time you try to punch a car out of the air or something, and when I concentrate properly my perceptions and reactions increase correspondingly in speed, which means I can actually consciously keep up with what's happening around me at those speeds. No super-sight; I was actually shortsighted enough to need glasses until I agreed to the laser surgery. No super-hearing or telepathy or plasma blasts either. Pity.

I'm the wrong side of thirty years old, but I was what they're calling Born with a capital B almost precisely one year ago.

"Feel anything yet?"

"Not a thing... guy in my ear. What's your name?"

"Uh, 'Control' is fine."

"Well, whatever suits you."

"Incursion is expected to become detectable in the next ten seconds. Stand by."

"I am standing by," I say back into the heavy satellite radio handset, and increase my rate of ascent. It gets cooler briefly, but once I reach cloud layers it actually does get rather warmer. Sunlight. Sunburn, if I stay too long. I can hold my breath for what seems like half an hour up here.

I near the edge of the atmosphere and perform the mental equivalent of licking my finger and testing the wind. And there's the pulse, like a sunrise - a warm sort of glow on the horizon, a familiar and somehow attractive flavour of power source, announcing its presence. I take that direction and start accelerating, nose-first, arms by my sides. Humans aren't naturally very aerodynamic but by staying way outside the thickest atmosphere I can get astonishing rates of acceleration. My top speed is unknown.

"They've got it. Let's move, people."

I discard the heavy weather gear as air friction increases. You learn a lot of geography in this "profession" but I still don't recognise the precise mountains I drop my coat over. In my ear, somebody shouts a bearing. Somebody else shouts another one - Arika's, coming in from the Pacific. Both these people are watching our blips move across the Earth's surface and projecting our paths forward to the point where they converge. They can't detect the incursion directly and this stupid sixth sense of ours is another one of those things that defies all logic and can't seem to be duplicated.

"It's in northern China," says the first guy. I'm not the only one who groans at this news. While I am not a missile, I am potentially a weapon, which means it's highly unlikely that anybody will be able to secure permission for me to enter Chinese airspace by the time I get there. However, neither this nor the Chinese air force is going to actually stop me entering their country, which means I am almost certainly about to spark what is euphemistically termed an "incident". And that's just the least immediately threatening of the three problems currently facing me.

The second problem is that the newcomer, who will be twice as powerful as me in every way, will be Chinese. This means the Chinese will try to turn him into a weapon. We know they will, we have seen this happen before. Combined with the first problem, we have a potential World War on our hands.

The third and most pressing problem is: There is a lead-up period before each Birth. During this lead-up period, it is like someone reaches directly into your head, grabs the pain centres of your brain and squeezes them in both fists. The pain is unlike anything you have ever felt before. At the same time, a torrent of powerful aggression hormones is triggered, which proceeds to completely suppress rational, intelligent thought by the time the "lightning", or whatever it is, strikes. The practical consequence of this is that each person is Born temporarily insane. The berserker rage lasts something like fifteen seconds. Depending on how many people are around you when you are Born, who those people are and your general psychological makeup before the strike, that can be enough time for you - in your hyper-accelerated state - to violently murder anywhere from ten to ten thousand people. We have no idea why this happens. And we have no idea how to prevent it, or any of the rest, from happening.

The third problem is that China is the most populous country in the world, and the city of Lanzhou, where it has now been determined that the newest member of the Line is going to be Born, is currently one of China's most densely populated cities.

"Jason, you need to move faster. At this rate you're going to get there minutes after it's all over. You're lucky he appeared in range at all, you don't want to blow this chance."

I grit my teeth and push the mental button that makes me go faster. "Better?" I scream into the handset, which is frustratingly non-aerodynamic and slows me down when I try to use it. "What about Arika?"

"Forget her. Arika's nowhere. Not even part of the equation. You're still not moving fast enough. I'm going to pipe audio into your earpiece that'll keep you at the right speed. You remember how this works, right?"

"Sure." A loud continuous tone begins. I kick up my speed another notch and the tone gradually diminishes until it is gone, at which point I settle down to a steady rate of thrust, just on the very edge of breathable atmosphere, rolling slowly on my axis to minimise sunburn. I have to gently alter my trajectory downwards to compensate for the Earth's curvature. Gravity counts for almost nothing at speeds like this.

"Better."

I hum epic Pink Floyd and idly wish I could get music, instead of guidance tones, piped into the fly-sized moulded receiver sitting in my ear. There is nothing like this. In the physical universe in which we live, it should not be possible for a human being, unaided, to fly like a bird. There should not be *superheroes*.

I become absorbed in the scenery and thirty minutes pass like a breath, the only break in the silence being an announcement from Control that the Mongolian border has come and gone without incident.

Locating the city of Lanzhou is a heck of a lot easier than anywhere else I've been in the past year. It is extremely easy to get lost while criss-crossing the globe at hypersonic speeds - I frequently end up either popping up into low space for a more coherent aerial perspective, or, if I happen to be in an English-speaking country, landing somewhere to ask for directions. You ever read those comics where they take a quick break and a coffee on the top of Mount Everest? Do you know how many mountains there are in the Himalayas? You can't *find* Mount Everest. I've tried. I doubt I even hit Nepal. This is different though - I can just follow the "glow". Like it's calling me home. Which, now that I think about it, possibly isn't the best simile.

There's an electronic plip in my ear and Control calls in again. "We knew this could happen: the Chinese have scrambled jets to intercept you at Lanzhou. They'll probably get there seconds after you do. They can't harm you significantly, but for the sake of plausible deniability and the minimisation of political impact we strongly advise you to get out of there as soon as you possibly can once the newcomer is dealt with. Got it?"

"Got it."

"T minus ten seconds. See you on the other side."

I'm roughly two seconds out of the city when something goes wrong with the picture. The glow spikes, just for a moment. It feels like a kick to the gut.

As I come in from a forty-five-degree angle all I can see on the approach is a stunning amount of agriculture on the surrounding hills and oriental architecture sprouting in between them. It's a blur - "Chinese city" is the best impression I can form of the place as I cross the city limits and bear down on the source of the incursion. But then I dip into the "zone" and start focusing and slowing my perception, and glance up ahead, and catch sight of the pillar of smoke.

It's an office building, caught in the act of being blown up. At this speed anything moving slower than a bullet looks all but frozen in space. The top five floors are expanding gently in all directions: I see steel girders, chunks of concrete, uncountable shards of glass, and people - well, bodies. Body parts. Clouds of blood, in some cases. There's a spark inside the pillar of cloud which is erupting above the tower, a faint light coming from inside it, bright enough for me to make out what's going on. There are people, suspended in mid-air - thrown up in the air, apparently motionless. As I get closer the spark resolves into a person, a figure with a bright halo, darting from one body to another like a gnat.

It's already started. This was supposed to be timed to the millisecond. The noise in my ear is still silent. I'm precisely on time. But he's already active. He's taken out his whole office block already.

I drop the radio and put the metaphorical hammer to the floor, tracing a gently banking curve through the air towards my adversary, trailing superheated air from my fingertips. I could try to save the people

in the cloud but you can't touch an ordinary human being while in a hyper-accelerated state - it's like hitting them with a freight train. You need to be slow and very, very gentle. It takes time to catch a person and drop them on the ground safely - time which my adversary could use take out more people. I need to take him out of the equation, and I need to do it as fast as possible. I can deal with everybody else later.

As I close in the cloud comes to resemble some obscene work of art, a war zone in zero gravity. People float, seemingly suspended inside the smoke, caught at the instant of the explosion, in every state from alive and unharmed through maimed to disembowelled to mere smears of gore, all alongside or slammed against enormous ugly weightless but still dangerously massy chunks of disassembled superstructure.

I bullet through the smoke, arcing upwards. He barely sees me coming - his raging ambient field will have masked my approach, which means I am able to take him by surprise, knocking him off-guard. I get a good punch in and wrap my arms around his waist in a rugby tackle. He's little: thin black hair, thin black tie, hot to the touch from air friction. He screams something at me but I ignore him and... and again, something's wrong with the picture--

He's about to start hitting back when we erupt out of the smoke cloud at a ten degree angle and that's when I see the second, taller office block right behind the first one. Mistake. Massive mistake. I try to pull up past it but there's not enough wiggle room. I duck and shield myself with the Chinese guy's body as we punch a diagonal hole through seven floors of rigidly constructed concrete and steel like a bullet through a box of tissues. The whole building is lifted off the ground by the impact - actually physically pulled, whole, upward off its foundations about two feet in the air and then dropped back down again. On my way through I spot several rows of businessmen and women watching the incursion from the office windows.

We smash upwards through the roof and keep accelerating. I'm still feeling a hundred percent but Chinese guy is dazed by the impact. His focus is wavering - more importantly, he's focused on me, now, not the civilians, whom we are rapidly leaving behind below us.

The civilians.

I recognised one of those faces in the cloud. He was mixed race, oriental/Caucasian. Younger and a tad shorter than me, and wearing not a suit but a t-shirt and dark jeans. A t-shirt I've seen before, black, with a white printed mathematical equation on it which I recognise but couldn't memorise if you gave me all day. There was a greyish drawstring bag slung around his shoulder, and on his face there was fear and shock where I am more used to seeing a cheery grin--

The air stands aside to let us ascend. We figured this out a long time ago. The sky is uninhabited. The sky is the only sensible place for superhumans to fight. I wince as the pressure in my inner ear skyrockets. My ears begin to pop. After one second I can't see the city below anymore. Another and we're almost out of atmosphere. The sky darkens visibly and my flame trail fades away behind me.

I spare a distracted glance at my enemy's half-closed eyes, which are shining from within, ice blue. That must be the light I saw. Did mine shine? This is the first time a member of the Line has intercepted another member in the process of Birth. I remember my eyes *hurting*, but I remember everything hurting. That doesn't make sense. Why would your eyes *emit* light? There are points of blue sparks at the tips of his fingernails. His clothes are ripped to shreds after the second tower block. Mine

- I had some rather natty armour on underneath the heavy weather gear - are likewise barely staying together. A mad little thought bolts through my brain: *Unless somebody figures out a battle suit which draws power from the person wearing it, future Line battles may have to be fought naked...*

I give him another kick to keep him stunned, release my grip and accelerate onwards past him. Gradually I let my rate of perception increase until my ears finish popping. I take in the rapidly clearing star fields above me. I don't know if I'm technically in space yet, but it feels like it; my skin's going numb, all sound has been left behind and the water in my most recent lungful of air is crystallising as I exhale it. One of these days, once this is all over, I am going to see what I can do about going into space. Get involved with the ESA, maybe, borrow a space suit and see if I can handle the calculations to rendezvous with a satellite, or maybe a space station. See if I can reach the Moon before I have to turn back, or even go further. See if I can make some good come of all this...

Ching was his name. He was my neighbour. He lived across the street from my house for nearly a year.

Ching was my neighbour up until the day I was Born.

I halt my upward acceleration and start powering feet-first in the opposite direction, first cancelling out my previous speed and then reversing direction completely. From this distance I can't see the Chinese guy, only sense him, so I use the "glow" as a target. Fractionally before the collision I dip back into the zone again. This time, even fully focused, I barely see him coming. He has the beginnings of a fist raised; I catch him right in the chest with both feet. Combined collision speed: about seven kilometres per second.

There's a tussle, but the fight is really going out of him now - I reach forward and grab him around the waist a second time, shouldering him downwards and still accelerating. I aim for what looks like a mountainside. The clouds have just risen up and passed us as my enemy's ice-blue eye shimmer fades completely and his regular eye colour, deep brown, returns. His body goes limp in my hands. He twists his head and looks at me, fear and confusion on his face, and mouths a few syllables I don't understand.

Ching was my neighbour on the day I was Born and he was this man's co-worker on the day he was Born.

I let go of him milliseconds too late.

He slams into the mountainside perpendicularly with the force of a small nuke, but I can't pull up fast enough to avoid crashing down myself. I smash into bare mountain at a shallow angle a short distance downhill, and grind down the rock face, then through what feels like a mile of paddy fields. My forearms and chest take most of the impact. I finally come to rest at the bottom of a deep, dark hole. It hurts almost as much as being Born.

The real agony fades mercifully quickly, after I get a few moments to relax, here at the bottom of my comfortable pit of mud, but it still hurts like hell. I am not a naturally fit individual. I didn't work out before I was Born and I haven't worked out since. We don't even know if you gain anything from working out when you have these abilities - I've never managed to push myself hard enough to find out. I don't *get* tired, even flying at maximum speed. But after that landing... I haven't felt this bad since I was fifteen, playing - "playing" - rugby in the middle of winter, running around until I get knocked over, getting up again, getting filthy and bruised and freezing. I feel like a plane crash. I feel like death.

Mud begins to collapse on the angled tunnel I just bored, blocking out the light. I use the waning

reserves of my strength to claw my way out into the blisteringly bright daylight, covered in red mud. My armour is still hanging together. Just about. In the television shows it always seems like the hero, no matter how badly beaten, retains just enough clothing to stay decent. Somehow that seems to be exactly what happened here. I have almost a full pair of trousers but just scraps in terms of upper body coverage. I might actually look pretty good, if my belly wasn't so big and hairy.

I scrape the worst of the mud off my arms and shoulders and rip off the more useless remnants of armour. After stretching painfully, I summon my resources and float with difficulty back up the horrific brown trench I've gouged through hills and hills and hills of stepped, shiny and immaculately tended paddy fields, and then up the badly scraped strip of rock above them, to the crater. It's half a mile wide, and smoking, and as I get nearer it becomes clear just how deep it is. I squint into it but can hardly make out the person I know must be still lying at the bottom, let alone sense him. I waft a bit closer and starting turfing over boulders, discarding them casually in the air behind me - I'm still working in accelerated time.

I slow down once I catch sight of blood, and stop completely when I realise that there's nothing else down here. No body. No body parts. Just blood.

I am not a violent man. The plan was supposed to avoid violence as far as possible. I wasn't supposed to get my hands dirty. That was why I liked it. I was going to distract him. I was supposed to hit him at the exact moment after he becomes invulnerable. Carry him into the air, smash him down on the rocks at full speed. Knock him completely out for the rest of the fifteen seconds. But something in the timing was wrong. I arrived late. And by the time he hit... I don't know whether it was the stress or the shock or the punishment he'd already received, but he'd turned neutral again. Or at least, neutral enough.

Every known Line member to date has killed somebody. Either during their Birth pains or afterwards or both. Even Arika. She was Born in her sleep, in her bed, at her home in Australia. She killed her whole family. It was a tragedy. She suffered because of it, and worse, she suffered right in the spotlight. But not me. I was on a trip that day, driving in Scotland. I was miles from anybody. I destroyed a mountain, but nobody died. My wife is still alive. My children still love me. I thought I was going to make it. I thought I was going to break the trend. Be the first of a new breed. Show the world what you can do *right* when you have this power.

It's gone beyond nations now. I know it. Arika knows it. We are part of a different system from everybody else. We are Born, intercepted and neutralised. We spend a year in training and intercept the next. It's the only way it can work. But it's a stopgap solution at best. What if you misjudge the punch? What happens next year? Or the year after? What about ten years from now? By then we're talking about people *millions* of times stronger than ordinary humans. What about twenty years? Thirty, forty, fifty, a *hundred*?

With shaking hands I stack the rocks back on top of the unknown. I'm not trying to cover my tracks. It's just that burying him is all I can think of to do. It's all I can think of to do to keep me distracted from what I've... what's happened.

Ching predicted this Birth. And probably mine too. He couldn't have known I would be away on the day but he knew it was going to me.

Which means he can predict who's going to be next.

If he's still alive.

I look upwards. Over the hill there's a pillar of smoke, still expanding with glacial slowness. Behind it is a building, mid-collapse. Specks in the air are people in need of rescue. And far away in the distance are approaching vapour trails.

There's work to be done.

Zanjero

"It's you."

I struggle futilely, catching only a glimpse of dark, crew-cut hair and the by-now-iconic combat suit. White and dark blue. "It's here. And it's now."

"Me? Why me?"

Exasperation. "We don't know."

I feel a needle going into my arm, right through the shirt. "This is anaesthetic. We're going to put you into the deepest coma it's biologically possible to wake from. Your brain functions will be slowed to a crawl and you'll be more or less paralysed from the neck down. It'll wear off in about fifteen minutes."

"There're nothing but sand out here for two hundred miles, what harm could--"

Then it starts to feel like layers of insulating foam are being placed in front of all my senses.

"Please just trust me. Even this might not work."

An insane white light wobbles out of my peripheral vision and stops dead in front of my eyes. That is the Sun. I have fallen on the sand.

A different voice, crackly: "Brent's into his dive. Thirty and counting. Go."

There's a distant sonic boom. And a seemingly eternal windy silence.

My eyes are burning out. They won't close. My head hurts, but I feel detached from the pain, like someone's bringing messages from the next room: "We've got a report here saying you have a splitting headache..."

It takes him minutes to reach me. I see every detail on his face, on his fists. His eyes are brown, like mine. My fingers twitch. "Hnnnnnnnnn--"

And then--

I wake up groggy, clotted to the ground.

Over the course of minutes I stagger upright, barely noticing the shreds of white and dark blue here and there on the blackened sand. Climb the nearest dune. Climb, jump, leap and fly.

It's a beautiful day.

Crushed Underground

We will omit, here, tired narrative of a typical prole's day in the life in this dark, oppressive, grimy dystopia-- the daily trials, the endless toil, the lack of privacy, food, enjoyment, comfort, companionship, love. We will skip over lengthy, detailed descriptions of the internal structure and endless maintenance of the kilometres-wide, hermetically sealed, utterly inescapable Talmansk Arcology, prison of humanity.

We will start, instead, with a lone man, sitting this evening at his liquid crystal desk, moving virtual objects to and fro across the arcology's internal network, in an office in a suite in a secret bunker where he dwells alone and has issued forth, electronically, rules and decrees for decades and decades, at the moment that the Revolution bursts into his office, automatic weapons blazing.

He lunges for a red button which has sat in the same spot on his desk, disregarded, for almost as long as he has held his position, and bullet-proof glass slams down all around him. The glass holds, just about. The man-- he looks late middle-aged-- collapses into his chair and just stares in frank amazement. Four or five bullets smoke in the wall behind him.

They're not warriors. Hardly any of them even look like credible threats. Two in the back are only boys, fourteen or fifteen years old, skinny, white-faced. There's an older man, greying, bulky, in need of exercise, he can't quite keep his gun straight. They are trained, yes, they all move with speed and attention paid to their surroundings (which are lavish, deep-coloured, with books and carpets), but... a word drags itself out of the depths of his vocabulary. "Rag-tag". And their eyes are all too wide.

After the rebels stop firing and a call is made for a demolitions expert, he finally recovers himself and turns on a speaker so he can talk to them.

"I can't describe how proud I am that you managed this," he says. "I honestly didn't think you would ever manage it. I'm sure you're even more acutely aware than I am that I have the most awesomely totalitarian surveillance and security system known to mankind at my disposal in this bunker. There are fail-safes for the fail-safes for the fail-safes. There is no way that *I* could think of, in any conceivable eventuality, that it would be possible for anybody to infiltrate their way all the way into this bunker without being detected from the moment you entered at floor zero. That you're here and my security board is all green is amazing. Truly amazing. You deserve applause." He claps, not insincerely. "You there, you're in charge, am I right? What's your name?"

"Nohta Brown," says the tallest man, the dark man in the heaviest armour, stepping forward. "What's yours?"

"I'm the Governor. Surely you know *that* already."

"What's your real name, Governor?"

The Governor sighs. "Calrus. Mitchell Calrus. I haven't had cause to use my real name in a long time. I doubt it means much to you. But I suppose you are owed something for making it all the way down here. Why are you here?"

"You *know* why we're here, Calrus. We want it to end. We want to leave this... sick *experiment* of yours. We want to see the world you've kept us secret from for so long. We want to be set free."

"Free?" Calrus leans back in his chair and folds his arms casually. "You can't," he says, matter-of-factly.

"It can't happen. Sorry."

The demolitions expert comes in. Brown talks to him for a moment. Calrus hears but doesn't quite understand the jargon. No matter. The expert begins work on the glass.

"You've been lying to us," says Brown. "We've been kept down here, in this so-called 'arcology', for at least three generations. Probably much longer, if what my grandfather told me is to be believed. But it's not true. This story you've fed us all. About us being buried underground. About the world outside being obscured because of wind and... and mud piling up on the arcology roof. But it's all lies. I've spoken to older generations. Since I was just a child. All of us have. We know what these chemicals in the food you feed us do to us. Keeping us docile. We know about the oceans. And the forests. I've read books about... about this sky thing and wind and... and fish and animals. And the Sun."

"You're not supposed to know what the Sun is, Nohta," says Calrus. "Those stories are *banned*."

"You can't destroy knowledge."

Calrus nods.

"Everything you've heard is wrong," he says. "Everything I've told you is correct. There *is* nothing left outside this arcology. We do have to stay here. For the rest of your life and the rest of your children's lives. There's no Sun. There's no such thing as love, or any other emotions you may have heard of. You're off the dose. Go back to work. All of you. Please. *This* is your universe. There is nothing outside it, understand me?"

"You're going to let us out of here," says Brown. He pulls out a crumpled rectangle from a pocket. "What is this? What is it?"

"A fiction," says Calrus, barely glancing at it. "You know everything can be faked. If you kill me, you'll never get out of here, not past the diamond carapace, not with all the high explosives you can muster. You have mining to do, Nohta Brown. Your shaft is untended."

The demolitions man, still unnamed, begins attaching shaped charges to the bullet-proof screen. Calrus moves to the farthest corner - next to a bookshelf - and, with effort, turns the desk and chair over as shielding for the explosion. "Automatic weapons and explosives. With your resources. Unbelievable. It must have taken you years. Where do you operate from? How did you learn how to subvert my security? Did you have help?"

There's no answer. The squad is retreating to safety. "You don't have to answer if you don't want to, of course," he adds.

The explosion is too loud to even register as noise in Calrus' ears. He survives the explosion but is dazed and extremely deaf for some time afterwards, as Brown and his men hurry back in, lift the shattered desk off him, lay into him with the heavy ends of their machine guns until he stops fighting back, and finally drag him away.

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They tie his arms behind his back with heavy industrial tape. They make him lead them out of his suite and back through the mazelike bunker to the elevator. They travel straight up, without stopping, to the Crow's Nest, the top floor of the tallest building in the arcology, the gigantic kilometre-tall stalactite which supports the arcology ceiling. They take him to the edge and hold him there and hijack the city-

wide video network to show the teeming masses their leader, at their mercy. They threaten to drop him.

Millions of people find the gear change difficult to comprehend. No more Governor? So... what would they do?

Some kilometres away to the southwest, the drug factory is in flames. The signal should have hit Calrus' desk hours ago but it was masked and he never even knew. Soon everybody will be off the dose, whether they like it or not. Withdrawal will kill a few, but the survivors will be so much stronger! *Then* they'll know what to do.

"Don't kill me," says Calrus. "Just don't. I'll show you what you want to see. I'll show you the light outside. Just let me live. Let me come with you. I want to leave as much as you do."

"You're a prisoner too, eh?"

"Did it look like I had the option of leaving? Through those locks?"

Calrus shows them the way. It takes some hours. He leads them to the ground floor of the arcology and then they set out on foot, as a procession, with people gathering around them by the hundred, by the thousand, increasing in volume, some of them getting the idea and starting to throw things and shout. It seems like half the city is following them by the time the tiny band of rebels and their captive reach a building wedged into the farthest southern corner of the arcology, where the hexagonal diamond pattern meets ground level. Calrus, his arms freed, deactivates the security for all of them and enters. Three hair triggers are pointed at him from behind. If it is a trap, he will be the first to die. And everybody will still be free. So he has nothing to lose. That is the reasoning.

Hundreds of people, the less well-programmed, crowd in behind them, trying to follow the rebels.

They reach a wide open room, dark, grimy, full of mining equipment. Calrus opens a rusty panel and enters another code. Elderly hydraulics begin to whine. One wall of the room begins to unfold, dislodging some of the equipment stacked against it. The door is ten feet thick. Behind it is a long, fluorescent-lit tunnel. "This leads beyond the boundary of the arcology. It leads to the surface. The airlock at the far end will lead you outside. Follow me."

The tunnel is almost a kilometre long. It bends gently and climbs gradually upwards. The further they travel, the cleaner the sections of tunnel seem to be. As if they were built later. As if the tunnel had been extended over time. Every fifty metres or so are gigantic slots in the walls - doors, retracted. The last door is closed, with black and yellow signs covering it. It's convex, like the exterior of a shell. The text becomes visible slowly:

AIRLOCK
WARNING: HUMAN-HOSTILE ENVIRONMENT AHEAD
CHEMICAL/BIOLOGICAL/RADIOLOGICAL CONTAMINANTS
USE RESPIRATION MASK
FULL SUIT PROTECTION ***STRONGLY* RECOMMENDED**

DECONTAMINATION MANDATORY ON RETURN
MAXIMUM EXPOSURE TWENTY-FIVE (25) MINUTES
NO RETURN WITHIN FIFTEEN (15) DAYS

WAIT FOR DOUBLE GREEN LIGHT BEFORE COMMENCING SECOND CYCLE

"How much of this do you believe, Nohta Brown?" asks Calrus as he plugs yet another code into the panel in the wall. The first gigantic door rotates into the ceiling.

They step into the enormous, spherical cell behind the airlock. "Forgive me," says Calrus. "But I'm going to continue this charade for as long as possible." He goes to the final wall panel and opens a large locker behind it. There're half a dozen radiation suits behind it, and plastic masks on long cables hooked into air compressors in the wall. Calrus straps one mask over his face.

"Just open the door," says Brown, refusing Calrus' offer of a mask of his own. Behind him, his followers likewise decline. They clutch their weaponry nervously.

Two green lights flash.

"Freedom," says Calrus, and pulls a very large lever. The airlock closes behind them. And the second door opens ahead of them.

The first thing the rebels feel is their ears, popping as air rushes out through the opening crack. Then the stink of strange air coming back in. And then the *wind*.

Black and yellow dust streams in under the door. There are mountains of it out there. Piled up as part of the ruse, obviously. Here it comes. Here comes the Sun.

The door folds away over their heads, leaving them exposed to the elements in a low chasm between several large hills of earth and dust. Nohta Brown runs up the high dune ahead. He is already gasping as he reaches the top. The air is foul, choked with strange metallic and chemical smells. There doesn't seem to be enough oxygen in it. Calrus follows him, trailing his air hose.

He scans the horizon.

"This is it, Nohta," says Calrus, slightly muffled through the mask. "This is what you asked for. You feel that air movement? That's light wind. Three hundred miles per hour, it goes, on bad days. You feel the sting of dust and sand in the air? That's earth. Smell the fresh air, Nohta. Feel the fire of the Sun," says Calrus, and points to the livid orange glow behind the livid yellow sky.

Behind them, the arcology looms, just a mountain of mud from the outside, some of it hundreds of metres thick. The tunnel from which they just emerged can be seen leading off, towards it, worming its way into the filth. In every other direction is desolation. Hills of rock and sand and mud. On one horizon is a collection of angular blocks; gigantic hollow husks of buildings, shifted by tectonic plate movement, worn down and bent over by constant grinding wind.

"This is all there was left after the disaster," shouts Calrus. "This and the arcology we live in. I'm trying to reverse it. I'm doing the best I can. I'm using algae to regenerate the atmosphere, and I have DNA samples of the fish and animals and trees you've heard of. Your picture, it's an oak tree. And the green stuff on the ground is grass. There will be grass again. But it's going to take almost two thousand years longer, can you understand that? A hundred generations. And we *have to wait* for that to finish. I have to keep humanity alive and breeding in our burrow until the world is ready for us again."

"I don't believe you!" cries Nohta. He turns around and around, taking in all the space and all the freedom. There's nothing over his head and it makes him feel scared and exposed.

"This atmosphere is dangerous for you. Even if you could breathe it for the long term you'll die of radiation poisoning within days. Use my mask. We can go back inside. I have to go back myself. We

need to rebuild the chemical factory. The work has to continue. Just take this!"

Nohta refuses the mask. "No."

"What don't you believe?" shouts Calrus. "What of this looks fake to you? How long have you believed what you believe? How young did you start listening to the lies?"

"I don't remember," Nohta gasps. "I was no more than... six..."

Twenty years. Calrus bites his lip. Then turns away. And walks away from him, back down the dune.

Nohta's followers have found a few additional masks where the first one is attached, and are breathing from them in turn.

Calrus looks up at the figure on the hill, who has fallen to his knees. Then he checks for the two green lights, and pulls the lever again.

Taphophobia

The teleporter looks like a gigantic metal hand reaching out of the lower right wall of the building, enclosing with eight evenly-spaced iridium steel claws (each machined to exceptional tolerances and tipped with foam when not in use to prevent people losing eyes and ears) a spherical volume roughly fifteen metres in diameter. There is a small wooden bridge leading over the lower two claws, between the rest and into the sphere they describe, where there is a round wooden platform, on which stands an assembly supporting two bell jars.

Both bell jars are evacuated. One of them has a two-microgram speck of boron suspended inside with magnetic fields. The other is empty.

Behind the metal claw and plugged into it is a forty-five-foot stack of machinery which is the power generator. In theory, that is to say, in a perfect universe, almost no power should be required to teleport something. The whole process should be frictionless, metaphorically speaking. In practice, both the teleportation machinery and the quantum fabric of the physical universe in which said machinery is embedded is unavoidably imperfect, which means a fair whack of energy is required, in a carefully shaped and directed pulse.

Arranged around the rest of the cavernous laboratory are other control desks, banks of capacitors, cables of thickness varying between one millimetre and one metre snaking off into the desks, the walls, the machinery and each other, physicists of all levels of education and experience, two forklift trucks and seemingly hundreds of flat panel computer monitors. On the walls are big projection screens, and on the ceiling, lights, air conditioning units and a mobile crane rig for the heavy lifting.

It is late morning. Fast had been broken. People are well-fed, confident and upbeat. Every element of the experiment has been laboriously confirmed as being in a state of readiness.

Dr Adrian Ashmore clicks the box on his screen marked "OK", mildly disappointed that there is no big red Button-with-a-capital-B for him to press. Fwa-zapp! The capacitors fire. Bright light flashes. Paper is swept off his desk by a sudden blast of wind. There's a thunderclap! The experiment is a success! The--

Wait, why is there a thunderclap?

*

"Is everybody okay? What just happened?"

"Anne's gone!"

"What?"

"Anne?"

"Anne's gone."

There is a brief moment of silence. "Gone *where?*"

Dr Ashmore stands up. He is gangly, ginger - right now, authoritative. "We need to run the experiment again," he announces. "Now! Quickly! The coordinates are still in the computer. We just need to run the same program again to swap everything back. You've got one minute. All of you."

Quite a lot of frantic shouting ensues. Ashmore's job is relatively simple and he finishes resetting his station within a second, leaving him to clench his sweating hands and wait fretfully for everybody else to finish.

Thomas Muoka is a theoretical kind of guy - he works with paper, not his hands, and has even less to do at this point than Ashmore. So he moves over to his colleague in the brief moment that is available and speaks his mind. "Adrian, what just happened should be impossible."

Ashmore laughs hollowly and doesn't meet Muoka's gaze. "I don't think Anne is going to find that to be much consolation."

"But you know what I'm saying. You know I'm right. And our chances of rescuing her--"

"Look... we have to try, Tom." Ashmore looks up. All the telltales on his screen are beginning to flick over to green again. "Are we ready? Are we ready?" he calls. "Ready? Okay, everybody stand back. Three-- Jan? Three, two, one, go!"

There's another thunderclap where the first one was - in the middle of the room, in front of the tall stack of blinking physics processors which is Anne Poole's workstation. But that's it.

"Do it again," says Ashmore. "And... somebody try phoning her!"

"Adrian, this isn't going to work," says Muoka. "If it didn't work the first time, why should it work the second time?"

They do it again anyway.

"It's saying 'not available'," says an intern, a phone clamped to his ear, halfway through the warm-up for the third run.

After the third time Ashmore quits. The machinery is supposed to be overhauled after each experiment. Four in quick succession has done it permanent damage; it simply won't run anymore. And there's still no answer on the phone.

There's a long and nervy silence. "What now, then?" somebody asks.

In a soft voice, Muoka says, "It was important to try. But I think now we should call the police."

*

It has taken years for them to build the teleporter, but the next weeks seem to take much, much longer.

Over and over again, the same story is retold from different angles:

> *There was a storm the night before the accident. During the storm, the lab was struck once. The lab stands at a relatively high altitude and this eventuality had not gone unanticipated; a lightning conductor earthed the strike and the teleporter's delicate electrical systems were well shielded from the electromagnetic effects. But computer mainframe storing the teleportation program was not. By a million-to-one chance, the program was very slightly corrupted - just a few bytes were changed, but they were enough to make the difference.*
>
> *The theoretical range of the equipment is infinite - though the probability of a successful translocation decreased dramatically once you go beyond, say, fifty kilometres. But that range goes in every direction. Anne Poole could have been plonked on the ground*

somewhere else in the country, but, all things being equal, it is significantly more likely that she was sent a good distance upwards or downwards - into the air or even into space, or alternatively, deep underground.

Teleportation isn't just a matter of transplanting something to a new location. It is an exchange of two portions of space. If something goes there, then whatever is there already has to come back. If Anne had been sent underground, then instead of a thunderclap there would have been a perfectly Anne-shaped piece of rock left standing in her place. If she had been sent to another location that was a short distance above ground level, then nothing would have happened - she would have just disappeared and been replaced with air. But neither of these things happened. Anne Poole was replaced with an Anne Poole-shaped volume of near-vacuum. As pressure equalised in the room, that caused a thunderclap.

That thunderclap - as half a dozen of us knew instantly - meant that Anne could not be rescued. Teleportation programming is an extremely protracted process even with the bare minimum of safety precautions observed. Coming up with an entirely new program - even a corrected version of the corrupted one - in less than a full day is humanly impossible. If there had been no thunderclap then there was a chance, however slim, that Anne would survive the fall to ground level and be found, or make her way home. If she had been replaced with a mineral likeness, then that meant she was fixed in space - fossilised alive - inside the coal seam. We could have run the corrupted program a second time and pulled her out again within moments. But the thunderclap meant she had been transported to a high altitude, and that meant she had started falling. Her location had changed and running the experiment again - which we did, in spite of all of the above - could only have realistically served to rescue more chunks of low-pressure air.

Anne Poole's body is never found and the search of the surrounding countryside is called off after a few months.

Dr Adrian Ashmore is deemed ultimately responsible for failing to spot the corruption to the program during the check-up process, and sent to prison for involuntary manslaughter.

Eighteen months pass.

*

"Jeff, who is this guy and is he supposed to be down here?"

The short man with the bushy moustache standing behind the newcomer in the weighty coat waves a grubby yellow piece of paper. "It's clear. He's from the police."

"What, so it's a crime to dig stuff up now? I thought they were going to get an archaeologist."

"Detective Haddon. The archaeologist's on his way," says the newcomer. "It's actually a more serious criminal offence to dig a body out of the ground than it is to dump one in the ground in the first place. Although how in heaven's name somebody dumped a body this far underground I don't know and why they need an archaeologist I also don't know. Can I see what you found?"

Adam Mansell nods and leads the tall man - who is almost bent double in an ill-fitting helmet which nevertheless connects with almost every overhead beam - into the deeper areas of the utterly dark and equipment-crowded tunnels. Jeff, the manager, follows them both. It is a longwall mine, sixty percent dug out.

Eventually they reach a shearing machine sitting at the coal face. It is broken. Jeff points out the dented machine head.

"What did that?"

"The body."

"...The body?" Haddon flicks the machine head. *Tenk.* "This thing's made of steel, or something, right? Is the body fossilised?"

"Look, you have to see it," says Jeff. "Over here. They only made one pass over it, that was enough to do the damage. Look here. At the face."

"It has to be made of diamond or something," says Adam.

The newcomer follows them up to the black coal face and all three aim their head torches at the place where Adam is standing.

There, sticking out of the rock wall, pale white, unmoving, are four knuckles and the tip of a thumb of a human's right hand. The hand is small, and probably female. About an inch of it has been revealed altogether. There is a ring.

"I guess the jewel in the ring might be diamond," says Jeff. "But a diamond that small won't do anything to our equipment. And as for the rest of it, I don't know. It's like... well, I don't like to say the word."

"Any of you touch it?" asks the policeman.

"Don't think so."

Haddon pulls on a plastic glove and gingerly prods the ring, then one of the fingers. "It feels hard. Not like diamond but pretty hard. But it still looks and feels like skin, somehow. I'll give you the skin colour is paler than most but it looks like it might be natural. Could be the light. I suppose it could be fossilised. But I never heard of a fossil hard enough to dent drilling equipment. And you don't get fossils in coal seams anyway, do you?"

"Coal *is* fossils."

"What's directly above here?" asks Haddon.

"Fields," says Jeff. "Fenced off. Danger of subsidence. Outright certainty by the time this seam's empty."

"Any faults in this coal seam? Any... I don't know... chasms?"

"Look, you're asking me? This is a solid chunk of coal. She's baked inside it. She's not made of diamond but she's hard as. Telling you, man."

"She must have been doing geology or something. Measuring rocks up above. Fell down a fault and wound up here."

"You're not listening to me, man. That doesn't make any sense. It's solid coal. And signposted. No fault, a single block. Anthracite. Low quality, but low quality anthracite is still good quality coal. You can't sink through solid rock. You know what the alternative is."

Haddon turns around and stands up, knocking his helmet on another beam. "Is-- ow. Is what? Somebody killed her, went back in time three hundred million years and dumped her in a tar pit in prehistoric Yorkshire? As a rational, thinking human being you'll forgive me if I take the stance that that, at least, makes more scientific sense than having tunnelled into purgatory and collided with somebody's immortal soul."

Jeff points.

Small pieces of coal are crumbling away from around the fingers, which have begun to move.

The Astronomer's Loss

"For the future," says the astronomer. "Humanity always needs challenges, horizons, adversity, to be constantly striving for the future. We had plans for the future. We went the Moon and we were going to found a colony there. We were going to go to Mars, and found a colony there too. We were going to colonise Europa, and Titan, and maybe others. We were going to capture and mine the asteroids, build space elevators, build ark ships and go to other star systems. We need space... so that we can study, and learn more about the universe and discover new science. We could be like you, flying faster than light--we know it's possible now! We *could* gain that much power. If you only gave us the time. We could colonise the galaxy and the universe."

"But you haven't."

The astronomer lowers his gaze from the growing ink blot in the sky and looks towards the horizon. Bright city lights. "To survive," he says. "One world cannot protect us forever. Humanity is vulnerable, living on a single unprotected rock. We need to be insured in case of asteroid impacts, or gamma ray bursts from space. We need to diversify genetically, to adapt to new environments and live on new worlds and look at the universe through new eyes. There's no other way to survive. You're taking away billions of years of potential future."

"No, we aren't."

He tries to stop shaking. "We need... something to shoot for. It's the only reason we ever built anything. It's the only reason we have mathematics, the only reason we have science. Because we wanted to understand the sky. We need light. We need stars to follow. We need inspiration."

"You don't."

Bright city lights. Millions of people who never even looked at the stars.

The voice says, "With the Moon and stars and planets we provided you with boundless opportunities. We gave you gifts. But you have shown no inclination to take advantage of them. Thus, the gifts are worthless to you, and we are giving them to somebody else."

The planets are all long gone. The inkblot finally closes overhead and the last star winks out. The gibbous Moon remains shining balefully down on the world for a tense and hopeful minute, but then, in an eyeblink, is swallowed up by one final event horizon, and spirited away.

Left in utter darkness, the former astronomer tries and fails to deal rationally with his loss, and his isolation from the human race who, as the voice rightly tried to tell him, has really lost nothing.

Amber

Dr Adrian Ashmore is gangly, ginger - right now, troubled. Understandably so. He fiddles obsessively with a clicky ballpoint pen and avoids meeting Detective Haddon's gaze when he enters the interview room.

"We've found Anne Poole," says Haddon, taking the seat in front of him. "Two days ago."

Ashmore raises his eyebrows. "Well, that's good to know. It's about time. Where was she?"

"She was in a coal seam, thirteen miles from your laboratory."

There is a long pause.

"...How far down?" asks Ashmore, eventually.

"About seven hundred feet," says Haddon.

There is another pause.

"What are you thinking?" asks Haddon.

"You know what I'm thinking, otherwise you wouldn't have asked me the question."

"Something was wrong with the equipment," Haddon suggests.

Ashmore shakes his head. "Until we ran it into the ground, the array was in perfect working order. I could have it running again inside a week. All I'd have to do is replace a few components."

"Something was wrong with the data. It looked like she went there but she went here instead."

Ashmore shakes his head. He fiddles with the ballpoint some more, then carefully stands it on its end. "The only way this would be possible," he says slowly, "is if there were two exchanges. First, Anne was swapped into the coal seam. Then, an instant later, a *second* operation swapped the coal from our lab into space, causing the thunderclap. The recording instrumentation would overwrite the first operation's data with the second so we would never see it. And we would never know that Anne had been sent underground instead. Running the second step a second time, like we did, would have no effect, and the statue itself is probably in millions of pieces somewhere in that area you combed. Easy enough to miss. That's the simplest explanation I can think of."

"And could all that have happened by accident?" asks Haddon.

"No. One program being corrupted, maybe. Then Anne would have just been in the wrong place at the right time. Two finely matched programs executing one after the other, with all the evidence being conveniently overwritten, is beyond coincidence. Somebody would have had to deliberately insert a pre-prepared substitute program set during the check-up procedure after the lightning strike." Ashmore exhales and then, hesitantly, says: "Which means Anne was murdered.

"At that time, I was the only person on the planet who understood teleportation well enough to construct those two programs on my own. That's why I'm here - I'm the man who knows the code best, I'm the man who should have seen the error. Which means that all the evidence points to me being the one who murdered her."

Ashmore puts the pen aside and leans forward. "I made a mistake. I admitted this a long time ago. The

odds of a randomly chosen teleportation program successfully compiling are negligible. The odds of a lightning bolt randomly mutating the program from one correct form into another correct form, more or less zero. So when the program compiled correctly I naturally assumed that that was evidence enough that it was still the correct program. As for foul play-- that thought never even entered my mind until now. You have to believe me. I did *not* murder Anne. I have no motive. She was a dear friend to me. In several fields she was a genius. I worked with her on half a dozen papers, what would I stand to gain from killing her?"

"Anne's not dead."

Ashmore has to think about this for quite a long time. "Was... was she found *hiding* in this mine?"

"No. Sealed in the coal. Like a fly in amber. I watched her get dug out myself."

"And she's alive? How is that possible?"

"We don't know," says Haddon.

*

The raving colours and noises bouncing off the inside walls of Anne Poole's brain begin to fade in intensity. She becomes dimly aware that something strange is seeping in from the outermost portions of her consciousness, the parts connected to reality, so she flounders in the deep and overpowering ocean depth of the middle bit of her brain and begins to spacewalk along the murky bottom towards the beach.

As she gets closer the rippling light up above her resolves itself into a stylised yellow sun, and then, as she breaks the water's surface, lengthens and softens into a trio of short fluorescent tubes set into a tiled ceiling. She's warm. She's lying on something soft. All of these things are scary. Anne shrieks and flinches and tries to shrink away from the sensory overload. She can't do much more than close her eyes and curl into a ball.

"Anne?" She opens one eye briefly. A face has appeared over her. It matches a pattern she already knows. The name attached to it is all clogged up in her head somewhere, though. "Anne, it's Adrian," he whispers. "How are you feeling?"

Anne Poole curls up tighter and mumbles something. Not a lot of sound comes out. Nothing coherent.

"Anne, I'm sorry. We tried to rescue you. We're so sorry. I, um. I've no idea what would help you right now, the doctor said something familiar might help... I did some mathematical working. I'll put it here where you can see it. If you get used to light again, I mean. I don't know. You might recognise it. I couldn't get anything useful out. We *are* going to find who did this."

"Dr Ashmore, I think it would be best if we turn these lights down again," says another voice.

Ashmore looks up and nods, then leaves. The door shuts and the lights go out. Anne feels less dizzy like that, and relaxes a little.

*

Haddon and Ashmore meet the psychology consultant, Dr Shapur, in her office a little later.

"Even if they were provided with air, water and so on," says Shapur, sitting behind her desk, "a person deprived of stimulation in the manner that Dr Poole has endured would suffer irreversible

psychological damage after only a few days. Eighteen months' exposure should have killed her, many times over - as it is, her mind has atrophied more than should even be possible. She still responds to external stimuli which means she is still *thinking*... I don't doubt that it's *possible* to rebuild her mind. But it could conceivably take a lifetime."

"Tell him how she survived," says Haddon.

Shapur picks up a bulging ring binder and flips through it to find the report she's looking for. "Dr Poole... has... changed, is the only way any of us can think to put it. The teleportation event has altered her. She no longer has any need to breathe, drink or eat. She has no digestive or respiratory function. She also doesn't give off body heat, which leads me to believe that biological activity in her body may have ceased completely. It's either hibernation or a good impression of it."

"But she's moving. She can make noise," says Ashmore.

"Yes. Her nervous system is still active. EEG came back completely negative but there is clear evidence of cognitive activity: she can think. To move and think, you need chemical energy from food and your cells need oxygen supplied by blood flow. Which makes her a living impossibility.

"Dr Poole seems to be opaque to X-rays now, likewise the RF radiation we use for magnetic resonance imaging. And her skin is now completely impenetrable: she severely damaged the longwall mining equipment that ran into her in the coal seam and we've found no scalpel or needle which can harm her either. Likewise, pills and medicine taken orally would remain undigested and take no effect. She can inhale and exhale, but the air she breathes out is chemically identical to what she takes in, which means foreign gases have no effect on her.

"In other words, we have no way to administer drugs to her. We have no way to sedate her. We are limited in the procedures we can use to examine and treat her. As I say: without access to many of our modern treatments, a complete 'cure' could conceivably take decades."

"Which is why I'm here," surmises Ashmore, beginning to understand.

"Dr Poole can't be physically hurt," says Shapur. "She can't be or drugged, or starved, or suffocated. If, as I suspect, biological activity in her body has truly ceased completely then she may even have stopped ageing. Which means that, seventy years from now, when she wakes up cured, she may be *physically* the same age as she is now."

"There'll be a hearing," says Haddon, "and you may have your sentence reduced in light of the new facts, but you're still going back to prison, and you'll probably never be allowed to touch the teleportation machinery again. But we're going to give you access to books. And a computer. Anything you need. Everybody's going to be studying this, you will be too. We want to know who did this to her just as much as you do. But we also want to know *how*. And, if possible, we want to know if this result can be reversed. Or duplicated."

Indistinguishable from magic

He's waiting around the corner for her as she comes out of her office a little after 12:30pm. He sees her lock the door behind her and head along the corridor for the stairwell.

She's coming for the corner, he can see her approaching as he goes to head her off. He makes the same pace towards the corner and tries to match her footsteps, walking quietly, so that she won't realise he's approaching. The timing is perfect but his hands are sweating. He doesn't like this one bit.

They reach the corner at the exact same moment, it's too late for either of them to stop---"Sorry!"---and that's when he walks through her.

Seph Baird turns around with something approaching sick horror on her face, skin crawling like she just walked through a thick mass of spiderwebs.

"Sorry," he replies, holding his hands out apologetically. "I'm Mitch. We spoke on the phone? You're seeing me in about an hour? I came down early." He bows forward very slightly. He is shorter than she is, dark-haired, middle-aged, and wears a dark leather jacket and a plain black t-shirt with an ornate design promoting some tired 70s metal band. Skulls and thorns. A full and respectable beard. "You must be Josephine Baird, the physicist?"

"I'm a quantum statistician, it's not quite the same thing," manages Seph, clutching her bag protectively in front of her. Mitch puts his hands in his pockets and waits patiently as Seph takes a few breaths and says "Okay" a few times.

"Okay. Well... now I bet I've got your attention."

"You just walked through me."

"Yes," says Mitch. "I can walk through stuff. And myself." He passes his wrists through each other.

"Don't-- don't do that," says Seph, "it could be bad for you."

"Could it, this is what I need to know. Is this bad for me? Is it fatal?"

"Have you spoken to a doctor?"

"Would that help?"

Seph concedes this point.

*

The cafeteria at the hub of the Mathematical Sciences Centre is spacious but busy. Quite a lot of advanced mathematics is going on at nearby lounge chairs. Mitch goes to the hot food queue; Seph opts for tea. They grab a small square table-for-two in the middle of the room.

"Alright," says Mitch, sitting down with his tray. "Simple stuff first. Two glasses." He picks one up and, very slowly, as Seph squints intently, wedges it through the other one at a diagonal angle, then puts them down, interlocked.

Seph picks the new artifact up and turns it over in her hands for some time. She tries to wiggle them apart and fails. They'd break if she pulled harder. "So this isn't a magic trick?"

Mitch takes them out of her hands and pulls them apart. He puts them down on the table next to each

other, then slides them together, so the circular rims of the glasses overlap to make an old-fashioned binocular-lens shape. Seph inspects this too. He takes some cutlery and casually waves it through his hands and fingers, then embeds a few forks through the table. Underneath, individual tines can be seen protruding. The table appears to be undamaged. It stays undamaged when Mitch pulls everything out again.

"This started about a week ago. I was eating breakfast one morning and it was almost like I remembered how to do it, as if I'd forgotten it years ago. It took me a long time to summon the nerve to try it out, and... well, as we've established, what good would a doctor be? I decided to try to find a scientist... my brother said you were a tutor of a friend of his."

"Have you shown anybody?"

"Nobody who believed their eyes," says Mitch. "I mean, who would? I'm not going public. I've seen what's happening with that... what's her name? Forever surrounded by paparazzi, massive scientific media storm... She's so out of it she doesn't even know it's happening, lucky for her. Not so good for me. Hell, I haven't even stolen anything yet."

Hungry, Mitch starts eating, and discovers one forkful too late that what he thought was well-done steak is, in fact, liver. Seph sips her tea and sits and thinks in silence for a long time. She pulls a small notebook out of her bag and scribbles a few things.

"Okay, that's very well," says Seph. "I mean... yes. This would... cause a storm. Are you planning to? Steal anything, I mean?"

Mitch shrugs. "They'd never be able to catch me."

"You've got to sleep some time. Presumably you stay solid when you're asleep. You don't start drifting through things?"

"It takes conscious effort to phase. And I can't breathe while phased."

"Well, then. Several ideas spring to mind. But like you say, we're getting ahead of ourselves."

"I also have X-ray vision," Mitch says, poking the food down.

That completely derails Seph's train of thought. "*What?*"

"I can see through stuff. I can see inside people and things. Up to a distance, I mean. My eyes aren't perfect."

"That's not possible. Not with regular X-rays. This world is completely dark in the X-ray spectrum, there's nothing you should be able to detect unless-- oh hell, you're not bathing us all in high-energy X-radiation are you?"

"It just looks like colour! Regular colours. Not just metals and bones, either. I see everything."

"In colour? In proper 3D? You see the right colours for what things should be? Don't look at me like that!" She closes her arms up in front of her.

"I'm trying not to! Look, I seem to have acquired a set of powers which-- which are *open to abuse*, but I've read the odd comic book. Great responsibility et cetera. Anyway, I can't just look at the skin below the clothes. I can't just peel away layers like that. It's a focus depth thing. And people just look red on the interior. Icky red and other nasty colours. Watching blood circulate isn't fun, it's horrific."

"You see this with your *actual* eyes? Your *eyeballs focus* light emanating from organs and objects which are hidden *completely in darkness*? Is that what you're saying, Mitchell?"

"I haven't thought about it like that!"

Seph sits back and stares at the ceiling. "So you have two completely different, completely unrelated *superpowers*, is that right? This is insane. This is... major." She thinks for a very long while, lips moving. Mitch finishes his vegetables and puts the rest of his food aside.

Seph doodles. She thinks about her timetable. Her PhD's ahead of schedule. "Other than all of that," she says eventually, "you are still physically human?"

"As far as I know."

"Then we're going to have to experiment on you."

Paper universe

Thomas Muoka's the tallest guy you've ever met. He'd get tired of people asking him, "Hey, you must be pretty good at basketball, right?" but he doesn't because he's actually really, really good at basketball, and likes telling people about it. He represented his city a few times when he was a decade or two younger; has a few trophies. Still plays on weekends. But he knows he's slowing down. It's mainly for his heart's benefit these days, because who wants to run on a machine? Physics is his day job.

Muoka's here because of physics and personal commitment. He wants to know what's happened to his friend. He has been throwing ideas backwards and forwards with Ashmore for some time. Ashmore said he was pretty close to solving a good portion of the problem a few days ago, before he called the meeting. Muoka wants Anne back. They were relatively close. He's aware that she had research in progress which dearly needs her input. And also, well, Mysteries Of Teleportation Revealed: he's a physicist, his job is to learn. This could be significant.

Dr Srin Shapur is minuscule. She has the kind of hair that's ideal for pinning up in a tight bun and then shaking down in slow motion halfway through the movie, and even has the thick, nerdy glasses to take off dramatically too. Unfortunately, this will never happen, because she needs the glasses to see.

She has been having an unproductive few months. She knows more than almost anybody in the country about sensory deprivation and the rate at which she is gaining knowledge of the subject - from reading others' work and from her own studies of her own unique patient - will put her at number one in the world before the year is out. But she still feels like she knows next to nothing. Despite her rigorously planned and carefully performed tests and therapies, Anne Poole is only glacially slowly recovering her mind; more slowly, even, than a newborn baby. And the tiny, barely detectable fragments of memories of her old life which Anne retained through her fossilisation are eroding, being overwritten even as days pass. Wiped clean to make space for Anne's mind to pull itself together again. It's demoralising work. It could be years before real progress is seen.

If Shapur could use medicines and sedatives, she'd be making better progress. That's why she's here, she tells herself.

Detective John Haddon - big guy, listen to that chair creak - is drawing blanks on the murder attempt and his superiors are getting tetchy. He wants to know who tried to kill Anne Poole. He wants to know why they picked such a preposterously over-complex method and he wants to know why they failed. He just wants it solved. Super-advanced quantum physics can go hang. He doesn't trust something so close to science fiction.

He still isn't completely sure it wasn't Ashmore.

And Ashmore, when he enters the small-ish meeting room with two enormous handfuls of paper, is gangly, ginger and... drained. He moves slowly, like he is carrying something enormously heavy on his back.

"I'll admit right off that this is superscience. Really odd stuff. Very much out there. I'm not in a position to study Anne for verification myself but this paper here..." - it is hefty and the front page has more equations than Haddon or Shapur can count on it - "...outlines my basic hypothesis."

"Superscience?" askes Shapur. Ashmore has seized upon a nearby flipchart and starting scribbling

keywords and diagrams on it - possibly for nobody's benefit but his own.

"I think this can be adapted to work as a computer model and I think experimentation will confirm it in reality. You see... well, I'll try to keep away from mathematical language if I can. Time has altered for Anne's body. She's stuck. She's moving through it slower than the rest of us. Relativistic effects are applying to her skin and interior and her constituent cells, as if she's moving very close to the speed of light. Externally, what we see is apparently a person frozen in time. Not needing food or water or air because only a fraction of a second has passed from her perspective.

"How can she be moving at a substantial fraction of *c* and standing still at the same time? Because she's not moving in a straight line. She's moving in circles. Imagine a long thin tube, a cylinder. The surface of that cylinder is two-dimensional. But if you zoom out a long way, the long narrow cylinder appears thinner and thinner until it looks like just a line - one-dimensional. That's like the universe. Several of our spacial dimensions are wrapped around on a tiny scale like this so that from our macroscopic perspective it looks like reality is only three-dimensional. Like we're a paper-thin universe. But actually we can move, very, very slightly, imperceptibly, through a fourth spacial dimension.

"That's what's happening to Anne. She's vibrating into and out of the fourth dimension at some mind-numbingly high velocity, millions of times per second. She spends enough time in our plane of reality that she still interacts with it in the usual fashion - enough to reflect light and other EM waves in the usual way, enough to be subject to gravity. She looks normal and moves about normally. But almost no time passes for her, because every particle in her is going around in 4D circles at close to lightspeed.

"Get her under an electron microscope and I think you'd be able to bear this out. It's not magic, it's just a slightly unusual application of relativity on a local scale. It's not a complete theory, for that I would need at least *some* observational data, but with tweaks I think it can be made to work.

"Does that make sense?"

"Yes," says Shapur. "I guess so."

"Sure," says Haddon.

"No," says Thomas Muoka.

"*No!*" shouts Ashmore. He storms over to the flipchart, rips off the paper and tears it up. "It doesn't. *At all.*

"This solves maybe ten percent of the enigma. She can still move about. She can walk and talk, although I know she's having to learn how to do all of this again from scratch. She can *see* and *think* and respond to stimuli. So it seems like every part of her body is living on accelerated time except for her nervous system, which is acting like normal. Unless, discarding the impossible in favour of the improbable, her brainstem *is* in drastically decelerated time like the rest of her, and it is simply responding billions of times quicker than previously. In either case, certainly most of her body is in perpetual motion and can't seem to be slowed down. Which is, again, a complete thermodynamic contradiction in terms. Anne Poole is an anomaly. Something is drastically, hideously, cosmically wrong with her. And that's not the most important part.

"*This has nothing to do with teleportation.*

"Anne's immortal. But the clothes she was wearing when she was teleported are still perfectly ordinary.

Samples of thread were successfully taken for study not long after she was dug up. Her mobile phone, which she was carrying when she disappeared, ran down its battery while it was buried, but it was successfully charged up again by the police when they checked its memory. I know, I had the report pulled by Haddon. None of the artifacts Anne carried with her were affected by the jump. And on the quantum level, there's no difference between biological and non-biological matter, and so there's no reason why they should have been affected differently from Anne herself.

"Which means that, at the time of the jump, Anne was *already* immortal."

"Adrian, there are military and defense angles coming in here," says Muoka. "Teleportation was one thing. When Anne disappeared it became untouchable. But immortality technology could be the biggest thing of all time. The research is being distributed, there are people we both know being recruited by serious outfits with serious money and secrecy behind them, even as I speak. Contractors. NDAs. Do you know who Michaelson Group are? Everybody's been talking about it, it's all over the news. It doesn't matter that our equipment's all shot and shut down, there'll be more independent TP tests within months. And now you're saying--"

"I'm saying there's something else at work here."

Haddon says, "So we can't live forever."

"I'm not saying we can't live forever," says Ashmore. "And I'm not saying it would be an abomination against God and nature to try. I'm pro-immortality. But we can't jump to conclusions. We need to take this *really* slowly or somebody else - multiple people - are going to get seriously hurt. We need to abandon some assumptions."

"How do you kill an immortal?" asks Shapur, rhetorically.

Ashmore points at her, lecturing instinct taking over. "*Correct.* You can't. But you can neutralise her by putting her out of harm's way."

"Did she *know* she was immortal?" asks Muoka.

"I'm sure that an eyewitness can be found to testify that she was eating and drinking like a normal human being up until as late as breakfast on the day of the experiment," says Haddon.

"But that doesn't necessarily prove anything," says Muoka.

"She's not going to remember," says Shapur. "We're rebuilding her mind from scratch, she'll be a whole new person. Only the very deepest structures of Dr Poole's mind have survived intact. So I can say for a fact that we can't and won't ever be able to ask her."

"But *someone* knew," says Ashmore. "Someone who wanted Anne out of the way and who knew teleportation physics. A *lot* of teleportation physics. Ten times as much as anybody in the world knew at the time of the experiment, as far as we know. Which... is..." - he meets Muoka's eyes for just a moment - "just about possible."

"Unless it's divine intervention."

"What was it you were saying?" says Haddon. "An abomination against God?"

"There was a lightning strike," Muoka notes wryly.

"So Anne turns herself immortal and God takes offence?" says Ashmore. "No. I don't accept that."

"When you say 'just about possible'," says Haddon, "are you talking about industrial espionage?"
Ashmore glances at Muoka again, as if seeking permission for something. Muoka shrugs.
"Not exactly," says Ashmore.

Exponents

1. *Every year, a randomly chosen person on Earth is struck by lightning and gains superpowers.*

2. *Each new superhuman is twice as powerful as the previous one.*

3. *This has been going on for eleven years.*

A desolate air base smack in the North American heartland, surrounded by a sixty-kilometre ribbon of electric fence and razor wire hung with intimidating red, yellow and white signs warding off photographers, trespassers and enemies of the state respectively, *plus* incomprehensibly secret experiments going on within? It's a little greener, vegetation-wise, but Kuang Ching-Yu thinks you might as well call it Area 51 and save yourself five pages of description.

As far as most of Ching's past colleagues know, he works at Google. He does not.

Ching's a faster-than-light communications engineer, one of about nine in the whole world. There are only nine FTLCEngs in the whole world because FTLC does not work.

Well, they should work in theory, but they don't, because, in a bitter twist of irony, they are blocked by a very loud repeating message explaining *that very theory*.

Ching is also an amateur photographer, so the red signs in particular drive him nuts. On bad days, the amount of stuff he has failed to commit to film makes him nauseous: sunsets, starfields, red-lit racks of fighter jets, white-lit files of soldiers, bleak, fluorescent-lit command buildings, oppressively black concrete bunkers and, of course, the impossible flying people. The latter, in particular, he feels a near-irresistible compulsion to take photographic record of. Even now, after all his experimentation, he cannot quite believe it.

It's just a coma fantasy, he tells himself. Surely, science still applies in the waking world.

*

Two F-22s hurtle from horizon to horizon. From ground level, with the aid of binoculars, Ching can just about make out two human figures keeping pace and formation with the jets. They're wearing dark blue, and using the position that the aerodynamics boys eventually figured out for them: nose-first, with the feet very slightly lower than the head to ease the neck, and the arms very slightly spread, providing just a little lift. He has no idea how fast they're going. Any of them. He does know that without their transponders neither individual shows up on radar alongside the jets. They have no heat signature-- at least, when they're not moving fast enough to set the air on fire behind them.

The aircraft peel off towards a landing strip. The humans lose altitude and speed and just curl around lazily down to the ground. They don't need landing strips. The smaller of the two figures spots Ching from the air, and the larger one follows in the same direction.

As they get closer the dark blue aerodynamic flight suits become visible in detail; buckled rubbery things laden with stiff attitude control fins along the arms and legs and neck and head and feet. The first aerosuits looked like living aeroplanes, but the fins are coming to look more and more like bird feathers with every revision the design team makes. There are goggles.

"The thing about these suits, you two," says Ching as they get within speaking distance, "is they're going for improved speed and manoeuvrability, but they won't improve your reactions or control. What good is being able to move twice as fast if you can't tell what you're doing at that speed?"

"They also look bloody stupid," says Arika, wrenching off her hood and goggles. "And they're *too hot*."

Jason lands, nods to Ching, who nods in return. Jason appears to concur on the heat issue. "It's better when you're moving at speed because of windchill. But they don't breathe."

"They don't want to put in holes because it'll ruin the airflow," says Ching.

"I say screw airflow," says Arika.

"That's what I'm saying," says Ching. "I think it's ridiculous. They should work on something approaching armour. Something which can take being punched through a mountain."

Jason Chilton (Nine) is a short, broad-shouldered, stubbly, just-a-little-overweight Brit. He is/was/may still be a project manager for a company whose purpose Ching was only dimly able to understand, even after Jason explained it with diagrams. Jason openly admits to being infinitely more at home wearing a work shirt in an office environment, and finds the aerosuit and, indeed, the entire notion of being superpowered nonsensical. He was, in fact, punched through a mountain once.

Arika McClure (Eight) is taller than either of them. She is a teenaged, mixed-race, Australian orphan whose parents died under tragic circumstances almost three years ago. She ticks all kinds of demographic boxes and looks a hell of a lot better in the suit than Jason does. She loves being superpowered, every minute of it. She has done some actual successful crimefighting in her home town. She is on an endless happy adventure.

Both of them have been flying for more than a year, and have grown to hate walking so much that they rarely bother touching the ground anymore. Ching finds it disconcerting to talk to them as they bob up and down unconsciously on the spot, looking down at him, but he, like many other people on the base, has given up trying to get them to disobey their instincts.

"Twenty-four hours left," says Ching. "Still haven't found Eleven. I said I should have gone with them to work the equipment. Morons're going to miss the deadline."

"That's not true at all," says Arika. "He's here. He arrived yesterday."

"You were told that?"

"No," says Jason. "Sixth sense. Woke us both up in the middle of the night. He's here."

"He's here? And you weren't told, and I wasn't told, and none of us have spoken to him?"

The two Powers shrug.

*

Ching encounters his boss in the corridor which runs around C Block and quickly matches walking speed with him. Both of them are en route to the same meeting room.

"Moxon."

"Kuang."

"I know Eleven arrived last night."

Captain Moxon slows down. "We were going to tell you today. This very meeting."

"Do you have any idea how much work we need to do in the next twenty-four hours? I should have been notified the second you took off from the Philippines en route here. I could have been preparing all of yesterday and working all night."

"Look, Kuang. We've been busy. The other guys on your team are following your instructions. It is *in hand*."

"You just don't need me, is that it?"

"Of course we need you. You have the overview and the notes and the designs. You can explain everything in plain English. You're the key."

They open the double doors to the meeting room, in which there is a wide oval boardroom table which seats thirty, but only one other man, a dark-haired airman who instantly snaps to attention. Moxon tells him to be seated. Ching circles the table and plonks down his sheaf of paperwork at the far end, nearest the white screens.

"Ching-Yu Kuang, Jerry Kavet. He's our translator."

Ching goes back over and shakes Kavet's hand before handing him a file of paper. "Tagalog, am I right?"

"Yes, sir, and some local dialects." Kavet is broad-shouldered and bronzed and apparently heavily jet-lagged.

"Tell him everything you know about this," Moxon says to Ching.

Ching spreads out his paperwork and gathers his thoughts for just a second.

"Once every year, somebody, somewhere on Earth, undergoes a metamorphosis. They remain physically and genetically human, but gain the ability to apply reactionless forces to their own bodies, which, in turn, permits superhuman feats of strength and unaided flight. They also gain the ability to dramatically accelerate their own perceptions, which allows them to think and react when moving at superhuman speeds; superhuman resistance to damage, which prevents them from tearing their own bodies apart when using their super-strength; and, finally, a sixth sense for other nearby Powers. We call them Powers, or members of the Line. Superhumans. Metahumans.

"Never 'mutants'. Never 'heroes'. Those are misnomers.

"Each one is more powerful than the last, and the man you're about to speak to-- it *is* a man, Captain Moxon?"

"Yes."

"What's his name?"

"Datu Dimasalang."

"Mister Dimasalang has been identified as soon to become the eleventh Power. As of 0820 hours tomorrow, he's going to become a superman more powerful than all the previous Powers put together."

"Right...?" Jerry Kavet is vaguely aware of the chaos which surrounded the events of last year's Birth, which nearly began a war, but has as few of the facts as the media sources which reported on it. Flying men are still predominantly fictional in this world - a new field of poorly-documented pseudoscience, like UFOs.

"This base was established to study the existing Powers and figure out how, if at all, this phenomenon can be controlled, harnessed, or, as a last resort, stopped entirely. The people here have been working on it since the first genuine superhuman was positively identified in Russia. We now believe this woman is the sixth Power. The five earlier Powers are assumed to have been of too little note, or too remotely located, to be noticeable on a global scale. The seventh Power was also Russian but is now dead. The eighth Power was Arika McClure, an Australian who is here at the base right now. The ninth was Jason Chilton, a Briton who is also here. The tenth was Tzu-Le Chang, Chinese, and also dead, as of almost precisely a year ago.

"I won't go into the scientific details of our studies," says Ching. Because there hardly are any, he adds to himself. "New Powers are born insane. There's a lead-up period of five to seven minutes of intense pain and then they go totally berserk for fifteen point eight seconds. For Dimasalang, at full perceptual acceleration, that time period will be equivalent to almost nine hours. In that time, at maximum speed, he could, from a standing start in this room, reach and exterminate everybody on this base *and* an additional five to ten thousand people in the towns of Fairview and Brooksburg, eighteen miles to the south-south-east and south respectively. He will be impervious to, and *faster* than, all conventional weaponry. A missile would be able to track the heat generated by air friction, but would never be able to catch up with something so fast and mobile, and certainly the explosion would not do more than stun him."

Ching pauses and waits for the question he knows, from reading Kavet's face, is coming. Kavet opens his mouth and Ching gestures that he can speak.

"Why don't you just kill him?"

"Because we're *scientists*."

2048

Why don't they just kill him?

Because that could cause the Birth to occur early.

Because that could cause the eleventh Power to jump to somebody else - the nearest human or the killer or somebody random elsewhere in the world where the Birth could not be controlled.

Because that could choke the flow of power and cause next year's new Line member to be born early, or born more powerful, or split the power across several people, or cause a cascade of all the power (however much there is) to earth itself all over the world at once, destroying a city or a continent or the entire planet.

Because we could lose it forever.

Ching has made all of these arguments at length, with eloquence, to many different parties. Before he would agree to work with them to find the eleventh Power, he had to fight very hard indeed to get Moxon and the chain of superiors from which he dangles to give him the guarantees he needed. Thus far, he has managed to retain exclusive knowledge of the precise procedure and technology needed to find unBorn Powers, but he knows that if anything goes wrong tomorrow then there's a strong chance they'll rip everything they need out of his machines and paperwork and then proceed to break their promise in - critically - a most unscientific fashion.

What's one random death in the world every year, to preserve your way of life?

Ching says, "We are working on alternate, more ethical means of controlling the Power. This is what we need you to explain to Dimasalang. We want to hook him up to some electronic systems to measure his brainwaves and body chemistry when the Birth begins, and we intend to administer several sedatives in the hope that it slows him down. If these measures don't succeed and he escapes the bunker in which, assuming this part of the plan hasn't also been changed without my consent, we're planning to seal him for the duration of the Birth, Eight and Nine will restrain him manually. From these readings - and only getting one data point every year is not ideal, but we'll do the best we can - we hope to at least devise a way to contain future incursions while our core studies continue. It's a simple matter of explaining the experiment and getting him to consent to it. Do you understand? For the fine detail you can check your folder."

Jerry Kavet flips through the paperwork. "This is a lot to take in."

"I understand that," says Ching. "Do you have any questions?"

Kavet closes his folder. "When can I speak to him?"

"That's an excellent question," says Ching, looking pointedly at Moxon.

Moxon nods. "Thank you, Kuang, that'll be all."

"I need to speak to Dimasalang too," says Ching.

"You'll be allowed to give him one final briefing at 0700 tomorrow," says Moxon.

"I need to communicate some facts to him in person. This five-minute briefing isn't enough. We can't do this by Chinese Whispers."

"That'll be all."

Ching glares at Moxon for a few seconds, then stands up, gathers his paper and leaves.

*

Ching waves his pass at the electronic locks in front of three progressively heavier containment doors on his way down to the basement where the United States' Medium Preonic Receiver is cocooned, an upward-pointing forty-foot parabolic dish floodlit by soft blue and red light.

It is quiet, cool and relaxing down here, because there is nobody around and almost nothing is happening. Ching climbs a steep set of steel steps into the nest of control systems suspended by scaffolding above the dish's focal point, slumps into the chair in the centre and flips on all the blank monitors within arm's reach. Glumly, he pulls out a sandwich and begins getting crumbs on all the equipment.

He pulls the lever which makes the chair tilt backwards, and listens to the familiar dull humming of the MPR and stares at the oscilloscope waveform pouring out of it.

The machine doesn't record every bit it receives; that would be impossible, every data storage system on Earth would be filled to capacity in a matter of days. But that doesn't matter because the message is repeating, cycling back around to the beginning once every 60 trillion bits. All the machine has to do is feed each new bit to the adjacent supercomputer complex and check each new cycle for deviations from the original. Because the system is completely autonomous and absolutely no new data has been generated in the four years or so since the original signal was detected, nobody comes down here anymore.

Ching stares at the flickering waveform and thinks about escape.

Everything humanity has ever learned about the physics of the universe is explained from basic principles inside just the first 0.5% of the message. After that, the message apparently continues at the same density of information. Nobody knows quite how much further it goes, but there are glimpses of all kinds of greater things. Many, many instances have been discovered deep inside the message's strata of the term ">c"; in English, "faster than light". Supralight communications technology, like the MPR is set up to receive. Solid, reliable FTL travel. Teleportation. Time travel. Sub-subatomics. Force fields. Singularity physics. Extradimensional travel. Antigravity. There are isolated phrases which are used as major headings and yet seemingly translate to meaninglessnesses, like "superlight", "infolectricity", "photogravity"... The explanation for the Powers is there somewhere. It just needs to be found.

Not a single hint has been found, yet, of anything which could be translated to "grand unification".

Ching, his former mentor Mike Murphy, his friend Jim Akker, code-breakers from half a dozen U.S. agencies and physicists all over the world have all wormed their way into the message, in groups and alone. Ching knows that, further through the message, its texture changes and the symbols all change, replaced with something likely to be much more sophisticated and powerful, but for now, the first 1% or so, he is as fluent as anybody in its simple symbolic alphabet and language, Eka.

He could access the text from his office, but working here, on the raw feed, is more conducive to thought, and it's really hard to disturb someone buried so far underground.

On a wodge of blank printer paper, he begins scribbling translation and guessed translation, while the

night begins to pass.

*

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*

Ching is woken up the following morning by the patient and persistent bleeping of an error message. He stares, uncomprehending, at it for a few seconds. Then he realises that whatever the error is trying to communicate to him is irrelevant, because the time is 0810 hours and he has almost, *almost* overslept on the day of one of the most important events in scientific history.

He scrambles out of the control nest and bolts for the vault door, stomach so knotted he can barely put one foot in front of the other. He has already missed the final briefing, though it's entirely possible that was never anything other than a fiction. He almost panics when he discovers that the door is locked and won't respond to his electronic pass. But then he remembers. Right now, Datu Dimasalang is buried in a concrete bunker a mile and a half away, but there is a substantial chance that he will escape. Eight and Nine are at ground level directly over it, waiting for that to happen, but there is, again, a substantial chance that they will be unable to restrain him. Therefore, everybody on the base is locked safely a long way underground, Ching included.

Ching hurries back to the nest and cancels all the readouts from the MPR, bringing up instead the software which his colleagues and superiors, huddled in a much better-equipped control room elsewhere in the complex, are using to monitor the Birth. He takes in a few key figures from the bank of screens and his pulse begins to settle. Everything is apparently under control. Not under *his* control, but that is, admittedly, his own fault this time around. Probably nobody would be able to find him all the way down here, even if they tried.

He breathes once, deeply, and phones the control room, while simultaneously pulling up the screen carrying the video stream from inside Dimasalang's chamber.

"Where the hell are you?" demands Moxon, just as Ching's screen catches up with reality. And a large number of pieces of information which quietly connected themselves together in Ching's sleeping brain decide to present themselves all together.

Ching stares at the image for one long second.

The cell is maybe ten metres square, with Dimasalang positioned in the middle, viewed from the side. Dimasalang is a 65-year-old Filipino man, skinny and quite short, with a not-entirely-optimal shape to his spine. His clothing is minimal, a pair of shorts and a vest, with electrodes placed all over him. His head is tilted backwards and his eyes are closed; he is comatose. The man's arms are restrained behind him by a fearsome set of steel manacles. Sealed around his legs from the knees downwards are what look like plaster casts, except two inches thick, welded together and made of steel. They are bolted to the ceiling.

Dimasalang is suspended from the ceiling by his feet. He is lit from below by fluorescent strip lights screwed to the floor.

Ching's mind races, but not fast enough to stop him saying his first sentence: "What have you done to him?"

"We have signed documents of consent," says Moxon. "The forms say that we are free to use any restraint system we feel appropriate to prevent his escape following Birth and that we are under no obligation to inform him as to the nature of these restraints in case this increases the chances of his escape. He understood what he was agreeing to and signed it of his own free will. Where are you?"

You had me brief Kavet after *Eleven was brought here. Nobody had explained anything to Dimasalang before he was brought here. You brought him here without his consent.* Ching does not say any of this. He thinks it.

It's 08:14. Dimasalang begins moving.

"Where are you?" Moxon asks again. To Ching's left and right, secondary screens begin dropping out as the remote feeds are cut off from the control room.

It takes all the self-control Ching has to avoid shouting in response: *You brought him here and subjected him to these experiments and you didn't even tell him what you were doing to him. We spent all this time preparing for the berserker rage, but you never stopped to consider what he might do* after *that, when he wakes up covered in blood, thousands of miles from his home and his family, in a hostile nation which abducted him from his bed and stuck drugs in his arms and encased him in steel and buried him underground. When he wakes up* sane.

Dimasalang is beginning to rock from side to side and moan. Weird light effects are beginning to flicker across his skin, effects Ching has seen once before. In Lanzhou, he actually caught a few seconds of digital video of Tzu-Le Chang's inexplicable Birth pyrotechnics, before pulling the fire alarm and joining the stampede for the emergency stairs--

"He's in the Preonic Receiver room," says another voice, faintly, to Moxon.

"Kuang, stay where you are," says Moxon. Aside, he adds, "Try to get his comms shut off..."

"You just made the most powerful enemy it was possible to make," says Ching.

"No, we didn't."

Ching hangs up.

*

Datu Dimasalang wakes up, insane, at precisely 08:20:44.03 hours, Central Standard Time.

It's difficult, and the metal emits shrieks of protest so loud that they are even audible at ground level, but he tears himself free of his wrist and leg restraints. Shards of exploded metal *spang* off the reinforced black concrete wall at nearly the speed of sound. Three cameras and a light tube shatter.

His animal hindbrain tells him that he is sealed inside some dark and claustrophobic cell. He must escape. He looks upwards - in as much as there is an "upwards" when gravity appears to be operating 1/2048th as strongly as normal - and launches himself through the foot-thick ceiling, a scrawny human cannonball.

The one remaining operational closed-circuit camera in the cell watches all of this, and continues to record as the monitoring equipment, discarded electrodes, dust, rock, concrete, and steel ricochet around the empty cell and settle.

Somewhere, a seismometer jitters and scrawls its readings across graph paper. The earth bucks

irregularly, as if something is hammering around inside it, trying to find its way out.

There are no points of reference underground.

*

"That's it, it's over," says Jason Chilton into his headset. He and Arika are still hovering over the bunker. "Nothing happened. Not a thing. Might have been an eventful sixteen seconds for you guys but I found that to be the most boring two and a half hours of my life. What gives? The restraints worked?"

"They killed him," says Ching's voice. "They tricked him into diving into the Earth's crust. Eleven's dead."

"Is he serious?" asks Arika.

"Are you serious? What about next year? Ching, *what do we do next year?*"

"The same thing again," says Ching, clicking rapidly on half a dozen screens at once, willing the various "Loading..." bars to move faster. Twenty percent. "They think it can be made to work. It's just weapons to them. They'll try to wait until there's an American Birth, they think it's only a matter of time. But nobody on this entire base has the faintest idea what they're dealing with."

"Does that include you?"

Ching sighs. "Jason, I need you to come and get me from the Preonic Receiver room. They're about to come and get me. Ten years from now humanity will give Birth to a being so powerful he can punch a hole all the way through the Earth. Twenty years and he'll be able to withstand a nuclear explosion from point blank range. Totally cutting off the Power is the *only* way this threat will *ever* be neutralised and these lunatics just murdered yet another data point."

Twenty-five percent and he hears the steel containment doors whirring open. It's too late. Ching hears booted feet scuttling into the MPR chamber. He forces himself not to waste time looking up. There isn't time to complete the transfer. Okay, Plan B--

"Put your hands up and move away from the equipment," barks a voice.

"They need me to tell them how to find Twelve. And it's not happening. Now, Jason, please--"

POOM. Jason Chilton arrives like a crack of thunder. He swoops forward, coming to rest between Ching and the small squad of guards. "What's going on here?"

"None of us were supposed to know what actually happened," says Ching. "We need to leave. You, me and Arika."

"Could you all come with us, please," says the front trooper.

"No, guys, no," says Ching. "These gods are on *my* side. They like me better." He reaches up and pushes the key which will forcibly (and silently) overwrite the Receiver's delicate firmware using high-voltage electricity, bricking it for at least eighteen months.

Somebody raises a gun.

POOM. All the guards are now weaponless, clutching stinging fingers.

To Jason, just as Arika arrives, Ching says, "England."

Fine Structure 2048

POOM.

Two killed in "transporter accident"

Last Updated: Friday, 24 August 2007, 09:58 GMT 10:58 UK

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Two killed in "transporter accident"

Two people are dead and two more are missing following a second attempt to create a *Star Trek*-style "transporter" at Yorkshire University.

Teleportation experts Dr Philip Hood MBE, Alan Jeyrie, Martin Klemperer and Teng Lo all vanished from the laboratory at the moment of the experiment yesterday evening.

Klemperer and Hood were found minutes later in the laboratory's car park, having fallen to their deaths from an estimated height of more than five hundred feet. A police search has begun for Jeyrie and Lo.

Yesterday's experiment was a precise duplicate of the infamous teleportation test in August 2005, which was originally intended to exchange the positions of two tiny spheres of boron placed just a few feet apart.

That experiment instead resulted in physicist Dr Anne Poole being teleported into a local coal seam. She was stumbled upon by a mining crew 18 months later, having inexplicably survived her ordeal, for reasons which have left both doctors and scientists baffled.

Dr Poole no longer requires food, water or air to survive, but is being treated for severe psychological damage resulting from her long-term sensory deprivation.

The University's teleportation programme was abandoned immediately after Dr Poole's disappearance, only to be revived with dramatically increased funding and an accelerated timetable in January 2007, shortly after her condition was diagnosed.

A spokesman from the Physical Sciences Centre said that purpose of the experiment had never been to duplicate the accident which altered Dr Poole, and declined to comment on the possibility of Jeyrie or Lo having undergone the same transformation, saying, "Naturally we continue to hope that our colleagues and friends will be located alive and well as quickly as possible, but at the present time we are forced to assume nothing."

> Teleportation theorist Dr Thomas Muoka said that Dr Adrian Ashmore, who was found responsible for the original accident, "had no direct involvement with [yesterday's] experiment", but "served in an advisory capacity only". Dr Ashmore is currently serving a five-year sentence for gross criminal negligence.
>
> [...]

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Thomas Muoka sits down in the chair opposite Ashmore's.

"...So."

"So." Ashmore counts off on his fingers. "Phil Hood had fifty years of physics behind him. The man was an institution. His death marks the end of an age. He brought in the first useful equations from the Eka script team and he got the first proposals drawn up. The project just wouldn't have existed without him. Martin Klemperer was and still is the best scientific educator I have met, bar none. I don't know how many thousands of people he got started with his books and TV shows. He got *me* started. His backing, his *belief*, got the project funded in the first place, when nothing else would. And he was a master physicist in his own right. Alan Jeyrie, I'm told, took over most of the transposition modelling duties in my place when the project was started up again. I never got much of a chance to get to know him but he was a good guy by all accounts. And Teng Lo. Chief computer engineer. Custom supercomputer architecture and software. Man of a million inspired optimisations. Again, a highly qualified teleportation physicist. That makes four extremely talented physicists, dead."

"We don't know that Lo and Jeyrie--"

"Oh, come off it, Tom! They're dead! And this is not my fault this time around! You should have been ready. Logs, checksums, manual steps. On-site security. We went over all of this. *What happened?*"

"You're blaming me?"

Ashmore gestures around the busy vistors' room. "Who else? Who else is left to blame? Nobody will ever touch teleportation technology again after this. Nobody could if they wanted to! With Klemperer dead and Anne effectively dead and me in here, this entire field of science has been gutted."

"Adrian, this was out of my control. This was nothing I could have prevented. The press are missing significant facts."

"Like?"

"Alan Jeyrie. Wasn't in the lab at the time of the experiment."

Ashmore sits bolt upright.

"He'd slipped out for a cigarette. Apparently he wasn't enjoying the tension. We didn't even know he'd disappeared until we looked over the numbers a second time and found the third and fourth components to the transfer."

"He didn't have line of sight with the machinery?"

"No. And there's more. Teng Lo? He set up the apparatus we asked for in the afternoon and then, since

he had no actual part to play in the experiment, he headed home. It was his daughter's birthday. He then disappeared *from his car on the motorway* while driving home from the Institute. The police found a dark blue Nissan Primera which had swerved into the central reservation crash barrier at seventy miles per hour, and there was nobody in it, just keys in the ignition and a buckled seatbelt over an empty seat. He was two and a half miles from the sphere of actuation. Word finally got back to us at the lab two hours later."

"That's impossible," says Ashmore.

"Yes. I know. We've got the replacement code logged and we still have no idea how it was done."

"The TP protocols are static. They work on static objects. To hit Lo from that distance, you'd need to know precisely where he was in space, to an accuracy of centimetres, ahead of time. Way ahead of time. You couldn't just put a GPS tracking device in his pocket because you need to run a time-consuming supercomputer calculation to generate the teleportation program."

"I know," says Muoka. "But then, we know, and we have always known, that we are dealing with somebody with a deep and intricate understanding of TP, beyond anything anybody we know has attained. The knowledge *is* public. It's not unthinkable that some savant out there might have made deductions we haven't reached yet."

"If you have the code logged, does that mean you know where Jeyrie and Lo were sent?"

"Miles into space. And I mean miles. Search parties were combing the projected landing areas for all of yesterday. But I guess you're right. If neither man has made it home by now, then the chances are that they died of asphyxiation before they even hit the ground."

"I find it interesting to note that all four of them went upwards."

"Almost directly upwards," says Muoka.

"If they'd gone down, they could have been retrieved alive this time around. Sixteen to one odds. So. Put all of this together... and someone killed this project," says Ashmore. "Deliberately. This is not about Anne, or her immortality. This is an agent who wants teleportation science killed stone dead. Who already has advanced teleportation technology of their own. Who wants... to preserve a monopoly, maybe?"

"That is precisely the conclusion to which I would have come, too," says Muoka. "Sabotage. Maybe some other country or corporation delved further into the message than us, found shortcuts or macros or... I don't know, something. Somebody who was on both teams, working against us. We could prove this because it is firmly established, and investigations will bear out, that this sabotage took technology which mainstream science in general and our laboratory specifically have not yet developed. That is what I *would* think. *But.*"

"There's a 'but'?"

"You know that, prior to Anne's accident, a bolt of lightning struck the laboratory and we had to check everything over from step one. There was a lightning rod, but the insulation wasn't 100% effective, as we knew, hence the do-over, hence the altered program. This time around, we were careful, paranoid careful. The insulation was upped. We had weather-monitoring equipment, we had an actual guy on the roof watching the sky. We had breakers which would shut down the experiment if a large static charge

was detected moving through the building."

"What kind of reaction time on these breakers?" asks Ashmore, quickly.

Muoka keeps going. "We had a nearly clear sky. One-eighth cloud, the weather report is a matter of public record. There was no rain, no thunder, no static. We let the experiment run as planned."

"And a local charge hit the machine instead? Somebody with rubber shoes touched a sensitive piece of equipment?"

"No. *Lightning struck the machine. Again.* Out of thin air, while the machine was running. The breakers fired, but the shutdown command just couldn't have circulated through the whole system fast enough. First the program was okay. The cycle began. The lightning struck. The breakers were triggered. The program changed. The program was executed. The breakers closed."

"So they set up a piece of code to detect the charge being earthed and insert the altered program at--"

"Maybe so, Adrian, but you can't *control the weather!* This is not an omniscient, omnipotent teleportation cult! For it to work, the strike had to hit inside a two-millisecond window. What happened is statistically impossible. This was an act of God!"

"What? Maybe the machine generates massive static charges. Maybe it's a fault with the electrics in the building. I can think of a million things."

"We have an eyewitness who saw the strike! You can talk to Haddon, fine. Tell him your million things. But I'm done with this. I don't care what's killing my friends and colleagues, but I'm quitting now before it hits me, or you, or somebody else I care about." Muoka stands up. "I'm going back to the theory."

"Tom, you can't just turn your back on this. You're supposed to be a scientist and this is just superstition."

"Then find me a scientific explanation. I don't know what to believe anymore."

The Four-Dimensional Man

Experimentation:

"Scuba gear," says Josephine Baird, whirling around in her swivel office chair to face Mitch has he comes through the door.

Mitch stops dead in the doorway, stressed and slightly damp from drizzle. He not very tall; he is carrying a hefty backpack into which he could probably fit, which is full of schoolchildren's marked homework books. "Josephine, traffic getting here was *extremely*-much worse than I anticipated. They're tearing up the road, for whatever arcane reasons. Got stuck at the railway crossing. If getting back is going to be equally bad, then I need to be leaving in about ten minutes' time. So, if you can not just assail me with non-sequiturs and get to the, like, *point*, I have lessons to give this afternoon."

"We could have rescheduled--"

Mitch waves a hand, dumps his backpack in the corner, plonks into another chair and scoots over to Seph's desk. "I'm here now. Whatcha got?"

It turns out to be a local newspaper. The story Seph is looking at concerns the mysterious disappearance of some two thousand pounds from a local bank. The theft occurred in the middle of the night; no alarms were tripped, no fingerprints or clues were left, and no security cameras detected anything out of the ordinary. A sealed metal box alongside a few hundred others had contained fifty thousand pounds in the form of thick wodges of twenties one night. The following morning, a single wodge had evaporated. There's a sub-headline:

Police Baffled

Mitch doesn't need to read the story. He knows the story; he has a copy of the same paper.

"You can't breathe when you're completely phased," says Josephine. "To stay completely invisible for long periods of time, you need breathing apparatus. There is only one shop stocking diving equipment within three miles of where you live, and, as it turns out, you have indeed visited them and rented stuff there. Congratulations, Mitch Calrus, you are the world's first supervillain."

Mitch has the expression on his face of a child who has been Caught. He avoids Seph's steely glare and leans back in his chair to put some distance between them. "Haaah. God damn it."

"You are also a *terrible*, as in ineffective, supervillain. I am the world's laziest amateur detective. I asked literally one question of one single store clerk and I knew it was you."

Mitch still hasn't just run away. He actually looks embarrassed as opposed to defensive. Seph was banking on this. "You do have the advantage of knowing what I can do," says Mitch.

"I know a *lot* more about what you can do than you do, when it comes down to it. And I'm the only one who knows anything about you. Right *now*, anyway. Without that extra knowledge, this is an insoluble locked room mystery. On the other hand, I could just tell the police that I have this sensational man here who can see through walls and walk through walls and you'd be going to *prison*. You wore scuba gear to get into the bank, right? Probably stopped your car around the corner, walked a hundred feet in, a hundred feet out, easy. Have you touched the money yet? With your bare hands? As opposed to through the dry suit."

"Huh, yeah, yeah, I think so..."

"Okay. Have you got a criminal record?"

"No!"

"So if you return the cash tonight, you *probably* won't get caught by the fingerprints."

Mitch looks stunned. "Look, the diving equipment wasn't *cheap*..."

"Mitch! Mitch! Look at me! You're a teacher! Of kids! You're supposed to be a role model! What does this say? Crime is bad, unless you can absolutely, positively get away with it? Consider this an expensive mistake. Consider yourself lucky I don't just pick up the phone and turn your expense into jail time."

"They couldn't hold me in jail."

"They can't hold you, but they can make your life unpleasant. You start phasing through police officers, you're resisting arrest. You leave your prison cell, that's much more illegal than stealing cash." Mitch could even kill someone instantly just by materialising his hand in their brain. Seph is extremely confident that Mitch would never do this, but even so, she leaves this part out of her prepared speech. "Follow that path to its logical conclusion. You can't erase a criminal record by being intangible. Living inside the law is *comfy*. There are nice people here. And from the last however many months, I know you well enough that I know you like doing the right thing. You are a nice person, not a supervillain. This isn't some comic book one-hundred-and-eighty-degree good-to-bad overnight flip. Why did you pinch the money?"

Mitch starts and stops talking a few times as a few emotions - guilt, resentment, defensiveness - clamber over his face. "Well, I'm a teacher. A relatively new one. I don't get paid a huge amount and I have a five-figure student loan. You name it. You're still studying, for your PhD. You know how money goes."

"I do," concedes Seph.

"Well then. And my two housemates got married and moved out. Haven't found anybody to move in instead. It's difficult, you know?"

Seph doesn't know if this last piece of information is true or just something Mitch made up as an additional excuse. "Drugs?"

"Oh, for God's sake." Mitch stands up and stomps angrily away from Seph a step or two.

Seph holds her hands up. "Sorry. Fine. Sorry I asked."

"Have some faith in me for a change."

"I'm trying!"

Mitch folds his arms.

"Okay," says Seph. "Here's what we can do. You take the money back. It reappears as miraculously as it disappeared. Put it back in the same box, ideally. Or somewhere nearby. Make it so it looks like a simple clerical error. So everybody forgets about it ever happening and you get away with it. In return: I will tell you all the amazing breakthrough facts which I have deduced about your mysterious abilities.

I'll continue to work with you to figure out the full extent and nature of your powers. And, for your protection, we'll sit on any kind of announcement for at least a year. I'm sure I can think of a year's worth of tests so the time isn't wasted. Sounds fair?"

Mitch glowers a little. "Fine," he says.

"Ten minutes, you said. So that's more or less your time up. Go on, get out of here."

Mitch grunts, picks up his bag and leaves. Seph turns back to her work and giggles at the mental image of assigning a school teacher detention.

[1970-] Crash Zero

Stop-starting at rush hour along the terminally traffic-jammed High Yorick Street towards the centre of the city, junior police officer Aks sees a vision through the window of the automobile.

"That's *her!* There, there, you see? Look! Look!"

"That's her who?"

Aks rolls down the auto window a little bit and points. "That building there. 'Bookwreck'. She went down the side. Blonde hair. You did history, right?"

"I hate history. I left school early because of how much I hate it. It's why I'm a police officer - no knowledge of history necessary."

"Stop the auto." It's more or less stopped anyway.

"Aks, no, man, it's not worth the paperwork."

Aks leaves his partner, Illu, in the auto, and climbs out into the early evening drizzle.

This part of Cahagan was originally built as a suburb, with leisurely winding roads and large forested gardens separating semi-detached houses. Then it was enclosed by a minor arcology, and lots of the houses were demolished so that heavy chemical processing plants could be installed. Then the arcology was destroyed, the plants fell into disrepair and the suburb became a favela. Some time later still, the largest plant, being vaguely temple-like in its construction and central in its placement, became the centre of a holy city. And then, over the course of uncounted more years, this part of Cahagan was repurposed another half a dozen times, each new development built into, or over the top of, or out of the pieces of what went before.

Right now, High Yorick is central business district. Retail stores line the streets, occupying ancient buildings of every conceivable architectural style, like hermit crabs inhabiting abandoned seashells. It would be a fantastic multicoloured jumble, thriving with human life, but it's the tail end of a thoroughly miserable business day and everybody is hurrying home under black waterproof hoods and umbrellas before the clouds finally burst. It is usually a spacious and vibrant district to walk through, gawp at and shop in, but the roads have always been too narrow to handle the traffic that hits them every day at this time, so the place is gridlocked with vehicles: chunky family autos, unfashionably grey-green mechanical trams, double-decker buses, triple-decker goods transports, motorcycles, pedal bikes, horse-drawn cabs. The air is grey with exhaust fumes, the ground slick with rain.

Aks dons his cap and picks his way easily through the stationary traffic to the pavement. An idiot on wheeled shoes nearly runs him down; he makes an executive decision not to caution the guy. He sprints a few steps past Globo, a crenellated and brightly-lit cathedral-cum-supermarket, and ducks into the relative dryness of the still-very-wet alley between it and Bookwreck, an antique antique book shop.

Aks follows the tiny alley down three shallow steps, around a corner, and into a small open area between three massive, black ivy-covered buildings. In one corner is a small garden, fenced off, populated by hardy plants capable of surviving without much sunlight. In another, a second winding alley leads off into parts unknown. The noise of the high street, which is at most twenty metres away, is completely muffled here and the quiet is startling. Pale yellow light is cast by a motion-sensitive floodlight. It's a whole other world.

There's the woman. She's short and blonde and thirty-five and carrying a heavy satchel. She's unlocking a red-painted door about twice her height, which, from its location, is probably the back door into Bookwreck. The key is gigantic, at least fifteen centimetres long.

"How old are you," asks Aks, getting halfway through this sentence before realising that he hasn't thought this through at all, "ma'am?"

The woman turns around, regards Aks and his slightly ill-fitting police uniform with mild perplexity, and then calculatedly turns away him and opens the door.

Aks starts forward, trying to give a reassuring impression. "Is your name--"

The door slams shut behind her. That's not fully intentional on her part, it's a very heavy door.

Aks stops still for a moment, and gets rained on a little. A faint, pathetic beeping emanates from a module on his belt. Illu wants him back at the auto. It's not an unreasonable demand.

"I'm going mad," he says to himself.

He says it again, to Illu, when he gets back to the automobile, which has only managed to move a short distance down the street in the meantime.

Illu glares and gestures one hand towards him, a gesture which means "And? What happened? You lunatic?"

Aks: "Just... just--" He points to the road. "Nothing. Let's go."

"You can chase girls when you're off-duty. What's this about history?"

"I'm not sure," says Aks. "I need to check my old textbooks."

*

The University is on the other side of the city from High Yorick, nearer the sea. It's built into, and over the top of, a hollow granite and limestone geodesic dome left over from several Crashes previous. The dome is three hundred metres in diameter and fifty metres thick. Odd granite hexagons have been removed at strategic places on several levels, providing access to the gigantic dark cavity inside, which is completely filled with brightly-lit offices, parks, lecture halls, sports halls and accommodation. The exterior of the stone shell, meanwhile, has been covered (all except the very top) with more of the same. It is as if conventional skyscrapers of steel and glass were liquified, and then injected into the hemispherical mould, and then painted all over the outside for good measure.

This is modern architecture crossed with ancient Egyptian notions of building for the ages. While the exterior and interior have been built, shaken down by earthquakes, rebuilt, abandoned during war, recolonised, destroyed and rebuilt again once every two or three generations for thousands of years, the stone shell supporting them both has stood impassively for that entire time without even cracking. Because it is so long after the fact, and because so many different hands have touched and used the shell for so many different purposes in the meantime, it is impossible to guess who originally built it, or even what their technological level was. It *could* have been done with stone age technology. But there are holes built into the architecture which are perfect for ventilation and elevator shafts, and there are slots perfect for heavy load-bearing girders in all the right places. Who knows?

There are others like it elsewhere in the world. Possibly they were built by the same people, but it's a

sturdy design; parallel evolution isn't out of the question. Most of them have ended up as government buildings, or military fortresses. Some of them are in jungles or deserts and are unoccupied save for animals and plants. Right now, as it has been since the year dot, this one is the host of the University of Cahagan.

Aks' old professor lives and works from the fiftieth exterior floor. He has a window pointing south. The view, which takes in almost all the other major architectural oddities and wonders in Cahagan, is enviable, provided one doesn't suffer overly from vertigo.

"There *is* something in this," says Aks, once he has explained what he has discovered. It is some weeks later. Aks has spent the intervening time doing research, making sure he has something worth showing instead of simply making a fool of himself. The work made him miss academia. But being back in this office reminds him of the things he doesn't miss, namely the critical eyes of his teachers and the really rather unsettling way in which the University creaks when the wind blows hard. The shell is thousands of years old, to be sure, but Aks can't help reminding himself that this office was only built a decade or two ago, to replace a previous office which *fell down in a storm*.

"All the previous Crashes have happened at about this technological stage," says the professor, whose name is Gilland. "Everybody's looking for a connection. Or the condition that causes each one. That's no secret, at least in historical circles. Over the next few decades, as technology advances, I can see public concern going up gradually, until we either get past whatever causes a Crash, or it happens. But what you have is tenuous. Why must there even be an answer? It may just be a matter of statistics. Technology reaches a plateau, we stay there, the technology spreads around the world... if the world stays the way it is for long enough then any disaster, no matter how unlikely, becomes a serious probability."

"It's an old discussion," admits Aks.

"The oldest," remarks Gilland.

"But it just hit me so hard. It all made sense when I saw her."

"Extraordinary claims et cetera."

"Look-- there's a legend. The ancient Malaysians, pre-Crash-Five, had a legend about a priestess who couldn't die. And then the Crash-Four Greenlanders had legends about an undying female as well. The only way they could get rid of her was by mummifying her alive."

"There are lots of legends about women and men living forever."

"And then right after the most recent one you have Dalako Tjui who ruled most of ancient East Asia, and fits the pattern."

"It's just legend. There are many legends about many subjects. Like lightning, or snakes, or the origin of the world and all the diverse artifacts in it. They're common mythological themes. Unexplainable things, like death, they capture the imagination, they demand explanation. It doesn't mean there was ever a, a, a single snake which encircled the Earth, spawning all the myths at once. You should speak to an anthropologist. Blonde immortals are everywhere in mythology. It means nothing."

Aks stares glumly at his various bookmarked pictures. The room creaks again. He shivers.

"Noise still putting you off?"

"I always preferred the inside to the outside when I was studying here," says Aks. "You may not get as much natural light, but at least you don't have to worry about your room sliding off the roof into oblivion any minute."

"Well, maybe we should both get moving. I have a tutorial elsewhere in a little while anyway. You know they found another one of these domes just a couple of months ago?"

Aks carefully packs away all his books and picks his coat up from the back of his chair. "I didn't."

"In Antarctica. It's absolutely pristine, because it's utterly, utterly inaccessible. You have to trek two hundred kilometres across sheer ice to get there and then you can't get inside it. Somebody's turned it into a bunker of some sort, blocked off all the usual passages with steel locks."

"To stop people getting in or to stop something getting out?"

"Well, that's the question, isn't it?"

*

They head for the elevators and descend, talking about Aks' police work instead of his hypothesis. Aks is still a fresh-faced newbie in the force, but he already has half a dozen decent stories. It's enough to last them the tedious ride to the ground floor and the short walk from there to the nearest exit from the dome.

"I'm going this way. I have some students to tutor," says Gilland.

"Well, my shift's starting imminently too," says Aks. The police station is in the opposite direction.

"I don't know what I can say to you, Aks," says Gilland. "If you are still sure about this, get some evidence. Pictures are fine, biographical sources would be better. Do some actual research, like you've been trained to do. Use the library. But please don't stalk this poor woman. If you're really, really, *really* sure, and you're prepared to endure the embarrassment, fine, approach her. Once. But if she tells you to jump in the harbour, please just drop it, hmm? Don't get obsessed. I don't think I'd be insulting you terribly if I said I think you're a better police officer than you are a historian."

[1970-] The Nature of the Weapon

Aks buys an antique book from the mysterious woman's antique store.

Bookwreck started out as a tedious two-storey cuboid of pale grey breezeblocks, a conventional, functional sort of building, possibly cheap bulk housing or military accommodation, before being hit by an aircraft. That happened during Crash One, and so the building was then abandoned for a substantial amount of time. Oak trees and creeping ivy grew, knitting the original breezeblock shell together with the stout cylinder of fuselage, now embedded where the ground floor's ceiling was supposed to be. When people came back to the city, the upper floor was rebuilt using much more aesthetically pleasing bricks; all except for the upper floor's ceiling, through which an oak tree still sprouts.

Aks guesses most of this in the first seconds of his first visit to the shop, just after hitting his head on the plane.

"Ow."

"Oh! I'm so sorry. The padding must have fallen off." The woman hurries forward to help him; she is the only person in the shop. She picks up a yellowed piece of foam and some string and then stretches up to try to tie it back into the dangerously jagged metal edge of the plane wreck, which is handily positioned just a short distance inside the door of the shop, at exactly the height of Aks' forehead.

"Are you okay?"

"I'm fine, I'm fine, thanks."

"I'm small enough that I never have to duck under the thing, of course, but every now and then some poor soul gets conked."

It *is* the same woman. Short, with chin-length blonde hair. Mid-thirties. Floppy, green, slightly out-of-date clothes. She recognises him from a few days before but pretends not to. Aks realises this and decides it would be less awkward for all concerned if he did the same. It is an unspoken agreement.

The shop is fairly dimly lit; the glass frontage is heavily leaded and the glass itself is fairly ancient, so not a lot of light gets through. The left half of the main space is dominated by the aircraft tube, the bottom of which is roped off. Bookshelves and the trunk of the great oak form a towering and dense maze; two steps and Aks has lost sight of the entrance.

"I'm looking for a book," he says. "Not any specific book. Something for some research I'm doing."

The shopkeeper's name is Yuen. Yuen helps him locate, leaf through and purchase a M'e 0699 issue of *Ika Lgass Hunaethn*, a political periodical from roughly eight hundred years ago. The magazine is written in ancient Aethn, which was, as far as is ever practical, the *lingua franca* of the world in the years leading up to the most recent Crash. It costs him half a day's wages. (Startlingly well-preserved centuries-old artifacts are extremely cheap in a city as lousy with history as Cahagan.)

Yuen explains she found a hundred and fifty of them in an abandoned solar farm cottage while travelling abroad some years ago. Like most of the written works surviving to this era, the "paper" is actually flimsy plastic; non-biodegradable. Aks sadly isn't in a position to make an offer for the dead solar farmer's full collection.

On his way home, Aks flips through the magazine and finds a photograph in it, a big colour picture

attached to a four-page feature. It is of a woman in a massive, weighty golden cloak and headdress. The cloak is so thick that it completely hides the shape of her body. Her arms and legs are folded away underneath it somewhere and only her face is visible. Even that is partially obscured by the headdress - it can't be solid gold - which wraps around her temples and cheeks and then towers half a metre above her head. Her face is painted completely white except for her lips, which are painted red. White strands of hair are slicked back against her head. She is seated on a giant golden throne whose back and "armrests" rise even further than her headdress.

Aks knows who this is. He recognises the robes. This is a Chief Scientific Advisor to the kingdom of Oroth, a European kingdom which was centred on Sicily and once ruled every inch of the coast of the Mediterranean Sea, and much more besides. At the time, Oroth was the oldest and most powerful global entity, and its king was de facto ruler of, and able to dictate terms to, more than half of the world.

The Orothian role of Advisor was as ancient as the role of king. It was initially held by the king's chief priest/astrologer back in the days when Oroth was a theocracy. As the kingdom advanced into the modern age, the Orothian bureacracy retained most of its religious trappings. Oroth was a strong, modern civilisation at the time the photo was taken. The gold-clad Advisor in the photo was an educated, capable scientist and politician. Her job was to announce alterations to governmental policy and law. While policy and law had advanced to cover such topics as gender rights, environmental preservation issues and sophisticated financial regulations, the announcements were still ritually made through a stone megaphone which broadcast her voice across much of the capital city of Giarre. Such was tradition.

She looks like a Bronze Age tribal ruler; she is probably wearing contact lenses.

Contact lenses. Aks stares at the picture for a very long time, trying to remember what colour Yuen's eyes are.

He recognises only one word from the headline to the article: the Aethn for "Crash".

*

A prominent sportsman is almost murdered, his wife turns out to be partially complicit, and it all goes sideways... Aks is so busy with police shifts for the next month that he only has time to even glance at the magazine. He spends long, boring hours wading through paperwork, trying to remember the scanty bits of Aethn he learned at university, then arrives home to his shared flat at mid-morning, with maybe six hours before he has to go out again, and sensibly spends that time sleeping like a dead man instead of studying.

The full translation takes him another month:

> ***The Voice Of The World***
>
> ***Aoni Kulla On Cats, Crashes And The Future Of Orothian Science***
>
> *"It is solid gold," says Kulla. We're in her conservatory on the east face of Mount Etna, just a few minutes' walk down the hill from the Castle. It's excruciatingly early in the morning and Kulla has most of the lights turned off; her whole lodgings are gradually becoming illuminated with pink dawn light. "The first Advisor was a canny scientist. We've always*

been canny scientists. The headdress perfectly balanced, and there are some hidden connecting points in the throne which carry most of the weight when I'm sitting down, which is ninety percent of the time. Even so, I'm surprised my neck isn't the size of a wrestler's."

Wearing just conventional business dress, without her "costume" (her word), it's difficult to equate this Aoni Kulla with the booming, authoritative presence on our radio sets and television screens. Up there on the pedestal she is unassailable, an enormous golden figure delivering Truth direct from the Gods as the Advisor has done for hundreds of years, twice as big as reality and never, ever wrong. Here, in front of me, is a small, human woman who forgets where she keeps the water jugs, and then spills her water over the coffee table in her enthusiasm to speak. She is keen about the interview; it's the first she's found time for in over a year.

So which one is the real Aoni Kulla? "After eighteen years with the world at my feet, I've grown very comfortable with dictating writ," she says. "Tradition has value. These days all the dictations come out simultaneously as press releases, and it's all couched in legal terminology so that we can cover our backs. But I could never stand up in a gigantic golden mask and robe and shout something to every listener in Eurasia unless I was sure. Accountability is important. It makes me think carefully. It makes me-- us-- ensure a certain level of confidence. So the Golden Advisor is an important part of me."

But both people are, Kulla eventually concedes, an act...

[...]

"...but in this era there is so much information at our disposal and so much to be sifted that I simply don't have time to share my life with anything bigger. I only sleep for half an hour a night and the rest of the day is spent connected to the firehose." Another piece of Kulla jargon; she means the torrent of paperwork which pours into the Castle every hour of every day. "I'd never inflict being married to a life like this on somebody. Candidly, the next Advisor will get nowhere if she can't duplicate the feat."

She? Isn't the selection process supposed to be top secret?

"Or he! Slip of the tongue. I can't tell you more than you've heard. A male advisor would be a first, and an important one. But I won't pick one who can't do the job."

That brings us nicely onto the topic of the future. Kulla is looking forward to retiring - "somewhere isolated and sunny where I can decompress for a straight decade" - but refuses to drop further hints and Lgass readers will have to wait for the full story in tomorrow's edition. When asked about her scientific policies of the last year she is pleased to be able to speak more frankly...

[...]

"...admit that what the people at the Electromagnetic Project have been discovering could be significant to furthering our understanding of the world. But it's my belief that, after all this time, nothing remains to be discovered, only rediscovered. If there was anything to discover about the real deeper structure of matter, there would be surviving texts about it. But there aren't. That means we know in advance it's a dead end."

It's dawn. My time is almost up. I ask her about the Crash, and whether it could be connected. Aoni Kulla is stony-faced for a moment. "Something caused the Crash," she says, standing up and leading me out. "We don't know what caused the Crash. We have a long list of things which we know, both from historical evidence and our own experiments, didn't cause the Crash. This theory of indivisibles, 'atoms', is not on the list.

"I would never say that unless I was sure."

The door knocks just as we reach it. Behind it is a servant with a two-inch stack of typed reports and a box of white makeup.

Dallman Liffey, 0699-M-27

*

Illu comes up to Aks at his desk at the police station, the day after he finishes his translation. Aks has made arrangements to see Gilland on his next day off. That is his plan, but it changes when Illu turns up.

"What was the name of that girl of yours?"

"She's not 'that girl of mine'. Yuen."

"Do you have a picture of her? She works at that store, Bookwreck, right? Did your theory pan out?"

"I do not have a picture of Yuen." Aks pulls out his issue of *Ika Lgass Hunaethn* and opens it to the page with Aoni Kulla's picture on it. "This is a picture of the woman from my crazy theory," he says. "Why?"

Illu plonks down a piece of paper of his own. It is a rough monochrome photostat of a rough monochrome photostat of a police sketch drawn in - judging by the language of the typed notes - northern America. The sketch is a woman's head, full-face. Illu turns the paper around so that its orientation matches the magazine, and then squints carefully at them both.

"The words 'antique bookstore' were in the reports," he says. "I think you could make a case for the resemblance."

"I don't know about the priestess," says Aks, "but *that* woman is definitely Yuen. Who is she? What's she done?"

"She's an extremist Luddite," says Illu. "She blows up science labs. Holds demonstrations, steals notes, blocks legislation and all kinds of stuff. A gigantic report just arrived at Central from across the border, they just traced her here recently. Wanted on four separate continents, for murder, sabotage and destruction of property."

"She's anti-Crash..." says Aks. "That would make *sense*. She thinks advancing technology is going to cause the next Crash. Do you know what an 'indivisible' is?"

"I barely know what a Crash is," says Illu.

"The date on this sketch is eighteen years ago," Aks observes.

"Well, that's logical, the pile in Uwzny's office is about eighteen years tall. Look, I'm going to go and bring her in quietly. Do you want to be involved in this? Is there going to be a conflict of interest?"

"No," says Aks, standing up and putting away the magazine. "I'll come with you."

[1970-] The Big Idea

The first time it happens, she has maybe five seconds' warning. It is a Friday night in the middle of the capital city and she is at a restaurant with her husband when the world fills up with more light than the human eye can process. She cries out and reaches blindly across the table for her husband's arm to try to protect him. He is screaming back at her but she can't know that. All she can do is hang on to his hand with both of hers until the shockwave hits them and everything around her bursts into flames and disintegrates.

It's a full minute before she can see again. By that time she is eighteen kilometres outside of the city, rolling at eighty kph down a molten tarmac expressway crowded with shattered, upended, burning tin vehicles. The fireball is still growing overhead. Clutched in one of her fists is a puddle of gold.

*

"Go to the site of any major city and start digging. Anywhere in the world. You find layers and layers and layers of residue from earlier civilisations. You go to, I don't know, the jungle, Malaysia or South America, and you find they're crammed, absolutely stuffed to the gills, with temples and shrines and towers and homes of a dozen different styles. On every continent, you find this old, deep technology. Like solar power - we extrapolated solar power technology from stuff we discovered as archaeology. And telegraphy is the same. Underneath Russia and Europe there are these gigantic networks of high-tech underground train tracks, which work by magnets, which we'll clear out and rebuild and reactivate sooner or later. And the ocean is full of plastic waste from earlier generations, which gets harvested and converted into fuel. You go to the Arctic and you find nothing but crashed aeroplanes and airships. Like litter. There are books and carvings and pictures and stories and runes, information in a *million* languages, almost *none* of which are translatable. It's like... basically, the world is built on the wreckage of older worlds."

"So?"

"Bear with me."

*

"You've had a *month*," shouts the angry commandant at his scientific subordinates. "You've had all the money in the world. All the tools and equipment you could ask for. You were asked to do *one* thing for your nation."

The scientists raise protest. They raise diagrams and figures demonstrating the inconceivable pressures and stresses to which they have subjected their prisoner.

"She's an impossibility!"

"You were given one job. Either kill her, or duplicate the effect. But you've failed. Very well, then. Bury her. Somewhere totally inaccessible. Make it so she'll never be found. We can't hang her, we can't shoot her, still, we'll make an example of her anyway. Film the sentencing. No problem can't be solved. Nobody stands against us."

The last thing she says before they fill the mine with cement is that she'll outlive them all and that she'll outlive everything they ever thought of, worked for, fought for or swore loyalty to. She says if the nation's still there when she comes back then she'll tear it down single-handedly and you can write that

one down for future reference.

A hundred and ten years later, after everybody has forgotten, she comes back and does exactly this.

*

"So, first we thought that there was just some single isolated cataclysm, the Crash. Then we found that there had actually been a second Crash before that, so we called that Crash Two, which set a bad precedent, because then we found Crash Three. And then we found that there had been *eight* distinct Crashes, and then, just in the last few years, as archaeological science got better, we found that all of the Crashes had happened at roughly the same time. Technologically, I mean.

"So civilisation rises from barbarism. From huts to bricks to alchemy to technology to the age of information. And then it plateaus. Technology can only go so far. It stays there. And some factor, some unknown element, builds up and up and up while the world stays otherwise still, and then everything overbalances and suddenly it's the Stone Age. Again. And there is *no record* of what causes this. Anywhere. At all. There is no electronic data. Every magnetic tape or disc is blank or full of static. Even the best-preserved ones from the most recent generation. The Information Age becomes an informational black spot. Nothing not stored concretely in the form of patterns of ink survives the cataclysm. And there is never any useful information in the ink. It's all irrelevant. There's nothing.

"And so nobody remembers. Nobody remembers what caused the Crash and nobody knows how to prepare for it. So it happens again. And again. And... Right now we are just beginning to experiment with mechanical computational equipment. I'd say that within fifty years we will have reverse-engineered enough archaeotechnology that we'll be at that final point, the Information Age. We will still be alive. We may live to see, and die in, Crash Zero."

*

"Quond. Are you busy? It's about Aoni Kulla."

Quond swears, but keeps writing on the blackboard. "What has she done now? She's retired. I celebrated. No political power. I thought it was finally over and we were going to be able to get some funding back."

"I know. Quond, she's here. In person. She wants to speak to you."

Quond stares at his assistant for a long and angry moment. In one movement, he grabs the duster and scrubs off everything he wrote in the last five minutes. It was all wrong anyway. "Fine."

Quond straightens his coat and hair before heading down to the main entrance. How big is the Electromagnetic Project? Much smaller than it used to be. Aoni Kulla, backed by a squadron of like-minded or, more likely, sycophantic political supporters, has systematically blocked his research in every way imaginable for decades. She has been continuing a tradition set out by the previous Golden Advisor, to be sure, who was equally opposed to researching the base structure of matter, but there was more than just tradition in Kulla's attacks. There was venom. Money was taken almost directly out of his own pocket. Scheduled cash injections inexplicably blocked. His subordinates work for pittances. The Big Ring has been half-complete for longer than he can remember. Thirty people work here, once three hundred. They'd be *done* by now, Quond swears. Physics as the world knows it would be over and dusted without this... *coward*.

The lobby is huge, airy and white - built back when they could afford it. Kulla is standing in the middle, admiring the dated and repulsive sculpture in the middle of it, which is made out of matte grey pipes arranged to form something resembling an internal organ. Quond strides over to her, hands in his pockets. He doesn't shake her hand. Kulla seems unperturbed by this.

"What do you want?" asks Quond. "Are you now going to stand inside our machinery and physically obstruct our work, all else having failed?"

"I want you to read this," says Kulla, holding up two sheets of lined paper, clipped together. They have Kulla's own handwriting on the front and back. The title is "Theory of Atomic Structure".

Quond stands in front of her and reads the paper. It takes about ten minutes altogether. A few times he stops reading and blinks for a long time, thinking. When he finishes and looks up, Kulla is still standing right in front of him, watching him, having never moved.

"Where did you get this?"

"It's copied out from memory," says Kulla.

"You did this yourself?"

"Not myself. But I had sources as Advisor, and, as I have said, nothing remains to be discovered, only rediscovered."

"So who, then? When? Do you have more results like this? Is this everything?"

"This is the entire particulate structure of the universe. Protons, neutrons and electrons. This is everything you're likely to discover in the next ten years. To put it another way, it's where you should be by now without my interference. It's yours. You can continue your theoretical work and build upon this to find the rest. Your work here is over. All you have to do is dismantle the machinery."

"Advisor-- I mean, Kulla--"

"Aoni is acceptable."

"Kulla, do you *know* anything about science? About what it means to be a scientist? I can't just take these equations on faith, no matter how well they coincide with our predictions. You're telling us we're right. But we need numbers. We need to repeat these observations. Maybe there is more; we have to find out for ourselves. That is how science works. You are not the second-in-command of my country anymore. I understand your reservations about the connection between our work and the Crash but surely this information disproves that connection by its very existence. *Somebody* performed these experiments successfully. And lived to pass on the results. And no Crash befell them. So, what, then?"

"Are you acquainted with the legend of the cursed city of Ytreko of China?"

Quond rolls his eyes at this apparent derail. "I'm acquainted with both the legend and the city. The city is a plague zone or something of that ilk; anybody who approaches too closely becomes ill and soon dies. I am told there is evidence that the size of the dangerous zone is diminishing, but it is supposed to be a difficult city to access, since the bridges into that particular mountain pass were all destroyed. The legend is that some ancient god cursed it. What is your point?"

"The legend isn't true but, as you conceded, the facts are. Many thousands of years ago, Ytreko was the political capital of the Chinese Empire of its time, the seat of the most powerful superpower on Earth.

One of Ytreko's enemies struck it with a weapon, the 'curse', and its effects, though diminishing with time, lingered. The weapon was a direct product of research into the atomic structure of matter."

"An atomic weapon."

"Yes. Within ten years you will be able to devise the basic principles upon which the weapon operated. Within another ten, if you have the motivation, you will be able to build and detonate one of your own. You will be able to curse your very own city. Within another ten, if you have the motivation, your masters - not me, not you, your *masters*, for good or bad - will be able to build enough to strike and curse all the land on Earth. Do you understand what I am saying?"

"So you are scared," says Quond. "Scared that we will be unable to control this... genie... once we have released it."

"Yes," says Kulla.

"You fear that, as a result of our work here, the world will be extinguished."

"Yes."

"Another Crash."

"No," says Aoni Kulla. "Humanity always survives the Crash. Nuclear war is something else. The Crash is a self-defence mechanism. It prevents humanity from destroying itself. It prevents technology from advancing too far. It pulls us back when we get too close, do you see? When we learn enough to destroy ourselves, it takes that knowledge away from us."

"What? How? Are you speaking from some kind of authority, Kulla, or are you, as you appear to be, casting wild speculation? Where is the evidence of this? Show me where it's written."

"It isn't written anywhere. That's the clue! That's what the Crash *is!*"

Quond finally realises that he is in the presence of a deluded crackpot. He pushes the papers back at her and pushes her towards the door. "Get out of here."

"Quond, I am begging you. Stop the Electromagnetic Project immediately. I took a risk by revealing this to you. I thought you might be open to new ideas. To reason. Humanity is totally unique in the universe," says Kulla. "You can't be allowed to destroy yourselves."

"Well, we survived this long," says Quond.

There isn't any on-site security. They can't afford it. The best Quond can do is lead her by the arm, out of the front door and into the landscaped green grounds of the Project.

"No force in the universe can stop a scientist from learning," he tells her.

Kulla just shakes her head as he goes back inside and locks the door.

*

"How can civilisation just *end* and leave *no trace* of what ended it? How can we just go back to the Stone Age again and again and again? How can we forget so much all at once?"

"You're sounding a lot like one gigantic nutso conspiracy theorist," opines Illu, as they turn into High Yorick Street.

"I don't know," says Aks. "I don't know. But then I see this woman, right? Her face is all over history. And she gives me this book. It's from the day of the last Crash. I mean the *day*. Our year negative one-eighty. By their calendar it was the twenty-eighth of M'e, 0699. This magazine is cover-dated the twenty-ninth, which means it was almost certainly printed in the closing hours of the twenty-eighth. No historical document *anywhere in the world* has a date later than the twenty-eighth printed or written on it. This thing is priceless. And she, a professional seller of historical documents, practically gives it to me."

Illu parks the auto opposite Bookwreck.

"She wants me to figure it out," says Aks.

[1970-] Too Much Information

Bookwreck's front door is unlocked. Nobody is in. Illu and Aks find this puzzling.

"I think she's gone," says Illu, looking around the back rooms behind the shop: the stock rooms and kitchen. "Lots of stuff missing. No cooking equipment, no food. Tried upstairs? Hmm. Where's the bedroom?"

"Upstairs," says Aks, gingerly unhooking the rope across the bottom end of the aeroplane fuselage-cum-stairs.

"Upstairs has no roof," says Illu.

"Only half of it," says Aks. He climbs the steep steps which have been built into the plane's central aisle. The next room is square, and qualifies as being about halfway between "inside" and "outside". The oak tree sprouts upwards triumphantly through a metre-wide hole left in the flooring, and way up beyond where the ceiling should be, spreading branches over above the whole building, providing a moderate amount of cover from the elements. There is a broom and a stool and a bucket in the corner, along with a pile of recently swept leaves. There is a small wooden door to Aks' left, leading to the last room in the building.

"Wait here. She knows me," says Aks, going in.

The last room is quite dark for the time of day. There are light fittings in two of the walls but the ceiling is painted black, absorbing most of the light. The rest is collected by the books. The floor is almost completely covered with books and paperwork, odd little plastic toys and trinkets and artifacts, bits of clothing and empty glass bottles. Some of the book stacks are two metres high, propped against bookshelves that are even higher. Some of these books haven't been moved in years. In one corner is a bed, turned sideways and propped against the wall to yield more floor space. At the far end is a blacked-out window and under the blacked-out window is a desk, which is relatively clear, having only a pot full of pencils and a few pieces of scrap paper.

Sitting on a chair in front of the desk, writing, is Yuen. "It's about time," says Yuen, putting the pen down and turning around, "you almost missed me."

"This is a picture of you," says Aks to Yuen, handing over the photostat. Yuen looks at the picture. The face is hers. The name is hers. The date of the sketch is clearly visible. The date of birth of the person depicted is clearly visible. Any one of them could be wrong, and then everything would suddenly make sense.

Aks steps back a pace and looks around. He notices a poster hanging on the wall. A wide, dark blue rectangle of paper, laminated in plastic. There are two wide circles drawn on the paper, in white. Each circle is divided into sectors with thin white lines, and has thousands of white dots scattered across it. "What is this?"

"It's a chart."

Aks stares at the odd spindly white polygons which have been drawn between the white dots, and the tiny yellow names written next to each of the dots in an odd old script. Like most of the other artifacts

in the room, the books and papers and ornaments and occasional tapestries, it is meaningless to him.

"What is actually going on here, Yuen?" he says.

"Every now and then somebody figures me out," says Yuen. "Every now and then. It's usually a historian. But mostly it takes a long time to get. You just jumped right to the key question. Not 'Who are you?' but 'How old are you?'. So I went and did some calculations." She picks up a stack of paper covered with dense notes and arithmetic. "Because I'd lost count. I really had. I wondered. My current set of papers says I was born fifty-one years ago. I have a new set lined up which sets me back to twenty.

"The truth is I turned ten thousand years old on that day. Exactly ten thousand years old. And usually I duck the attention. I run and make a new identity and keep my head down and just keep on doing what I do, because, as far as I can tell, it's the only thing I can do which doesn't invariably result in utter catastrophe. But you don't turn ten thousand every day."

"So you thought you'd throw me a bone," says Aks.

"It's good to tell the truth to someone sometimes," says Yuen. "Even if every word makes them think you're more and more of a lunatic. It keeps me sane. And you'll be dead in seventy years so what does it matter in the long term?"

Aks nods carefully, then turns his head to the door. "Illu?"

Illu steps into the room. "Yuen Pelloe. We have an arrest warrant in your name for murder, sabotage, destruction of property and assorted additional charges to be specified at a later date," he says. "Please come with us. Cooperative action will count in your favour."

"Of course," says Yuen, standing up and allowing her hands to be tied.

*

Illu leads her down the stairs and back to the auto. She is loaded into the rear of the vehicle and Aks and Illu take their seats in the front. As Illu pulls away, she begins to speak again.

"Sometimes the discovery becomes massive and everybody in the world finds out at once and I end up on a pedestal. Sometimes they make me their leader, sometimes they call me an abomination, sometimes I get arrested and studied, usually it's all of this at once. I've been everywhere. I've done everything, spoken every language, built a pyramid, survived re-entry. History goes in cycles. If you watch it for long enough you can see the tipping points coming and be there when they happen. I invented fire, the wheel, the electric motor, antibiotics, you name it, every era, every country. Fought in X number of wars. Once, I actually ruled the whole world.

"I've walked on the Moon barefoot."

Aks shakes his head and looks out of the auto window. This is because a simple thing like actually having someone sit in front of him and recite his theory back to him has completely shaken his faith in it. He has nothing. Nothing, really. A flimsy scrap of plastic, too good to be true. A metric tonne of loose conjecture. Illu is keeping carefully silent and concentrating on the road. They're coming up to the suspension bridge which spans the harbour mouth.

"You've lived through eight Crashes," says Aks. "So you know what causes each Crash? You know what actually happens."

"The Crash destroys information. Or rather, it randomizes information. Ideas. Formal conceptual representations in people's minds. And, up to a certain granularity, elsewhere. On computer discs and magnetic tapes, where the data is stored densely. When you take all the coherent knowledge out of a human being's mind, what you have left is an animal, a dumb hominid with dumb hominid instincts. Still capable of survival, of course. Still very much viable in this world, and still capable of reproducing and learning terribly fast. When we first evolved it took tens of thousands of years to get from there to here. But when one is surrounded by inexplicable artifacts begging to be explained and understood and operated and harnessed, one learns. One learns to learn. The Crash doesn't kill anybody. It just starts everything over again. There are far more dangerous weapons."

"So it is a weapon? It wipes people's minds and it wipes electronic records too? That doesn't make--"

"Weapon isn't quite the right word. 'Infection'? 'Targeting agent', maybe. It's like a hound, unleashed. It *sniffs*. The weapon is, itself, smart. It's complex."

"And you're immune to this. So you just let it happen," says Aks.

"I make it happen," says Yuen. "It's me."

Aks looks around at her, incredulity on his face. "Why?"

"Because humans are the first and only sentient beings anywhere in the universe," says Yuen. "And if you all die out, there may *never* be more. And if you've lived as long as I have, you come to realise how terrible it would be for the universe to exist without humans in it.

"Especially if you're the only person left alive in that universe. And you can't die."

Yuen holds Aks' gaze for a very long moment. Then she smashes the auto window with her elbow, and dives through it.

Illu curses explosively and pulls the brakes, wrenching the vehicle to a stop in the middle of the lane. They were moving much too fast for diving out to be in any way safe. The woman is dead, surely - run over by speeding traffic or cut to shreds by the glass or just battered to death by asphalt.

Vehicles are already queuing up behind them as Illu and Aks both leap out of the auto. Yuen is far from dead. She is already up and running down the central reservation, making good time, hands still tied in front of her.

"Stop!" The order barely reaches her ears. The police officers set off after her. Before they're even begun to close the gap, Yuen veers left across the lanes of still-moving traffic, weaves miraculously through them, plants a foot on the edge of the bridge and jumps. The drop is easily a hundred metres. Water hits like concrete from that height. Aks and Illu have to spend critical seconds persuading the passing vehicles to stop before they can follow her to the edge of the bridge and by the time they have reached the side to look, there's nothing to see, not even a fragment of foam from the splash.

Illu is livid, practically jumping up and down. "We lost her. We lost her. She spun us-- spun *you* that gigantic lie to distract you and then jumped off the bridge and we lost her. She was suicidally insane and locked in the back of a police auto and managed to kill herself from a standing start under our watch. I am going to get blamed for this. No-- I'm not. You are. I'm blaming you. This is you. Should've stuck with your history books."

"*Or*," says Aks, now merely playing devil's advocate, "she really is immortal and she survived the

drop."

"And escaped? Yeah. *I like my option better.*"

*

And finally:

There is no night on the Antarctic continent at this time of year; after she is dropped off on the coast, the final leg takes her less than a week at a brisk walk. Cold weather gear is irrelevant, though the snow shoes help. All she really needs is the map, and once she comes within eyeshot of the enormous granite dome she folds it up and puts it away for the final few miles.

There are ragged remains of an exploration camp gathered in the dome's wind shadow, but all the explorers have left, either turning back or continuing onwards towards the south pole. They've left a mess. Litter is everywhere, ground into the snow.

Yuen locates the huge, heavy, hexagonal stainless steel bulkhead in the equator of the dome, which the explorers evidently spent some days trying and failing to crack open with ice picks. It is completely frozen solid. It is not designed to be removed. She begins hammering out a specific rhythm, and keep hammering for maybe half an hour, unable to hear any significant echo but knowing that the sound is reverberating all the way through the interior of the dome.

Eventually somebody walks out. He doesn't open the bulkhead. He just walks straight through it. He is dark-haired, and of about her age and height. He looks her up and down, takes her hand and leads her back the way he came, phasing them both through the steel like a finger poked carefully through the skin of a soap bubble.

The corridor beyond is utterly dark. The air inside is cold and smells of oil. The man keeps hold of her hand all the way to the other end, where they pass through a second bulkhead and into the dome proper.

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The dome is actually a complete globe, not so much sitting on top of the pack ice as floating in it. Two walkways cross the entire space perpendicularly, meeting at a tiny hub, and dividing the interior into four towering vertical segments. The first two segments are completely filled with mechanical equipment. Enormous pistons and cogs and wheels and spinners and pipes and rods and gears and towers and gantries, made of brass and gold and steel and other, longer-lasting materials, reaching all the way up to the vault of the ceiling and based all the way down on the curving floor. Brilliant illumination is cast upwards from floodlights below the walkways, lighting the entire mechanism from below. The light is just enough to cast metallic reflections in every direction but still leave the depths of the mechanism in total darkness. It is just enough light to give the darkness shape. It looks like these could be the secret machines which power the whole Earth - the weather, the tectonic plates, the volcanoes, the ocean currents.

Most of the machinery is inert, but some of the smaller wheels are clicking as they turn. And other, larger wheels are beginning to spin too. They are accelerating.

A discussion is taking place at the hub.

"You're early. At least twenty years early. And at the very least, you could have called."

"I told a man about myself."

"...How much? Everything?"

"Not everything. But I told him how we do it."

"Was he convinced?"

"I don't think so, but--"

Frustration. "Anne--"

"There's a fair chance he'll just drop it all, but he could go forward and get people working on it. Informational weaponry. Or nuclear. There's a chance, Mitch."

Things begin clattering in the depths of the machine. A long column of hundreds of enormous metal plates descends from the ceiling, swinging from the bottom of a metal monorail. Each plate is square and has a dense pattern of holes punched through it. They are punch cards full of data. Exceedingly large, exceedingly durable punch cards. They are rattling along very, very fast. In the distance they begin to split up and are diverted to different parts of the machine.

The first few hundred plates have data on them, but the later ones are all blank.

"You kept it maintained, anyway. I'm impressed."

"I've been doing this for long enough."

"Since you mention it..." Anne doesn't even bother to verbalise the question.

"We're coming up to forty-nine percent completion."

The third quarter of the globe is not filled with mechanical machinery. It is full of tall, silent monoliths, laid out in a grid pattern, forming a dark grey geometric forest of sorts. Each one is covered with coloured blinking lights and swamped with drooping vine-like cables, connecting all the monoliths to one other. There are fat cable connections between the monoliths and the machinery, sending data across to where a *POW* mechanical rammer is meticulously *POW* punching square holes in the *POW* blank metal plates. This is data being backed up. The immense calculation is being suspended.

The lights over the server farm are slowly winking out, ceasing to blink one at a time. Scheduled downtime.

"Eight more Crashes after this one. Roughly."

"Roughly. I think... we should do some studies. There has to be a better way than calling it as we see it each time."

"I don't think there is."

The final quarter of the dome is completely empty except for four cables - one silver, one gold, one black, one white - which drop down from some unseen hook in the recesses of the ceiling and then loop up and finally plug into the end of a metre-wide platinum egg. The egg is sitting on the grille gantry at the hub of the room, with its electronic innards spilled out onto the floor where Mitch is performing a final check on them while he talks.

"You're not a sociologist."

"And you are? I've been everything. I've had the time."

"Your head has always been wired for science. Not people."

"My head is as full of litter as the rest of this planet."

POW.

"That's the last one," says Anne.

Time passes as the machinery files the plates, with their new data, back into the pile where they came from and clacks back into its neutral position. Every last part of the machine will need cleaning, tuning, testing and resetting after this. The prime programs for the server farm will have to be reinserted from the raw binary. But there will be plenty of time for that. And Mitch is very good at it by this point.

Mitch finishes his work on the egg and begins putting his tools away. "Any last comments?"

"People die every time we do this."

"I know."

"Not directly. But people in aircraft. People in hospitals. People out at sea. When all that knowledge goes."

"Do you have any better ideas? And I ask this in all seriousness. If there are, there are, and fair play, I'll listen. But we've had so long to think about this. If there were, we'd have them by now. Surely. *We can't stop them learning.* By force, by persuasion, by breeding... It cannot be done without permanently perverting humanity as a species, and then the Zeroth Law or Golden Rule or whatever you call it goes, and the plan goes, and then - what, sixty thousand million deaths, cumulatively? - are for nothing."

Mitch slots the last component into the egg, hauls it over to the edge of the gantry. "They'd all be dead by now if not for us," he says. "Most of them would never have been born."

He stands back, gives the egg a solid push with his foot, and shoves it over the edge. The supporting cables pull taut and the egg traces a slow, quiet semicircle off into the darkness.

It's almost half a minute before the bob returns to them the first time, lazily swinging up towards them, close enough to reach out and touch at the peak of the swing.

"That doesn't make it right."

"So what do you want?" asks Mitch. He turns and faces her. "To make it right? To be somehow held accountable at the end of it all?"

Anne doesn't say anything, but Mitch is very close to the truth and he can see it.

"I can't help you, Anne. You're running the world, now."

As the bob reaches its furthest point for the second time - and it is invisibly small in the darkness at this point - something clicks inside it and it emits a bright white pulse of light. Components at the pointed end strobe in purple and ultraviolet for one complete period, then, as it swings out a third time, it clicks again and shuts off.

Failure Mode

To whom it may concern:

You may or may not know this, but there is an enormous building made of solid stone on the outskirts of the city of Tucson, Arizona. It is as if somebody took a mountain and dropped it on the edge of a light industrial park, and then chipped it and sculpted it into the perfect shape of a fairly slickly-architectured modern science laboratory, and then added signage and parking and maybe roads and paths around it. It looks like the biggest piece of stone sculpture in the world. It weighs over a million tonnes.

You probably have no idea why it is there. Or where it came from. Or what happened to the original.

That's unless the rock has sunk into the earth under its own weight and there's just a hole there now. That's a possibility too. Or you may not even be able to read this because English, as a language, has been lost. Or, most likely, it is a million years later and this message is dust, having never been read.

I think something is wrong with the universe.

*

Adrian Ashmore's adrenaline rush has begun before he even hits the floor. The lights went out and his chair disappeared from under him; a dinner hour prison break? No. Ridiculous.

He hits the wrong floor. Thin carpet, not the tiled floor of the dining hall. He fumbles around and finds a wall where there shouldn't be one, and then he knows.

He knows.

Somebody runs into him, completely unseen. "Who's this?" she says, feeling around for his arm and helping him up. "Sorry! I think a breaker got tripped or something." Forced cheerfulness.

"Who are you?" he asks her.

She tells him her name. He tells her his. And she stops dead in her tracks. Ashmore hears the sharp gasp and the shuffle backwards. Marie knows he is supposed to be in prison. And she knows Ashmore has been present for at least one previous botched teleportation experiment. And she knows, secretly, even if she hasn't allowed herself to realise it, that it is the middle of the day and that even if all the power was cut and the sky was overcast there should have been *some* ambient light in the Michaelson Group Arizona headquarters.

Ashmore hears all these facts coming together in Marie's mind and tries to keep her focused, distracted. He grips her hand and tells her, "Okay. You need to take me to the control room right now."

But she panics at being touched and shouts "Get away from me!" and scrambles away down the corridor.

*

I believe that the universe operates on certain fundamental principles. These are principles which, I believe, human beings are capable of deducing in full. One day, some years ago, I found a flaw in the universe, a loose thread, and started tugging. Was I messing with forces I didn't understand? Certainly. This is something I and many others have been called to do. We did it in a safe way. We did it in an attempt to understand what we were mucking about with. Or so we told ourselves.

We were blessed with inspiration from more than one source, from diverse viewpoints. But it was not so simple. My colleagues and I were forced to construct skyscrapers of theory before we had something sturdy enough to base a real machine on.

But science is never just for the sake of science. It should be, I wish it could be, but just think about the possibilities: To go from the Earth to the Moon in a second and a quarter without passing the space in between. To mount a device on a space telescope designed to trap photons emitted in another star system and thus study them up close, from mere Earth orbit. What couldn't we do, if we had teleportation? If we made the whole world into a single place with everybody next door to everybody else? How good could it have been? We actually dreamt about stuff like this. We thought such huge, impossible thoughts. "Everything will be different in twenty years", we said.

So maybe this is about hubris.

*

Ashmore follows the humming. He can hear a faint vibration in the ground so he follows the right-hand wall until he finds somebody who knows their way around, and holds their hand while he is led to the stairs and down however many flights. Eventually he locates the control room and announces to everybody who can hear him that the generator for their machine must be shut down, immediately. Immediately. They need to plan their attack before they do anything.

"Why?" people respond, to the unfamiliar, British-accented voice.

"Because there's nowhere for the heat to go. We're embedded in rock. No ventilation. It's just going to get hotter. Until it roasts us all. Shut it down and let's talk about getting out of here before that happens. I'm Adrian Ashmore. Where are the scientists?"

*

This is how the universe works:

Medium and meaning are separate. In the end, everything is just information: "I am a proton", "I have this wavefunction", "There are this many of us". When you describe something, you give information about it. It is impossible to describe something totally, because the act of description alters the thing being described. So, if you want to move something from place to place, you can't just read all the information from where it is and write all that information onto unformed vacuum at the place where you want it to be. "Heisenberg Compensators"? No. It's not the right answer.

Instead, you can separate off the information from the spacetime it describes. At the quantum level, information is substance. It can be manipulated. It is possible to cleave the quantum information about a volume of spacetime away from that volume. You can't look at it. You can't read it. But you can fire it off somewhere, anywhere. It's just a matter of calculation and energy input. And when the informational packet arrives at its destination point-- well, obviously, there's information in the way already. And that gets displaced, or knocked, like two steel balls colliding in an executive toy, and is catapulted back along the trail to point zero, on a mirror-image trail. So the two informational state volumes get exchanged. The whole thing happens at light speed. What's here goes there. What's there comes here. A lightspeed exchange of spacetime. Matter transportation.

This discovery was profoundly shocking. Quantum physics often has this effect, even on its close friends. Meaning/medium duality is like physically extracting the moral from what is really just a page of ink. It is like painting a hole in the ground and then diving through it.

We discovered this. And then we built machines to do it for real.

And somebody didn't like that.

*

They gather together-- the scientists and the engineers-- in a board room, around a single candle which casts only a few faint highlights on each face. Ashmore closes his eyes and imagines himself in a conference call. The leader is Drew Levenberg. Ashmore deems him too young by at least a decade.

Ashmore knows the whole story before anybody even starts speaking. The Michaelson Group Arizona laboratory was attempting an independent teleportation trial and something went wrong. The entire building became the subject of the transfer, and was flipped underground. At the same time, Adrian Ashmore was brought thousands of miles from the UK to be trapped under the ground along with it. The building is now completely encased in solid stone. There's no way to dig their way out - even if there was, they could hit magma if they head downwards or water if they head up. At least one component of the transfer moved thousands of miles to be here. They could be directly under the Atlantic rift for all they know. That's the bad news.

The good news is that the teleportation machinery runs off an independent local generator which was brought along with the building during the transfer. They're cut off from the Arizona electricity grid so their conventional computers won't work, except for the laptops, whose batteries will last at most two hours each. But with some of the world's most scintillatingly intelligent electrical engineers working on the task, they can build an AC transformer to run the TP rig and the computers off the generator simultaneously.

More bad news is that they don't know where they are. They can't know without unpicking the anomalous teleportation programs which were somehow inserted into the experiment. That would be time-consuming. Running the same program a second time would only move the entire building further in the same direction as before; this would eventually result in their hitting magma. But more good news, according to Ashmore, is that he thinks he can perform a relatively straightforward mathematical inversion on the anomalous program data, to make one which will put everything back where it came

from.

They'll need to ration the power carefully - the longer the generator runs, the more the facility will fill with heat. And there are almost no other light sources of any kind. It's going to be getting hotter anyway, hour on hour, even if nothing happens; it could have been worse if they'd been sent deeper. Oxygen will not be a problem. Humans can survive three weeks without food and they have loaded snack machines to pillage. The major problem will be water. Full tanks and full storage cupboards of water cooler refills will last... well, somebody will have to calculate that. Perhaps three days. With death following in another three.

It takes too long to get all of this firmly established and Ashmore is itching to get the project moving. But everybody is waiting for Drew's say-so, and Drew's spending too long thinking.

"Let's get going. I've done projects like this before," says Ashmore, to break the silence.

"Successfully?" responds Levenberg. "This is about more than just science. There are a hundred and fifty people in this building. I'm talking non-scientists. Admin, catering, janitorial. With no idea what's going on and nothing to do except panic. I'm going to start distributing tasks. But first I have a task for all of you. When we walk out that door... we have to be convincing."

"Who's not convinced? We can do this."

"Yes," says Levenberg. "Sure. If we cooperate, concentrate, stay focused, stay human. This can and will be done. In seventy-two hours. We know this, but we have to make *them believe* it. You all understand? We can't do this without faith."

*

> *Everybody's down here. With the Michaelson team and myself, that's everybody who knows anything concrete about teleportation. There are others in the world but they'll probably be scared off the project by now. Not that it would do them much good to come back to it.*
>
> *When Tom walked away from everything, he told me it was because he feared reprisal from somebody far more powerful than him. He cited evidence: impossibly timed lightning strikes, seemingly impossible teleportation events. I was sceptical, because I feel it is my job to be sceptical until something works ten times in a row and can be pretty certain to work another hundred. Science is the opposite of belief. I do believe in God, but not one who can't fit in the cracks; not a God who interferes directly in the affairs of mortal men, just a guy who wound up a Big Bang one day and walked away and let it run. Maybe he's found the insanely beautiful patterns inside his experiment, maybe he hasn't, but he's only watching, not even tapping on the glass. That's enough of a supreme being for me.*
>
> *But you--*

*

Day two.

"Someone help! Help!" cries a voice. "I think he's having a panic attack!"

Ashmore rushes over to the source of the sound, bringing a tiny light with him, fearing the worst. It's

Marie. She's kneeling over a man who is thrashing about on the floor. "What is it? What's happening? Is he okay? Jesus--"

"I think he's claustrophobic. I don't even know who he is. Hold him!"

"Can we sedate him? Why's this gone off *now*? Have you told him how close we are?"

"I don't know! There's no medicine, there aren't any medics or nurses! I don't know what to do!"

Ashmore tries to restrain the man, who is flailing dangerously and about to injure himself or someone else. "What's your name? Sir, what's your name? Calm down. Shhh... (Hold his other arm.) Listen: We're going to get out of here. My name is Adrian. I'm a master of teleportation science. I can tell you for certain that this time tomorrow you'll be home. We're confident about this. We're going home. You don't even have to be awake for it to happen--"

"Listen to him, he's trying to help you--"

"It's a bad dream, okay? It's just a bad dream. Except we can wake up. We're going to pinch the universe and it'll wake up and everything will be okay. I promise. I promise. It's just going to be a long night. A few more hours. And you need to-- ow-- go back to sleep. Aaagh! Ow!"

The man gets an arm loose. Ashmore takes an elbow in the eye. Then the man is out of their grasp and skittering away into the darkness. He'll have to be dealt with eventually.

Marie gasps. "...He's... ah. He's gone. He's gone. I don't know where. That was *awful*. Are you okay? Let me look at that--"

"I'm okay. I'm okay. I'm sorry. Ah... counselling the disturbed isn't something I do. I didn't know what else to say."

"...I'm sorry about what happened earlier."

"It's okay."

"You really believe all of that? What you said?"

"...Absolutely. Ah... Yes. Absolutely."

*

I know you're reading this.

*

Day four.

"This isn't right."

"Ashmore, I hope to God you're joking because we don't have time to get this wrong again. What's not right?"

"Drew, you don't-- Look at this graph. This is what we're picking up. This is the test curve. It's how teleportation was discovered. There was an anomaly on the curve and that's how we knew we could exploit this quantum loophole. Understand?"

"And you're saying what? That anomaly is--"

"This is our curve. Which we're picking up now. This is precisely as predicted by pre-2004 theories. *This*, however, is what it should look like, according to the post-2004 theories which superseded them. Okay? The anomaly's gone. There's no loophole."

"Meaning what?"

Ashmore says nothing for a moment. "Okay. Go and get Ralph and Holly and the rest of your smart guys to look at this. I need a minute."

Ashmore feels his way out of the control room and along the corridor to the adjacent kitchen. The taps are empty, both hot and cold. The cooler's empty and all the plastic bottles he can find are rattling, empty. He really needs water and it's extremely hot and there might not be any left anywhere. He knows all of this already and checking again hasn't changed anything. He leans against the wall and spends a long moment preparing himself for what he knows is coming next. And then, he returns to the control room, and the single TFT monitor with the single incriminating graph on it, around which nearly a dozen men and women are now gathered.

"So you're sure this isn't another--"

"--erature and pressure don't come into this! Depth doesn't! Universal laws are the same everywhere, that's what makes them--"

"--with all the other false starts, surely it's possible this is just another--"

"--No--"

"--No, he's right--"

"--If the machine wasn't working, we wouldn't even *have* a graph--"

"--It's working perfectly! It has to be, but--"

"--So teleportation has just *gone* from our universe? Is that it? The laws have just *changed*? So how do we fix *that?*"

And then there's silence. And everybody turns to face Ashmore. And in their eyes he sees the need for something to believe in. There's a long pause. He knows what he should say. But his tongue won't let him and "I don't know," is what comes out instead. He can't help it. "I'll have to think about it before I can be sure," he adds quickly, but the damage is already done.

Day five is very bad indeed.

*

> *I don't believe in the unexplainable.*
>
> *The universe operates on rules. You operate on rules.*
>
> *If the rules upon which the universe operates can change, then they, too, must change according to higher rules. Somewhere up there is a rule set to which you are beholden and humanity, I promise, will find a way to exploit those. There will come a time when everything is possible for us.*

*

By day six it's nearly over. The facility is hellishly hot and all the light sources have expired, except for the one in Ashmore's hands.

"What are you doing there, Adrian?" asks a voice.

It startles him. It's Drew.

"I didn't know anyone was... I found a PDA. Full battery. No one was using it. So I wrote something for my family. And I'm putting together a record of what happened here. Just on the off chance that... someone digs us out, eventually."

"Can... can I write something? To my family?"

It's absolutely silent in the room for a second. There's just the light illuminating Adrian's face. Then he hands the device to Drew.

"You have much family?" asks Drew, slouching down against the wall next to Ashmore.

"Divorced, one daughter," says Adrian. It hurts to talk. "She was grown up by the time we split up. Grown up enough to take my ex-wife's side in the argument. And it was quite messy, so... I haven't seen either of them in... well. It feels like a long time."

"Wife and three kids," says Drew, tapping on the virtual keyboard with the stylus.

"You're wife's maiden name wouldn't happen to be Michaelson, would it?"

"Heh. Not bad."

"You struck me as--"

"Look, I may just be another business manager to you. But at least I was good at business management. I knew to stop talking when the physicists got started."

Adrian notes Drew's use of the past tense.

Drew types for a very long time. Ashmore is in no hurry.

Eventually, Drew hands the PDA back. "It could have been worse," he says, desperately. "I mean, I think I did okay with organising the water rationing. For the most part. We could have been dead a long time ago."

"I guess so," says Ashmore. He opens his old file and picks up where he left off. They've both stopped sweating. That's a bad sign.

*

> *By now the flaw is nearly repaired. I don't know who you are. Maybe I'm about to meet you. More likely you're just a smart, smart man. Whatever happens next, as for right now, I am still alive.*
>
> ***Adrian Ashmore, 4th April 2008***

The Story So Far

Somebody has systematically exterminated every scientist involved with teleportation research except two: Thomas Muoka, who has sworn to abandon the project forever, and Anne Poole, who is suffering from massive brain damage. Not only this, but teleportation itself is also now physically impossible. Anne Poole has become invulnerable to physical harm and no longer requires air, water or food to survive.

Tom Muoka and Mike Murphy have been on the United Kingdom Advanced Physical Laboratory site since the morning.

"She can still see and hear," says Tom. "She can't be blinded. Her limbs cannot be overextended or wrenched, but they can be manipulated. She's frozen in time, but she can move. So something's wrong here. Sight and hearing depend on physical changes in the body. Chemical changes which precipitate electrical signals which convey messages. There is simply a point at which such chemical changes are so intense that they cause damage. Or where additional photons falling on the retina would cause damage rather than additional stimulation. Or where pushing the joint a little further would cause damage. But something's stopping her from passing that point. Understand? It's like there's a Platonic Ideal Form of Anne Poole's body. And she can't diverge from it to the point that her pain receptors would fire. So something is maintaining her physical state on an atomic level on a second-to-second basis. It doesn't make sense!"

Murphy climbs down from the high, domed roof of the Medium Preonic Receiver. The receiver is a wide, inverted parabolic dish enclosed in a modern brick facility. Half of the MPR's components are accessible by steel panels in the roof, the rest have to be reached by descending a short flight of steps into the bunker-like space under the dish. "Everything's good up there. Do you really think the A-Layer transmission has the answer?"

"All these things have happened at once. Ashmore disappeared from *prison* in broad daylight. The Michaelson Building - gone, permanently. I don't want to say it's punishment from God. I don't want to say Anne's an immortal being. But I can't deny it out loud," says Tom Muoka. "I'm too scared to deny it. All I can do is study the facts. That's what I'm here to do." He pokes a few final keys on his laptop, which is jacked into the MPL's systems, and an encouraging humming begins to build. "Almost done."

"Tom, the project never came to anything. I'm nearly retired. All the data is public--" says Murphy.

"We need to check it again. There has to be something missing."

*

> *Arika McClure and Jason Chilton are Powers, members of a series of people with superhuman strength and speed and the ability to fly. A new Power is born every year, each one twice as powerful as the last.*

Watching a man you know kill another man, even indirectly, even if there might have been rational reason to do so, is a profoundly unnerving and sickening experience. Ching knows that he wasn't supposed to see what happened. What was *supposed* to happen was that he saw nothing, and was told that the sedatives had worked and Datu Dimasalang had stayed docile the entire time. And then, maybe, he'd be told that Dimasalang was shipped off home. Or maybe he'd be told that Dimasalang had died

due to overdose. Or maybe Ching would have been held and forced to keep working on the problem regardless. Or maybe *anything*. But somebody dropped the ball. And luckily for Ching, he is a nice person. He has spent more time working directly with Jason Chilton (Nine) and Arika McClure (Eight) than anybody else. They like him. They trust him. They will do what he asks them to do.

Jason sets Ching down just outside the perimeter fence of the air base. Arika is not far behind. In the distance, one or two alarms begin sounding, but they have a minute or two before somebody makes it to their location.

"Ching, what is happening?" asks Jason.

"They killed Eleven. They killed a man. I just watched it. Maybe there was a half-way rational reason behind it. But this project is over now. If they think you're a threat, Jason, or, *you're* a threat, Arika, they'll kill you. Or me. Or anybody. We know what they're capable of, now. So it's over. All three of us are out now. Objections?"

"Nope," says Jason.

"They killed him?" says Arika. "Why would they kill him?"

"...Because Powers are threats. Okay? It's all based on fear. And despite everything I've tried to tell Moxon, despite all the good faith I gave him, he doesn't know any other way to deal with threats. So here's what we need to do. First priority is to protect our families..."

Ching's immediate family is his recent wife, Susie, who lives with him in their apartment in Brooksburg, a few miles south of the base. Susie knows that "Google" is just Ching's cover story and that he actually works for the United States Department of Defense, but she doesn't know any details beyond that. So far, this hasn't caused any friction. Most, if not all, of these facts are about to change, however, and Ching knows it.

Jason Chilton is married, with two children in primary school. A trans-Atlantic move would have been a monumental undertaking, so, for now, the Chilton home is still in Kent in the United Kingdom. His wife knows about everything that he can do, but his daily activities and tests on the base are protected by various U.S. secrecy laws and he has obeyed these thus far. As for his kids, he is supposed to be keeping everything secret from them, and besides, nobody they blabbed to would believe them, or so goes the reasoning.

In theory, Jason could and should spend the working week in America and be flown home to his family at the weekend by conventional civilian jet, for maximum discretion. In practice, he has found he can easily make a high-altitude trans-Atlantic morning commute and nothing Moxon or anybody else on the base can do could stop him from going home to his family every night. Nobody has reported a sighting so far, mainly because he travels by night, but summer is coming and the nights are getting shorter.

Arika McClure has no immediate family. She has no legal guardian. It's debatable whether she needs one, because she's nearly eighteen years old, and the Air Force is taking reasonable care of her so far, and in any case she's quite capable of making her own decisions, not that anybody other than Jason could possibly make her do something she didn't want to do, and... frankly, it's complicated. Sometimes she sleeps on the base, sometimes she sleeps on Ching and Susie's sofa, sometimes she just goes missing for a night. She saw the base counsellor once, at Ching and Jason's encouragement. The results

were vague enough to be potentially alarming and since then she has turned down further offers of support. Nobody is quite sure what she wants and possibly nor is she. But she has no immediate family. Right now, Ching sees that as an asset.

"Arika. Your job is to go to Susie. I'll give you a word to tell her which will allow her to trust you. Tell her... tell her everything you know. Show her everything you can do. Keeping secrets beyond this point cannot possibly help. Get her trust and get her to pack up some essentials. Keep her safe in the house. If somebody comes, get out of there and take her somewhere safe. Don't tell me where it is. Don't tell anyone. Go out into the hills or somewhere nobody will be able to find you easily. Wait for Jason or me to come back for you. Jason: you and I are going to England. You can check your family and... well, say whatever you want. But you need to drop me off somewhere on the way. First you need to steal me the HV pod. And a satellite communicator. Then we can go."

"You really think they'll put Susie in danger?" asks Arika.

"I've seen them kill one person today," says Ching. "Right now I would believe anything. All I know is you're not faster than radio communications, not yet. The word is 'Houdini'. Go. Go!"

Minutes later, Ching is slouched inside the experimental hypervelocity pod, headed east. It is simply a conventional jet fighter with all wings, armaments and propulsion removed, and a big, heavy handle. The idea of the pod is to protect a human occupant while he or she is towed, at hypersonic speeds, by a Power. It's cosy and quiet and air-conditioned. Under Jason Chilton's power, it can get from Nevada to England in less than an hour, completely circumventing civilian air travel.

Ching broadcasts to Jason from the cockpit. At first Jason thinks he is just filling silence and doesn't pay much attention. "A few years ago there was a man called Mike Murphy who had an idea for faster-than-light communications. The idea was to send messages through a secondary plane of our universe with differing physical properties from our own, one where light was faster. The theory was all there, a dozen and a half different papers on the possibility. He got some people together and some funding and they built their equipment. And when they tried it out, they found that something was wrong.

"There was nothing in there. Over small scales - millionths of a metre - the signals worked fine. But they dropped off to zero amazingly rapidly - geometrically, with the sixth power of distance. The mathematics said they were supposed to drop off linearly; slowly enough that a signal would still be audible after passing through the Earth. You see, the universe has extra dimensions. We've known that for a long time. But they were supposed to be wrapped around on themselves, containing the energy like light in a fibre optic cable. They'd been unravelled. The extra energy was just being drained away into empty dimensions.

"And instead of being able to transmit anything of their own, all they could do was receive a single message, circulating around and around the extra dimensions they were trying to harness. A textbook. It started from the most basic principles of one plus one-- and it was months, years before anybody managed to translate enough of it to figure this out-- and built up the theorems of mathematics and the theories of physics, the laws of motion, and electromagnetism, and relativity, and quantum mechanics, and string theory, and... and it kept going. Even FTL communications. There was everything we knew about science. Hundreds of years of scientific discovery whittled down and presented economically in blunt black and white pages. And there was *more*. Think of physics as a series of milestones. I've just named five of them. There were more. At a glance, a *hundred* more, and the message went on long enough to contain another *million*.

"I was one of the people who helped discover this message. But the man who broke through the text was not me. He was named Jim Akker. He was Dutch. A linguist with a passing interest in mathematics. The Book or the Manual or the Rules or whatever you want to call it had been put online because it was felt that a team effort would stand a better chance of translating it, but not enough people looked at it, or those who did got five pages in and gave up in boredom, assuming that there would be nothing of note... which is fair. The document is huge. Intimidating. And not at all transparent. I can see why one would quit a short way into it. Akker was the first person to reach the first examples of new and unknown mathematics and physics. And he started putting the information he'd discovered online.

"Then Akker - who unfortunately had some fairly severe personal problems - committed suicide. Most of what he'd learned sadly died with him - the tattered, sketchy notes he left behind were more or less illegible, even to a native Dutch speaker, and access to his personal computer was denied by his family. I believe the machine may even have been destroyed by now.

"Since then, we've been scrambling to pick up the pieces. And I, personally, have been trying to find some kind of explanation for what you and your cousins, can do. Because I think it's in there, somewhere. What you're doing looks like magic, but it must be explainable somehow."

"So who wrote this message?" asks Jason on the radio.

"We don't know. Nobody knows. But it's interesting, because whether it was written by a human being or not, it's been totally accurate as far as anybody has been able to tell. FTL communications matched our observations and the message described that. Recently, teleportation technology was developed in line with what was discovered in the message and there was agreement there too."

"I thought teleportation was a failure," says Jason.

"Well, kind of. It's never worked *properly*, in the way we wanted it to, but it *does* work. But here's the thing. Last night, the message changed. The message is on two channels, right? Channel three has all this information, saying 'this is all possible'. But channel two is like a qualifier. It says, 'actually, no. FTL transmissions aren't allowed'. For whatever reason. At first, I thought it might be that we need to pay for access or something, but I've reconsidered that. It's something else. And that channel two message changed last night. It got longer."

"And what does it say now?" asks Jason.

"I don't know. I didn't have time to decode the new input and I didn't have time to transmit it to a safe location. All I knew is I didn't want the Power project to have access to more knowledge than they already have. So I broke their machine. And where we're going now is the site of the original machine which I helped build. To retrieve the new message."

"And what happens once you've done that?" asks Jason. "What if someone does come after us?"

Ching stares at the streaming clouds and ocean. "I don't know. I... I don't know. Let's just do this. It's important that we do this. GPS says we're coming up on the British mainland."

"Ching, is my family going to be at risk?" asks Jason.

"With you protecting them?" Ching starts giving more detailed directions. Within a few minutes, they have located the stately Lincolnshire home which the United Kingdom Advanced Physical Laboratory stands nearby. It's mid-afternoon, local time. Jason drops altitude, to make a relatively inconspicuous

approach. He drops Ching off behind a small grove of trees behind the facility, where Ching thinks they should be unseen. Ching takes his laptop and a few other small pieces of electronic equipment from the cockpit, and stuffs the latter into his pockets.

"What now?"

"Now you can go to your family. Make sure they're safe. Take them somewhere safer. Then... I don't know. We'll all have to meet up again somehow. Sooner or later these communicators will be disabled remotely. I'll think of something. Just go."

Jason leaves the HV pod behind the trees, and arrows into the sky and angles south, without another word said. Ching watches, shielding his eyes from the sun until the dark blue dot is too small to be noticed against the sky. Then he begins to wade through the trees and up the hill towards the MPR.

"Where did you come from?" asks a voice as he is halfway up. Ching stops, and looks up at the tall, thin scientist looking back down at him. He doesn't know who Tom Muoka is, but he does know that there are no footpaths approaching the MPR from this direction and the man is probably wondering why he didn't hear an approaching car.

"Let's come back to that," says Ching. "Who are you?"

"Who's that?" says another voice. It's Murphy, poking his head over the top of the MPR. "Ching?"

"Mike! Mike? I want to reactivate the Receiver. What's going on?"

*

> *Mitchell Calrus is a seemingly ordinary human being who can move and see through solid objects, and turn himself invisible.*

Seph Baird and Mitch Calrus wind along narrow country roads in Seph's minuscule cyan Nissan. Seph is a capable but *terrifying* driver, and Mitch is carsick. Mitch has toyed with the idea of phasing them both through anything they collide with, but the prospect of winding up partially phased through a mountain of twisted metal is even more terrifying than that of simply crashing, so he is simply trying to concentrate on the scenery and hold onto his lunch.

"The most immediate conclusion would be that you're passing the atoms between each other," says Seph. "Rearranging the atoms from each object so that they don't interfere with one another in stasis, then putting them all back into position afterwards. Like in your comic books. But that's obviously impossible. You would need direct, conscious knowledge and control over every atom in your body - including the ones in your brain which *do the controlling*. And, when you're linking the two glasses, you're even controlling particles outside your body, with which you're not in direct contact. And while an inanimate object would theoretically survive that process, applying it to yourself, living tissue, particularly nerve tissue like your brain, would be fatal.

"So the answer is a little bit more complicated. I think you're moving through another dimension. Our space is laid out in three dimensions in which we move freely, but other spacial dimensions have been theorised endlessly."

"I thought time was the fourth dimension."

"There is no 'the' fourth dimension, there's your usual three, and then the rest. Time *can* be modelled as

a dimension. It sometimes helps. But sometimes it doesn't. Anyway, you're not a time traveller. I'm talking about a fourth spacial dimension. Okay, imagine the universe was a flat table. And we're all flat objects on the table."

"Beer mats?"

"Fine, Mitch, beer mats. Embedded in the table. All we can do is slide around on the surface of the table. We see only a thin slit of reality, we can't climb out of it. What I think you've done is found a way to climb out of it.

"Beer mats are pretty good actually. So, ordinarily we just slide around. But because beermats have thickness, if we meet, we collide, we can't move through each other. But if you lift yourself up by just a fraction, you can slide over the top while I stay where I am. From a 3D viewpoint, it looks like you're passing through me, but you're actually sliding over the top of me. Now, this is the extra bit: if you stop, and try to relax back to three dimensions---you get stuck. There is pressure, from above and below."

"Like pint glasses on top of them."

"Kind of. Actually it's more like the beer mats are *really heavy*. This would be why we're compressed to just three dimensions. Because of the weight. Or possibly some kind of physical barrier. When *you* relax, you default to our plane like everybody else in the world. So... you aren't likely to fall to the centre of the Earth while you're asleep, if that's been worrying you. But, if you put two objects on top of each other, the pressure creates friction, and, while they don't actually interfere with each other at the atomic level - necessarily - they can't move. Which is how your tricks work. When you're tangible, that's because you're in real space. When you're intangible, or invisible, your bodily structure is kind of rippling into the fourth dimension. (All except for the soles of your feet, of course.) And you seem to be able to apply these perpendicular forces to other objects you're in contact with, like cutlery and your clothes. I can model this mathematically if you want."

Mitch is ecstatic. "I was told you were smart! Awesome! I got it, I got it: I can be 'The Four-Dimensional Man'. That's pretty good. Too bad my real name isn't alliterative."

"Fine. I've told you *what* you can do. But I've opened up about a million additional questions. I have no idea *how* you do it, what the mechanism is, or *why* you are the only person who can. Look: additional dimensions were predicted a long time ago. In theory. There is a substantial amount of evidence, right now, that they may even exist. But nobody ever, ever predicted that they would be accessible by an ordinary-- by what appears to be an ordinary human being without equipment."

"So we still need to figure out my secret origin."

"Which is why we're here," says Seph, turning off the main road and heading up a narrower one, past a slightly overgrown sign saying "UKAPL". Mitch doesn't catch the smaller writing underneath it but Seph explains anyway. "This is the United Kingdom Advanced Physical Laboratory. It was built a few years ago."

"This is where they found the weird message which you mentioned?"

"This is where they found the weird message which nobody has managed to decode much of yet. There's two reasons we're here. One is that you have X-ray vision. I figured that out. You *can't* see in X-rays. Your head just doesn't have the hardware. That's ridiculous. What you're seeing is light bent

through the fourth dimension. When you look inside something, you're angling your eyeball to catch light which isn't sent straight through the third dimension, but *around* all the obstructions. In 4D you can just pass through stuff, and so can some light."

"Right?"

Seph parks the car in the small car park. There is one other car already there, which gives Mitch brief pause for thought, but Seph is still chattering away happily as she pulls out her rucksack and locks the doors. "Right. *Then* the problem becomes darkness. How come you can see an apple in my bag and tell me that it's green? And see my internal organs in red and purple and whatever? The bag is dark inside. I am not internally lit. That means that some light must be coming *in* from the fourth dimension. Then it must be bouncing off the particles of the object you're looking at, being partially absorbed - hence the colour - and then reaching your eye. The photons can move through 4D but they obey an arc, maybe a parabola, maybe something else. Which means that the Sun must be giving out this superlight all the time. Which is why you can't use your X-ray vision on the Sun! Try it."

It's early afternoon. Mitch tries it. "Ow." He blinks until the spots go away. For a moment he thinks he sees something actually moving in the air, but in a moment it's gone.

"Now: four-dimensional superlight. It's *mentioned* in the Eka Script. We'd probably have discovered it ourselves within a few decades. So now we know that it *exists*. It's a real phenomenon."

"Eka Script?"

"The weird message. We call it the Script or the Message or the Manual or the Document or whatever. Eka is just a name somebody came up with. Eka is the language it's written in. Anyway: 4D imaging is a *mind-bogglingly* powerful tool, Mitch. We're talking magnetic resonance imaging plus plus plus. Imagine a surgeon who can wield a scalpel in 4D. But then imagine a soldier who can walk through walls. Or a thief. Or *anything*. Basically, what I'm saying is: we are standing on a terrifyingly tall diving board here. If you're *not* a complete one-of-a-kind genetic abnormality, the whole world might be about to go sideways."

"Okay... You mentioned there was a second reason I'm here?"

Before Seph can answer, they come around the corner to the front of the Medium Preonic Receiver and there are the rest of the people: Ching, Mike Murphy and Tom Muoka. "Hello," says Seph.

"Did you tell other people?" hisses Mitch.

"No," says Seph. "I don't know why they're here. Why are you here?"

"Seph!" cries Ching, rushing forward and enthusiastically greeting Seph for the first time in several years. "What are you doing here?"

"Are we expecting many more people?" sighs Mike Murphy.

"I wasn't expecting anybody," says Ching. "I was expecting to be on my own. But I'm glad you're here, Seph. We need your help. We need to talk."

What a coincidence, that they'd all come together at the same location at the same time.

*

There was a war in Heaven and the debris fell to Earth.

As they work, Ching, Mike, Tom and Seph tell each other what they know. Ching doesn't say anything about his flying companions; without hard proof, there would be no point in attempting to convince his colleagues of what he's seen with his eyes. Instead he tells them everything he's learned about the Message since they last spoke, which isn't much, and he tells them that he may... just may... have discovered something one might come to call "antigravity". Seph, likewise, only reveals that she has discovered proof that 4D superlight exists; not how she arrived at this conclusion. For the moment there is little need to prove these facts. There will be time for that.

Tom tells the long and increasingly disturbing story of teleportation science and Anne Poole. Mike Murphy has little to tell. And Mitch Calrus drifts away from the increasingly technical discussion, eventually seating himself on the roof of the MPR where the view is best, playing on his PSP. For now, he lets them think he's with Seph, which is, broadly speaking, true.

Within minutes, Ching has been provided with a fresh printout of the new message. After an hour he has confirmed the group's suspicions. They gather on the roof, near the hacked-together live readout, not far from where Mitch is seated, ignoring them. The sun's setting.

"The Eka Script *has* changed," says Ching. "There was never any doubt about that. Up until recently, the message on channel two said that FTL communications were not available to us, because some inexplicable parameter was out of range. Last night, something else was added to the list of things which are not available. Teleportation. It's been switched off."

"You told me it was about access permissions," says Mike Murphy. "You said, and these are your exact words, 'we need to buy a more expensive broadband package'."

Ching smiles. "I know. That was a joke. A guess. Maybe the A-layer is a natural formation and maybe it isn't. Maybe it is about something vaguely resembling money but it could be something else entirely. It could be that FTLC consumes a finite resource which ran out some time ago. Maybe teleportation works the same way. All we can say for sure is that somebody's behind it all."

"I don't think that's necessarily true," says Muoka. "Almost everything we've discovered so far has to do with meaning/medium duality. The meaning of an object and its physical existence are independent from one another. You can tell something what it should be. You can take what-it-is away from *it*. Information as substance. You say somebody had to have authored the message. I don't think... maybe there doesn't need to be an author. If the message is part *of* the universe, it's information. Maybe it doesn't need to be artificial."

"It has prime numbers in it! It has grammar and vocabulary!" says Ching.

"It could just be a state definition. Boundary conditions for the Big Bang, maybe with a few twists. Here's what I think. Our universe and the Eka Script are the same thing, presented from different angles. As if one is a shadow of the other. Or they're both shadows of the same larger object. When one changes, so must the other. Which implies that an effected change to channel two could have shut out TP universally," says Muoka. "Or vice versa."

"Two objections," says Murphy. "One is that it can't be that simple. The mere idea of a self-modifying p-brane frightens me because self-modifying systems can modify themselves to be all but unmodifiable. And the other is that this message is about a million times longer than could ever be necessary to describe our entire universe. What can there possibly be in the rest? Shredded newspaper?"

"Ching ran a frequency analysis and it's definitely coherent all the way through," says Seph.

"Unless there's more to the universe than we know," suggests Mitch, arriving behind them all. He has his earphones out and his game turned off. He has been listening. "Just saying."

"A million times more?" asks Murphy, glaring at Mitch.

Mitch shrugs. "Why not? Maybe the power is being pulled from extra dimensions. We know they exist. I know you do, because I can't see through part of this machine."

"That's because it's partially four-dimensional," says Seph. "That's how it works. I wanted to see if you could tell."

"What's he talking about?" asks Murphy. "What are you doing here, anyway?"

Mitch points downwards, towards the middle of the MPR's structure. "This is an inverted parabolic dish, right? It's right there at the focal point. Opaque even in 4D. I just noticed it. Like a thumbtack, with the point aimed up through hyperspace. It's weird as hell."

"Mitch, don't--" begins Seph.

Mitch bends down and reaches into the roof of the Receiver. He reaches down towards the focus, reaching through the brick and aluminium like a ghost.

"What's he doing? *What's he doing?*"

Mitch touches the sharp, rapidly oscillating 4D obstruction. It wobbles against his fingers, gives him a mild electric shock, and then collapses, crushed back down into three-dimensional space. As it falls, it leaves a momentary wormhole in hyperspace, a gap between regular reality and whatever is lying on the other side of it. The hole slams shut within femtoseconds, of course, but that is enough time for information to strike through it, like lightning.

Sundown

Thousands of years earlier, Plato described something similar. Take a deep, dark cave and chain some prisoners at the bottom, so that they cannot move about or flex their arms or legs. Restrain them in a row, bolting them down so tightly that they cannot even move their heads, so that they have no choice but to all gaze upon the same cave wall. Build a fire behind them, to cast a steady light on the wall. And then march various objects past the light source, so that their shadows are cast on the wall where the prisoners may see.

Now imagine that the prisoners have been raised in this cave from birth. Because of the nature of their imprisonment, they would be unaware of any world other than the two-dimensional patterns of light and shadow on the wall ahead of them, and the sounds they heard (and, if they were permitted to talk, made themselves). They would be unaware that they even had limbs. If a dog was marched past the fire, and heard to bark, they would associate their word for "dog" not with what we know as a dog, but with what we would recognise merely as a dog-shaped shadow. For them, the entire world would be two-dimensional. Everything they knew would be thought of in terms of dark two-dimensional shapes and the sounds they appeared to emit. They would not know what movement is. Or what legs, arms, eyes and light truly are.

There are many possible interpretations which can be drawn from the allegory, especially when one considers the possibility of a prisoner breaking free and stepping out of the cave into brilliant, sunlit reality for the first time. But one of these is the ontological concept that the real world of three dimensions of space and one of time in which we live is, itself, *not the whole thing*. That all humans are still imprisoned in some fashion; that what is perceived is a literal or figurative shadow of the entire truth; that, in less flowery terms, there exist additional dimensions of spacetime which we are unable to perceive because we are not so free to move through them.

As the simulation burns its trail through his brain Ching feels like that freed prisoner.

Only, much more so. To make the analogy apply better, many additional directions of freedom would have to be stripped from the prisoners. Their senses of touch and hearing (and smell and taste if they had them) would be taken away, leaving only sight, and utter lack of sensation in/of the rest of the body. The full human body would then be cut down to a single eye, plus a brain and minimal biological support. Not even an eyelid to facilitate blinking, or muscles to allow it to move or focus. And the eye itself would not be permitted such luxury as a moving two-dimensional picture to look at, or even a line, but a dot, a single tiny dim grey pixel on a black background, not shining constantly but winking periodically, just to provide the absolute minimum of sensory input necessary to prove to the owner of the eye that he or she is not simply dead.

Even that would not be enough. To provide the true level of constrast Ching is experiencing, the world outside would have to be bigger, too, much bigger than a simple yellow Sun shining down on simple green grass. It would need to be created like a fractal, with intelligent patterns on every conceivable level, going up higher and higher into the sky, cut and carved into impossibly intricate shapes, with whole universes forming the building blocks of megaverses, themselves forming the foundations of still larger and more complex structures, with every tiniest component picked out in a unique and scintillating colour, voice, texture and emotion, and the whole thing extending upwards for hundreds and hundreds of dimensions, with no end to the wonder in sight.

This is approximately what Ching is seeing.

In reality, Ching claws at his skull, dazzled and nauseous with uncomprehension. In the simulation, a moment passes and then something up near the top of the structure ruptures open, and two dark dots shoot out of the hole like bullets. They decelerate and become caught in the pull of some other-dimensional gravitational force and go into freefall, descending together and eventually tumbling glacially slowly past Ching's point of view.

Ching watches them fall. He finds himself dragged down with them. He follows behind the two shapes as they plunge all the way back to ground level and into the black, engulfing cave, and down further still. And then the dull, winking pixel returns, and Ching opens his eyes to find himself face down on the edge of the United Kingdom Advanced Physical Laboratory Medium Preonic Receiver roof, clawing onto the concrete wall for balance while his ears stop spinning. His stomach convulses unpleasantly. "Was that for real?" asks a voice. Seph.

Ching stares at the grey concrete from a few centimetres away, trying to get his gut under control. He remembers that he hasn't eaten anything today. He feels shell-shocked and ill, and one thing that he now knows for absolute certainty is that there *is* something wrong, really catastrophically wrong with the world. It is as if something inconceivably important happened, and he wasn't there for it, or he wasn't ready for it, and now there are going to be terrible, costly Consequences. It is as if something is missing. No: more like *something is there in the room* who shouldn't be. A big, still, silent, threatening shape. Like a spider sitting on your pillow.

"He fell," stammers Ching, to whoever is listening. "And something went wrong."

"What did you see? Did we all just see the same thing?" Murphy.

"I don't know I just saw! I can't-- I can't even think about it properly!" Seph.

"What are you?" asks Tom Muoka. Ching turns around and looks up. It looks like a bomb hit the five of them. Muoka is sitting with his back against the dome, feet stretched out in front of him, leaning against the GEWR panels, head lolling as if half-dead, clutching one shoulder, panting, seemingly exhausted. Murphy is on his knees, struggling to get up. Seph is supporting herself on the wall around the edge of the Receiver building's roof, clutching her immense mane of hair with one hand.

Not five. Four. Ching looks up at the top of the dome and Mitch is not visible. "Where is he?"

"Describe what you saw," says Murphy. "Ching. Describe what you saw."

"I can't. Mitch fell. From somewhere else, to get here. There was a war or a fight or a battle or something and to stop it he came here. He killed the bad guy and he came here. And he's supposed to be dead."

At that moment Mitch flickers into visibility at the top of the dome. Flicker is the right word, different parts of his body jitter between being transparent and opaque, as if he is wobbling in and out of hyperspace. He is on his knees, almost in a foetal position. Multiple cross-sections move across his body like MRI scans. Mitch is apparently moaning or screaming but as different portions of his larynx and tongue disappear and reappear the sound is broken up with short, sharp edits of silence. There are curious discharges of blue light around his fingertips and the corners of his eyes.

Ching doesn't like what he's looking at. "We need to get out of here. We need to get away from him.

He's waking up--"

"What's happened to him?" demands Seph.

"What in God's name are you?" demands Murphy.

Mitch looks up, still unable to fully tune in. His pupils are on fire and as his gaze sweeps across them it leaves spots in their eyes. "I d-- -ow! -- -on-- kn--!"

Seph climbs the dome and kneels in front of him, but is helpless for what to do other than shield herself from the light. "Don't touch him!" shout several people.

"Somebody call an ambulance!" suggests Seph.

"They couldn't help!" responds Ching, and then Mitch clonks back into real space and Seph catches him as he falls forward. She holds his head tight and murmurs calmly to him, lowering him to the floor. He holds onto her and just barely manages to stay real. A long moment of silence passes.

"I want to go home," is the first thing Mitch manages to say.

*

There's a pub in the village, the Hornpiper. Back during the A-LAY project, Seph, Ching and Murphy were regulars and it was also a decent place to drink: a twisty, low and claustrophobic pub with tables and chairs scattered off in dark corners and booths, separated off by black architectural beams, with friendly service and tatty furniture.

That all seems to have changed. The Hornpiper is now under the control of some impersonal corporate chain. The lighting is all bright, pleasant and wrong, and the bar staff are all clueless new youths. New seats. Lamentable range of drink on tap.

They bring Mitch in through the rear entrance and pick a table where any passing regulars aren't so likely to take notice of them. Mitch is still under the weather but the walk down the hill to the village has helped. He's had one bottle of water already. Murphy gets him some more from the bar. And some beer. And orders some food.

"He can move through 4D," states Muoka, pointing accusingly at Mitch, once Murphy returns bearing the first round of drinks.

"He can see and move through 4D," says Seph, who sits closest to Mitch. "That's what was happening. He came to me months ago, he said he had no idea what was happening to him. But that was it. He can walk through walls and see by superlight. And if he's from however many dimensions above us it would make sense that he can move through some of them."

"No, no, no," says Murphy. "One step at a time. Extraordinary claims demand more proof than just a shared psychadelic head trip."

"Assuming it was shared," says Muoka.

"I already told you what I saw," says Ching. "He was fighting someone, and they landed in this universe, and he killed the bad guy."

"And they were both locked in," says Seph.

Muoka and Murphy both come to agree with this outline of what was seen. But as for details, all four of

them find the concepts strangely difficult to phrase. Simply trying to put words around them causes them to slip away, like dreams.

"I don't like this," says Murphy. "It's just too much like an environmental effect. Drugs in the air or ultra-low-frequency mood vibrations or something equally freakish."

"His head was glowing," says Seph. "I know what I saw."

"I know," says Ching. "The glowing thing was real."

"How do you know that?" asks Muoka.

"Because I have seen it before."

"What? Where? When?"

The conversation is silenced briefly when their food arrives, a big bowl of chips. Ching claims most of the chips and eats a few. The waiter leaves.

"You're the huge anomaly," says Ching to Mitch. "You're what's wrong with this whole universe. You're the reason why science has suddenly stopped working like science is supposed to work. Did you kill the teleporters?"

"No," says Mitch.

"What about the Powers? The flying people?"

"I don't know what that means." Nor does anybody else at the table.

"Why are you here?" Ching asks. "What's stopping you from going home?"

Mitch gulps some more water, then speaks.

"The place I come from is... bigger than this.

"I come from a long way up the chain-- that's the structure you all saw. The structure itself goes up a long way further still. I can't describe anything in the place I come from, outside of poetic terms. The words for it just aren't there.

"In the stack, everything is made up of smaller things and everything makes up something bigger. Universes combine to form multiverses, and they form rings which line up together to make strings, which are the building blocks of new, bigger universes. And because it's so large and complex, you can slice the entire mess up any way you like and find something living there. The whole place is alive. And intelligent life, too. You can't move for it. You're made of it, essentially. Like a human being is made up of individual living cells, only imagine each atom in the cell was a universe in its own right.

"It's not often that things move up the stack. An atom can't very well enlarge itself to human size. But things from up above can interfere below. Say a human started doing atomic experiments. Gets the cell under the microscope, starts bombarding it with protons or what have you. Interference. Only that picture doesn't really work, because the human can also actually descend to the level of the cell. He can climb into it and walk around.

"Dr Muoka was talking about information as substance. Well, it's true. Up there, much more so than down here. And if information can be pushed and shoved around and twisted, what do you call that?"

There's a long pause while they think about this. Then Muoka says, "Thought."

"Right. If information is a substance, then intelligent thought is a fundamental force. And it is. Up in the stack it's the dominant force. That's why intelligence shows up everywhere up there. Information clumps together like mass under gravity. And everything just *wants* to think."

"That's balderdash!" says Muoka. "This universe is empty!"

"I know. You're 3D. It's like you're under a microscope slide. Thought's a multidimensional push and it doesn't operate quite right down here. And the effects are very weak. But it's there, you've done the experiments yourself, with the teleporters. In principle, it's there. But here's why you're under this slide. This thing attacked my home. Intelligence can be moulded to different forms. It descended to my level and started using extradimensional power to destroy. I killed it, by shifting the playing field to a place where I *could* kill it. I blew a hole in the underside of my universe and dragged it down here, to your universe, three dimensions. And then trapped us both there, under this metaphorical rock, this prison wall. Where neither of us has any power. And I killed it. Right?"

All four of them nod.

"But I'm still here," says Mitch. "Because I had to be in the trap too. It was the only way to make sure. I can do this:" He puts out his hand and makes it vanish. "I can move a tiny distance up or down. That's me rapping my knuckles against the cell wall. But that's all."

"When did this happen?" asks Muoka.

"Where I come from we have six dimensions of time. It's complicated."

"And what's happened to Mitch?" asks Seph.

Mitch finishes his water and sighs. "I'm still here."

Leaving The Real World

When Ching's satellite radio starts making noises, he excuses himself from the table and ducks out the back door of the Hornpiper. There's a short set of steps leading down to the car park at the rear. He sits down and turns on the speaker, expecting to talk to Arika.

Instead, it is his wife Susie, who is close to hysteria. It takes some effort for Ching to get the story from her. He eventually figures out that Arika came to see Susie at the house like he asked. Instead of telling Susie anything, Arika simply said that she had been told to go home for the day, on account of an experiment going wrong. They had some lunch and watched some television. A few hours later, somebody knocked on the door. From the description, Ching decides it was probably Moxon.

At this point, Arika, without explanation, scooped Susie Kuang up in her arms and flew her out of town. They are now both standing in a deserted patch of scrub on a low clifftop overlooking the highway leading into Brooksburg from the south.

Arika is being sullen and unresponsive, and Susie is, quite understandably, freaking out.

"She's a superhuman," says Ching. "Arika's a superhuman. And she's not the only superhuman. This is my job, studying superhumans. Finding out what makes them tick. Nobody knows where they come from. And, obviously, the United States wants control of them. I couldn't tell you any of this. I'm sorry I had to keep secrets, but I explained all of this US Espionage Act stuff. I had to keep quiet by law. And-- you said it was okay."

"It's magic!" cries Susie Kuang.

"It's not magic. It's-- it's just as if all the rules of the world just changed. Like someone added an extra rule book," says Ching. "It doesn't work like your astrology or your Tarot or your water-into-wine. It's not miraculous. It has rules like everything else and it can be studied but it's as if a thousand years of scientific history were just cut out and now we're looking at the end results. Of course it all looks impossible. Nobody can fly. But a picture can't talk. And-- and-- lumps of metal with wheels can't push themselves uphill. And a building can't be half a kilometre high. This is my *job*."

"But she's flying," says Susie. "How is she flying?"

"I don't know," says Ching. "I don't know anything, yet. But I met a man today who might be connected in with all of this. So we're learning. That's what's important. Now you have to listen. They killed one today, on the air base, while I was watching. A superhuman. It was a guy from Malaysia. They drugged him and then they killed him."

"What?"

"They killed him because they were scared of what he could do. And they didn't listen to me."

"*I'm* scared."

"I know. So I had Jason and Arika help me escape. You know Jason Chilton who I keep mentioning? He's a superhuman too. He's brought me to England. Where I'll be safe."

"Are they trying to kill you too?"

Ching switches ears on the satellite radio. "I don't know. I don't know what they might try to do to me. And I don't know what they think I might try to do to them. But you don't get to be the world's most

powerful country by letting people walk away with military secrets. So I've come home. And-- This is the hard part. You're Involved now. With a capital I. I was worried they might try to use you to get to me, and Moxon came to your door, and that's what he was going to try to do. So you need to come back to England too. You need to grab as much as you can and move back home. Today."

"What? No. No, it's my house. It's our house. I can't just move out at five seconds' notice. Are you mad?"

"It feels like a dream to me, if that's what you mean," says Ching. "But I just keep taking it five minutes at a time and somehow I'm managing. I can't say the same for tomorrow. All I know is it's not safe for you where you are now. Even with Arika protecting you."

"And another thing! She's--" Susie stops and looks around. Arika's looking off towards the road, but she's not out of earshot and she is almost certainly listening in. "She hasn't said more than ten words in the last few hours. I feel like I don't know her. I never really did know her."

"She's had some tragedy in her life," explains Ching. "It wasn't her fault, but she blames herself, she's messed up and needs help, and nobody can make her accept any. So basically, just treat her like a normal teenager. A friend-slash-bodyguard." Ching doesn't add: and maybe she won't start thinking like a god.

"Ching, I'm not leaving our home! It's our home! We just decorated!"

"I know," says Ching. "I'm sorry. I'm sorry I got involved with all this mega-science, and at the same time I got all involved with you, and I never saw a conflict coming up. But I just don't think it's safe for you to stay in that country."

"And what if they come after us in England?"

"England is not America. The United States government is not omnipotent over here. And if bad stuff does come up..." Ching breathes in, breathes out... "We can always go back to China."

China. "This is ridiculous."

"This is a humanity test. An adaptability test. Get a few bags of stuff, get to an airport, and get out of there. Please. And be safe."

"Okay. Okay."

"Be safe. Put Arika on, will you? I love you."

"I love you too."

A moment passes while Susie hands Arika's satellite radio back to her.

"Yup," says Arika.

"Arika, I need you to take care of my wife," says Ching. "Just take care of her, okay? You're her guardian angel. You're basically indestructible and can fly. There are no anti-Power weapons. But Susie's not properly part of our universe yet. She's delicate."

Arika glances over at Susie, who is shuffling about distractedly, occasionally shooing insects. "I'll keep an eye on her," says Arika.

"Thanks. Sorry to put all this on you at once. Are you okay?"

"...Pretty much."

"Arika, you're eighteen, right?"

"Nearly. Yeah?"

"Okay. Just asking. Call me when Susie's made her decision."

"...Sure."

"Good luck."

*

Mitch has come out of the pub and is waiting behind Ching when he turns off the satellite radio.

Ching looks up. "I suppose you heard most of that."

"I don't even know what I heard. What are you, a government agent? You can tell me. I would believe anything at this point."

"I don't want to tell you," says Ching. "And you really wouldn't believe me. Just leave it at 'I have confidential information in my head'. And a smart government treats confidential information like a virus."

"You said 'flying people', inside."

Ching looks off into space for a little while. The stars are coming out. "The information was waiting up there for us to find it. Like an electrical charge in a thundercloud. You raised a conductor up into hyperspace, and the information earthed itself in us. That makes sense. I think I believe your story. And I think we can help each other."

"You can help me get home?"

"I have a complete listing of this universe's source code," says Ching. "I'm theoretically omnipotent. It's just a matter of time. How much time do you have?"

"I don't know," says Mitchell Calrus. "The rest of my life, in theory."

[Oul's Egg] The artifact was completely impenetrable to all forms of matter except living human flesh

"It was designated 88-0009-ATY, but in the files it's also referred to as Oul's Egg, or simply 'the Egg'. Technically it wasn't egg-shaped, but an ellipsoid, a three-dimensional oval. One point eight nine eight eight metres along the long axis, circular cross-section expanding to zero point seven three four zero metres at its widest point. About the size of a man. Mirror finish. Completely silent, completely inert. No measurable temperature, no noise or vibration from within, no electromagnetic emissions, no movement.

"You could reach your hand into it. If you were wearing a ring or a watch they'd get stopped. A subcutaneous implant, also stopped. But your hand would pass through fine. Your shirt sleeve would be bunched up against the exterior shell while your arm went all the way in. But nothing else. Knives couldn't damage the shell. Scalpels, no. Drills, no. Bullets, no. Cutting lasers, no. An extremely expensive industrial hydraulic press was destroyed trying to make it crack under force.

"The lasers were an interesting test. The laser light was all reflected. And I mean all of it. All light falling on the shell was reflected. That's thermodynamically impossible for a mirrored surface. All mirrors are imperfect. This one wasn't. The same happened when the Egg was tested with thermal radiation, microwaves, ultraviolet, gamma rays, X-rays, radio waves... which meant that there was no way to scan the Egg's interior. Except by reaching inside it and feeling around.

"This was done.

"Volunteers had to be brave. There could have been machinery, chemical reactants, sharp edged blades moving at high speed, anything. Obviously the volunteers couldn't wear protective clothing; the gloves couldn't go through, only their bare hands. But a systematic search of the Egg's whole interior found nothing. It was reported that the Egg felt warm inside; in fact, a hand put into it rapidly began to overheat. It turned out this was the volunteers' own body heat, unable to escape, because it was being reflected back on their hands by the shell. The Egg itself had no measurable temperature.

"Living human flesh could penetrate the Egg. Portions of your body which would be considered "dead" could too: toenails, the top layer of skin, body hair, tooth enamel. Blood could. Blood dripped out of an open wound on somebody's arm could. Fingernail clippings, fine.

"Air couldn't pass through the Egg. Including air held in a volunteer's mouth, nose or lungs. As a result, a volunteer couldn't climb into the Egg without rupturing their lungs, and this was not attempted. Fillings in teeth couldn't pass through. Contact lenses couldn't pass through. The rest of a human head could, with no problems, although the experience was profoundly unpleasant, something akin to live burial.

"Now the obvious question at this point in the briefing is why all these tests were performed on live humans, instead of animals, namely lab rats.

"Lab rats couldn't penetrate the Egg.

"Wood couldn't penetrate the Egg. Inorganic matter, no. Metal, no. Dead vegetable matter, no. Live

Fine Structure [Oul's Egg] The artifact was completely impenetrable to all forms of matter except living human flesh

plants, no. Live rats, no. Live mice, no. Dead animal flesh - meat - no. Living higher animals, no. Dogs, no. Apes - a female ape was obtained to experiment on, she was returned unharmed - no. But humans, yes.

"Living humans, yes. Living human flesh, yes. Dead human flesh, no. Or so it seemed at first. A severed human hand, no. A skull, no. Preserved organs, no. But then it was found that surgically removed human organs would pass through with no problem. Which was initially confusing. But then a pattern was discovered: permeability depended on the alive-or-dead state of the originating human of the body part in question. A body part of a *living* human? Yes. A body part from a dead human? No.

"Some ethical debate followed.

"Several convicted prisoners who had been given the death penalty were approached. Several of those approached expressed an interest in furthering the cause of science, in exchange for a relatively swift timetable and a relatively peaceful execution. One man was selected. A great deal of bureaucractic and legal documentation was processed. The man was transported to the experiment laboratory at Tarczal Mountain. The first forty centimetres of his arm were inserted into the centre of the ellipsoid, and he was made to breathe air mixed with increasing amounts of carbon monoxide, inducing sleep, suffocation and finally death. This experiment was scheduled to begin at 14:00 hours, local time, 1st July 1988.

"From this point onwards there is a four-day gap in the official record."

*

"At around midday on 5th July, following two consecutive missed scheduled communiques by the Tarczal lab's Operations Commander, a party of armed investigators arrived by truck at Tarczal's ground level entrance. Here, it was discovered that the facility's Emergency Black Site Containment system had been manually triggered, flooding the personnel elevator shaft, freight elevator shaft, emergency stairwells and camouflaged vent shafts with a layer of cement eight feet thick.

"The idea behind the EBSC - versions of which are still in use to this day though none have ever been activated - is to protect the outside world when something goes catastrophically wrong at a black laboratory site. The canonical example is a contagious biological hazard or a radioactive hazard. It protects the world from whatever may have been spilled, and it protects the world from knowing that the black laboratory existed in the first place.

"Given that there were never any dangerous biological or viral substances present on the site, the investigators surmised that there had been a leak in the Tarczal laboratory's nuclear generator, and the Operations Commander had bravely sacrificed himself and his subordinates to contain that leak, rather than risk another disaster on the scale of Chernobyl.

"Thirty-eight people were killed.

"The incident was covered up. This was not difficult; all of the thirty-eight on the black site had airtight cover stories already in place. The project was abandoned and the site sealed off. The matter was forgotten until forty-eight hours ago."

*

Fine Structure [Oul's Egg] The artifact was completely impenetrable to all forms of matter except living human flesh

"There was no leak."

[Oul's Egg] halfway homes, catacombs, twilight zones

Two figures trudge through a mountain valley in a foggy part of Ukraine at dusk, one complaining to the other.

"...I mean, abstractly, I knew temperatures this low existed, in laboratories, but I didn't know it was possible to *be* this cold. How much further? Can we stop? I think I'm dying." This is Rula. She isn't actually dying. She just hates weather. Of almost every variety.

Alexander thinks it isn't *that* cold, but doesn't say so. "If we stop now you'll just get colder. There's a cave coming up. It can't be more than a kilometre."

"Yes! Alex! And this mysterious cave! It was summer the last time you made this hike. There was sun! And, you know, visibility! I have never been this cold in my whole life. If we die of exposure I'm going to kill you."

"Look, it's not going to get too much worse today and it'll be better tomorrow. We find the cave, set up the stove, get warm, we'll be fine. We'll be fine! It's around behind these trees. We'll watch the stars. Tomorrow's going to be beautiful and sunny and we'll reach Skoliava by midday. It'll be all downhill."

"You said it'd be picturesque. I hate this. All I see is fog. And scrawny pine trees. We'll never find it."

Twenty minutes of relatively silent trudging elapse. Then, Alexander announces, "This is it." He points at an long, smoothed rut of cold dry mud just coming up ahead. "This is where I slipped over on the way down the hill last time around. We turn left here, and the cave's about two hundred metres up this track. We'd have been able to see it on the way down into the valley, if there wasn't any fog."

"I see a chocolate wrapper," says Rula, accusingly.

"Where?"

"There."

"Well, then," says Alexander, guiltily, picking it up and stuffing it in his pocket. "We know we're in the right place."

Another ten minutes later they have made it. Rula grudgingly admits that the cave, while dark, miserable and scary, at least offers protection from the elements. She climbs into her sleeping bag for warmth while Alexander gets the stove out and starts heating beans up. She is asleep by the time he's done, so he eats them all himself. Then he cuddles up to her and tries to get comfortable.

*

"Wake up."

Alexander flails around, unable to escape his sleeping bag. He makes primitive proto-human noises and screws up his eyes. It's still dark. Very dark, actually. He checks his watch and it is not yet seven in the morning.

"There's a tunnel," says Rula. "Do you see it? Inside the cave."

Alexander squints in the direction he knows Rula must be pointing. Some distance away in the depths of the cave is a very faint yellowish circle, the mouth of a man-sized tunnel illuminated from within by what must be a tiny incandescent bulb. The light is barely visible; in daylight it would have gone

completely unnoticed.

"It's nothing," he lies. He actually has no idea what the tunnel is. All he knows is that he is still technically asleep, and wants to stay that way.

"It was there before," says Rula. She is holding his digital camera and apparently has flipped backwards through the photographs until she found the ones Alexander took when he was on the previous hike. "Here." She hands the camera over with the screen showing a photograph taken inside the cave. Two men in their fifties - Alexander's father and his uncle - are standing side by side smiling, in walking gear. There is camping equipment scattered around the place. The flash has lit up the interior of the cave behind them. The rim of the tunnel mouth is just about visible, if you know what you're looking for.

Alex compares the photograph with what he can see in front of him in reality. Same scenery. Same tunnel mouth. He and his father and uncle must have completely missed it last time through.

"So who built that?" asks Rula.

"It's six-forty in the morning," complains Alex, handing back the camera. "Go back to sleep."

"I can't sleep," says Rula. "It's too cold and there's humming."

"Humming." Alexander listens briefly. She's right. It's coming from the tunnel.

*

It's narrow, barely wide enough for a man to slide through sideways. There's a lot of dust and rubble on the floor around the mouth and going down into the interior-- whoever built it didn't clean up after themselves very carefully. A series of tiny light bulbs on twisted black wires is screwed into the ceiling at intervals of a few metres. There's enough light to see that the tunnel goes down for ten metres or more before curving out of sight.

"What do you think is down there?" asks Rula.

"It must be a mine. Or an archaeological dig. Rula--"

Rula flicks on a torch and begins to descend, brushing crumbs of stone from both walls as she steadies herself.

"I'll be back up in a few minutes," she says.

Alexander has the distinctly unnerving feeling that he's seen this movie. "It could be dangerous," he replies. "There could be a cave-in."

Rula keeps going and soon she is out of sight. The words "I'll be back soon" echo up from the tunnel.

Alexander squints into the depths. He shuffles around the cave, with his hands in his pockets, for half a minute. Then he curses, grabs a torch of his own from his kit bag, and descends after her.

*

After thirty metres of scraping Alexander emerges, blinking, into a fluorescent-lit subterranean corridor. The walls are painted a greenish grey and the ceiling is low. To his right the corridor ends in a heavy wooden door with a small window of wired glass revealing only darkness beyond. To his left it extends a little way before turning right and continuing into the mountain. There are similar doors

opposite the tunnel mouth and just around the corner. On the floor is a very large mechanical drill and a pile of rubble large enough that Alexander is forced to clamber over it to get past. "Rula?"

Rula shouts. "Oh, you came. I think it's an old Soviet lab!"

"We *really* shouldn't be here. What if someone's here?"

"Nobody's here. Listen. It's just a hum. It must be an old generator." Rula tugs Alexander and he reluctantly follows her as she leads him off down the corridor.

Seemingly every other fluorescent light tube is dark or flickering.

"So somebody built this, just in the last year?"

"No, it must have been here for decades. And then somebody dug their way in recently."

"So how come the generator still works after so long?" asks Alexander.

"Because whoever dug the tunnel reactivated it, dummy."

Alexander stops momentarily at a fat line of yellow and black striped warning tape in the floor. The tape runs all the way across the floor and up the walls and across the ceiling above, forming a complete ring around the corridor. There's a second ring of tape about ten centimetres further along. On the floor and ceiling between the two rings are narrow metal rails; inside each wall a thick slab of metal is visible. Alexander notes a pair of small keypads on the wall flanking the tape, each with a big red button with a warning stencilled below. It is a containment door, retracted.

Rula doesn't notice that he has hesitated and continues past more dark doors and around the next corner. Then she screams. Alexander rushes over, sees the skeleton slumped against the wall and screams also.

It's grey, and very decomposed. Its sex would be difficult to guess at if not for the man-sized heavy sweater the corpse is wearing, knitted in several horrifically clashing colours. Dark trousers, thick glasses, cheap watch. "He's got a gun in his hand," says Rula, recovering. "He was trying to defend himself. Look. Big hole in the sweater. And the stain on the wall. Somebody shot him. Big damn bullet."

"Here?" Alexander stares at the situation for a long time. The wall behind the corpse is grey, not the loathsome pale green of the rest of the facility. In fact, it looks like there was more corridor there at one time, before it was sealed off. There is just a single strip of yellow/black tape, then another indentation in the walls, floor and ceiling, and then just blank concrete.

Rula takes a photograph using Alexander's camera. "At least a decade old," she says. "This way."

*

Alexander realises that Rula is following a fat blue industrial power cable on the floor. "I want to see where it goes," she says.

They pass two more bodies, these ones clothed in Soviet military gear, sprawled on the floor with machine guns nearby. Rula nearly slips on a spent ammunition casing. She takes more photographs of the bleak, labyrinthine facility. As they proceed further, here and there are more guns on the floor, and scattered paperwork. Dropped styrofoam coffee cups. And a great deal of dust and a smell of stale air. Alexander stoops to pick up a photocopied piece of paper. He can read the text, but it's still impossible

to understand. Too much scientific and military terminology. "There's a picture on this file. It looks like a big egg."

"Alex, does it look like this?" Rula is up ahead at the next T-junction.

He hurries to catch up with Rula, looks in the direction she is staring, and stops in his tracks. There are two severely bent and broken blast doors lying convex on the floor, with signs of many different colours plastered across them, red and white, blue and white, yellow and black. Warning. Unidentified object. Warning. Unknown hazard. Possible radiation hazard. Possible biohazard. Possible memetic hazard. Behind them is a warning-striped archway like elsewhere in the facility, and behind them all is a gigantic cubic vault, perhaps twenty-five metres on a side.

At the centre of the vault, suspended in a complex gantry composed partially of conventional scaffolding and partially of padded hydraulic shock absorbers, is a mirrored egg. It is colourless (the only colours are reflected from elsewhere in the room) and held upright, and it is about the right size to hold a coccooned, adult male. There are two bright spotlights focused on it from above, which reflect directly into Alexander and Rula's eyes, making it look as if the egg has two blazing white unblinking eyes.

In The Event Of An Emergency This Door Will Close And Lock Automatically

All Personnel Requiring Access To Vault A/T/Y Must Receive Authorisation From The Operations Commander, INCLUDING EMERGENCY PERSONNEL

*** CAUTION: E.B.S. Containment Procedures Are In Effect Beyond This Point ***

There are eight dead people on the floor around the room. There is dropped scientific equipment all over the room. There is an antique 1980s computer terminal to the immediate left of the door with a skeleton in a white coat slumped over it. As Alexander advances gingerly behind Rula he realises there is a balcony running around the upper half of the room, accessible by ladder, with several more dead people observing from above. The blue cable Rula was following is plugged into an industrial electricity outlet embedded in the floor in this room.

"What do you think that thing is?" Rula asks, transfixed by her own reflection. "American satellite technology? It looks like it could be an advanced model Sputnik. Or just a big blob of mercury."

"I don't like being in here," says Alexander. His skin is crawling. He feels like he is being watched, like the bodies are shifting when he isn't looking. "We need to get out."

Rula photographs everything. She photographs the egg twice, because the first picture has a bright white spot in the middle, the reflected flash.

There's a wheeled medical stretcher halfway up the egg's supporting scaffold. Rula climbs up a ladder to get there, though there is a small elevator platform. The stretcher has leather-and-sheepskin ankle

and wrist restraints. The restraints are torn. To the side of the stretcher is a platform where a doctor could stand to treat a patient who was lying on the stretcher. There are two tanks, presumably oxygen or nitrous oxide, with a plastic face mask on the end of a long hose. To the other side of the stretcher is the egg, precisely where the patient can easily insert his or her arm into it. If such a thing were possible. On closer inspection it looks like the wrist restraint on that side isn't torn.

Rula leans forward and gently flicks the egg with her finger and it just goes *tap*, softly, absorbing most of the sound, like a solid stone.

"Rula, there's blood on that thing," says Alexander suddenly. Rula stands back. Alexander is right. There is a bone sticking out of the egg right where the gurney is, and there is a trail of blood which dribbled all the way down the shell to the bottom tip, and underneath it, obscured by shadow, there is a wide dark puddle.

Rula begins to say, "So, someone stuck their hand in there and-- and they had to saw--"

"--*there is blood all over this room.*" Alexander is turning around, suddenly looking more carefully at the walls. He was paying too much attention to the egg. Maybe his visual cortex just wrote it all off as water damage, peeling wallpaper, whatever. But the pillow on the gurney isn't dyed red, it's stained, and several of the big wall panels have explosions over them, like splattered paint, and there are wide dried dark red shadows below many of the corpses. (Looking closer, Alex sees at least two femurs shattered, and arms broken at angles which hurt just to think about. In fact, even the bone in the side of the egg looks like it was broken off, not neatly sawn...) There's blood dripping down from the balcony, below some of the corpses up there, where it must have pooled and then overflowed, and there are even a few patches spattered on the floodlights, suspended from chains twenty metres up in the air. There are bloody footprints.

A human body contains a great deal of blood, but it is not stored under *high pressure*.

When Alexander's eyes meet Rula's it is clear that she is finally getting it. She reaches the exit before he does and sprints away along the corridor, again following the blue cable along the floor. As they run, Alexander spots green emergency exit signs here and there on the walls. When they return to the T-junction where they found the first skeleton, the blue cable goes right, back the way they came, but the green luminous running man points left, towards the dead scientist and corridor which is filled with cement.

"I think that's the exit," says Rula, pointing.

"I know," says Alexander. "He was trying to escape, opened the blast door and found solid concrete behind it. When they found out what was happening everybody was sealed in. To stop whatever-it-is from getting out."

"Whatever *what* was?"

"Just run," says Alexander, "just run. I don't want to know."

They hurry along the final few dim and dirty corridors. They pick their way past piles of black dusty rock hewn out of the mountain and reach the tunnel mouth, its tiny yellow bulbs still illuminating the way to the surface.

Alexander bends down and scoops up the electric drill from the rockpile. "Rula," he says, holding it up,

just as she is about to duck into the tunnel and start climbing. He raises the drill and revs the trigger, once. *Pyeeeeooooooooow.* "This is the cable we've been following."

*

By the time they get to the top of the tunnel day has broken. The sun is in exactly the right spot to shine its orange rays directly into the cave, dazzling them and casting sharp shadows on the interior wall. The morning air is fresh, even warm, and from their vantage point Alexander and Rula can see all of the rest of the mountain valley and the plains beyond and even the town of Skoliava, half a day's walk away.

From here it's all downhill.

Die

"Hello?"

"Paul, the first thing you need to do is to stop walking."

Paul Klick looks around himself, taking in the greenery of the park to his left and the architecture to his right, but continues to pace steadily down the middle of the street. Considering how close to the centre of Berlin he is standing, and the time of day, it is wonderfully quiet and still. "Make me."

"I can't make you. I'm just asking you. Please just stop and stand still and let's talk about this. What have you built, exactly?"

Paul stops walking in the middle of the street takes the machine out of his pocket. "It is a very small copper box," he says. He holds it up where the sunlight can catch it. It was a fairly miserable morning, wet and muggy, but now it's the afternoon, and the Sun is gradually coming out as the rain clouds boil away to the north. "Maybe the size of a die? A big die. Two centimetres."

"And what does it do?"

"Who is this?"

"Mike Murphy. I'm a physicist. I'm, ah, at the airport. I was supposed to be here for a business trip which looks like it isn't going to happen. I do consulting work. I've been trying to keep up with your blog. Maybe you don't remember me, I commented a few times. I'm sorry, by the way. About everything. You have my sincerest condolences. I know how you must be feeling now."

Paul very much doubts that.

"Where are you?" asks Murphy.

"Tiergartenstraße," says Paul.

"And which way are you headed?"

"Right now I am headed nowhere. I've stopped. I was thinking I might go into the park."

"No. No, don't do that. Just stay where you are. You know why I'm calling you."

"...Yes..." answers Paul, sounding distracted.

Murphy waits politely. "So. Tell me in your own words. What is it, exactly, that you've done? Tell me about this dice. Die, I mean. What does it do?"

"Do you know Eka?"

"Yes," answers Mike Murphy, with confidence.

Paul sits down on the park wall and relaxes a bit before beginning his story. "I decided to jump forward through the text a little way. I jumped to the hundred megabyte mark because that seemed like a nice round number. A lot further than anybody else had looked ahead before me. I guess I colonised that area of the Script and started exploring. I started to build. Do you know that information can be moulded? We have ways of pushing information around, modifying it, turning it into things. Somebody put out a paper a little while ago explaining how, if you had a few extra spacial dimensions, you would reach a point where thought became a fundamental force. It just doesn't work in 3D because we need

five or six for it to work properly. Right?"

"I worked on that paper," says Murphy. "Partially. I had some input. I don't remember if I'm credited. But yes. Go on."

"The part of the Script I was looking at seemed to be some kind of thesis on this subject. Lots of people see the Script as a textbook. I suppose this was the chapter of the Script which dealt with thought and minds. You see, an intelligent mind is more than just a lump of grey matter. This thought process that we have, the ability to think things through. It's a constant. An important shape. I guess I am not making much sense."

"You're saying there's a common element?"

"Not so much. Not an element. But there is an operation which intelligence defines. Intelligence watches itself. It loops back around on itself and watches its own actions. And there is a consciousness there. It can be weaker or stronger. Ants have no capacity to learn from what they do. But rats can see what is bad for them when they get an electric shock or something, and they know not to do it in the future. And humans and apes and dolphins can think very creatively about things like this. I have working. You probably saw the blog entries."

"Yes. Did you work this out for yourself?"

"No, I deduced it. From the Script. This is what it says in the Script. It was difficult to translate but it was clear enough once I succeeded in the translation. There are some equations which the Script seems to think are very important. It isn't a pattern. It's almost the opposite. I had to think up a word of my own to describe it so I called it a hypersystem. In three dimensions it is a very special case and not a great deal can happen. There is a limit to how intelligent something can become in three dimensions. Not very interesting. But that also means that the mathematics is easier. It was interesting to me. It works. I took the figures and the formulae and the operators and, well, made something more of them."

There's a long pause. Paul listens to the chirruping birds through one ear, and the increasingly noisy chaos of Tempelhof Airport through the other. "I guess it's pretty bad there."

Murphy has decided the noise is too much and has started making for the exit, lugging his holdall with him. "The popular opinion seems to be that this is a terrorist attack. All the planes are grounded. Everybody's panicking. Nobody has a clue what's happening. I guess nobody in central Berlin is answering their phones, but even so, no phone network is built to handle a situation like this. We may get cut off any minute. Paul. You discovered a way to push minds around, didn't you?"

"..." Paul sighs. By now he has wandered into the park and found a bench to sit on while he watches some fish in the pond. "Not yet. That was later."

"Where did you send them?" asks Murphy, leaving the airport terminal and setting off along a likely-looking road on foot.

"The box works like the conductor on a dodgem car. It connects this world with somewhere else. But that was later."

"Where did you send their souls, Paul?"

"NO!" shouts Paul. "NO! That is NOT the right word! I never used that word! People put that word in my mouth! They leapt on me and tried to turn very complex mathematics which they could not

comprehend into something that they thought they did understand! And they got upset and angry and then I started getting death threats in the mail just because of some stupid newspaper who didn't want to understand anything, they just wanted to sell copies. There is no such thing as a soul.

"Claudia always said there was a soul. And when I pointed the thing at my head and it lit up, and then I pointed it at her head and it lit up, and then I pointed it at her belly and it lit up just a small bit, she said that that was proof. But all along I said to her it was just a special structure. Whenever we talked about... 'what happens next'... she was always sure about what would happen next, and she always said that we'd be able meet up again afterwards. And I always said that I just didn't know. I couldn't be sure one way or the other. But at the time it wasn't so much of a bother because it was a long way off... And then it was suddenly right in front of me..."

Murphy knows this part of the story. This is the part where Paul spends six months sitting in Claudia's room at the hospital, pouring his emotions out on his laptop computer's keyboard, his entries becoming increasingly painful to read as Claudia's condition becomes increasingly untreatable. Eventually they became incoherent and Murphy regretfully stopped reading entirely. That was in July. It's now August.

"Why would you not call it a soul?" Murphy tries to keep Paul focused. He is following a queue of stationary traffic now, making his way towards the exit from the airport. "I read your entry. You tried it on all kinds of things. Lots of different animals turned out to be too stupid. Or too simple. Or they had a 'hypersystem', but it was a simple one. That fits, doesn't it? Something humans have, and everything else doesn't?"

"A soul is not covered by science. It is faith. It is something you choose whether or not to believe in. I did not know whether or not I believed in God and now I know there isn't one.

"And souls are immortal. But an infolectrical hypersystem is just a thing. It knits itself together with the rest of your body in the womb. And it grows when you grow. And it dies when your shell can no longer support it. Because we live in 3D. Where minds still need shells."

Paul has now wandered into the park, which, like the street, is littered with empty shells.

Mike Murphy looks up behind him to see a military jet arrowing towards the city centre from the southwest. It's the only thing moving in the whole sky. "Paul?"

"And then I realised what I needed to do..."

"Paul, you need to switch the box off," says Murphy.

"There's nothing to switch off," says Paul Klick.

Mike Murphy just watches. Many other travellers have started filing towards the road exit with him, having had the same idea, and a dozen or so of them have noticed what he was looking at and started watching with him. "Paul. They're sending somebody in." Murphy then realises that he may be the only person in the entire city who knows that the field is spherical, not circular. And then several people scream, and someone beside Murphy shouts something in a language he doesn't understand, and the jet, now a dark speck against a backdrop of shafts of yellow light beaming through gradually clearing rain cloud, calmly rolls over and drops out of the air. It just falls out of sight and is gone. *Koom* emanates from Murphy's phone's tiny low-fidelity speaker. *KOOOOOM* echoes over the airport, several seconds later, after the real sound from the impact has had time to reach it. A column of smoke begins to rise.

"Did you see that?" begs Murphy, still half-convinced he can end this, and trying to keep himself mentally isolated from the scenes of terror and shock playing out around him. Several people have started crying.

"I heard it," says Paul.

"Paul, you have no idea what you've caused. This is utter chaos. You're a mile and a half from any kind of human reaction to what you've done. You're insulated from the real world. You need to see what's happening here... You've killed a city."

"I-- what is your name again?"

"Michael Murphy. Doctor. The wrong kind of doctor."

"Michael. You don't understand, because you didn't let me finish my story. I have killed nobody. Your reaction, everybody's reaction, is a fearful reaction. I had this too, when I saw what was happening to my wife. I studied her condition. I am not a doctor of any kind, but I tried my best. But the human body isn't designed to be maintainable. It's just supposed to work! It has all these crazy dependencies, so efficient and compressed, so difficult to unravel that it makes me crazy just to think about. Nobody could fix Claudia, because the human body makes no sense. But minds are not as complicated.

"I looked at her. And I didn't know what was going to happen. And that uncertainty scared me. I hated not knowing whether I had already had my last conversation with her. So I went back to my research and I found a way to be certain.

"The way things are supposed to work in the Structure is that you die where you're born. No going up, no going down. There is no soul. There's just mathematics. There is no God. But there *is* a Structure. There *is* more than just 3D. And I found a hook. A bright white route upwards to a place that's bigger than this. And don't say what you're thinking. I know what you're thinking. It's just an exit, another place to go."

"Paul, you're going to die," says Mike Murphy. "They're going to find out what's happening and find out where you are and they'll fire a cruise missile at you and you'll die. Turn the box off."

"But I won't, don't you see? Nobody has to die anymore. It's a whole other world! We can just *leave!* Like avoiding the oncoming brick wall by unfolding wings!"

"That's not your decision to make! You sound like a cultist! Listen to yourself!"

"You could get hit by a truck tomorrow, Michael," says Paul Klick, "and if your brain dies then it is all over. My wife had half her life taken away from her. And my son died before he was even supposed to have been born. I couldn't save them. I was too slow. But that never has to happen again. This way we can be certain. They're all alive, I promise you. Come to me. I'll show you."

Mike Murphy is out of the airport now. He picks a direction which takes him towards the city centre, and the place on the map where he knows Paul Klick is, and starts walking. He has no idea why he is heading in this direction, but at least he now has room to think as he puts distance between himself and the hysteria of the airport. "It's not your choice. You had no right. And you don't even know that it worked."

"I do," says Paul.

It is at this moment that Murphy's phone finally cuts off.

*

Murphy tries to call Paul again, every five minutes for the next hour, and less frequently from then onwards, but each attempt fails. Eventually he winds up inside a crowded pub watching the live news channels on a huge projector screen, trying with limited success to translate the news tickers into English. There is footage of streets full of corpses and crashed motor vehicles, the dead zone hastily and ineffectually cordoned off by the remaining police forces. A hysterical woman breaks the cordon and rushes over to be with her son-- she falls before she makes it ten paces.

Later that afternoon, an Unmanned Aerial Vehicle, a drone, is launched into the city, and navigates to the centre of the dead zone, tracked by television cameras until it is out of sight. What it finds there goes unreported for several days.

With night drawing in and nowhere else to go, Murphy spends a largely sleepless night at the airport along with thousands of other stranded travellers, many of them Germans now homeless and mourning family living in the dead zone. Eventually, unable to sleep, he pulls out his laptop and, in the absence of working wi-fi, pulls up copies of Paul Klick's blog from his web cache. Lit by candles from the vigil at the other end of the terminal, Murphy scribbles his own equations and working on the back of a notepad. He naps for a few hours around sunrise and wakes up not just refreshed but enlightened. His dreaming brain has put together some equations which his half-conscious, half-asleep mind wasn't able to process. He writes 'IT WORKS' on his pad under the last line of working. And then he stares at it for a while, wondering what to do next.

Early that morning, several lunatic opportunists, either unaware of the risk or choosing to disregard it, break into the dead zone, hoping to steal cars and valuables. They survive (though they are arrested when they come back out). That means that the dead zone has collapsed. Central Berlin is hesitantly reoccupied over the course of the next month. The death toll, initially wildly overestimated, eventually drops to a little less than nine hundred thousand.

Come midday, Murphy has managed to get far enough out of Berlin to catch a train the rest of the way home. By this time it has been revealed that the UAV did indeed locate Paul Klick at the epicentre of the phenomenon and identified him as its source. He was found dead, supposedly having taken his own life, though many speculate that the drone could have been used to kill him. A small sealed copper box was found on his person; it was opened, and found to be entirely empty.

As soon as he regains phone signal, Murphy starts checking in with his friends and loved ones, most of whom fear him dead in what is being described in some parts as an attack and in others as a disaster. Ching-Yu Kuang is just over halfway down his list.

"The Script has changed again," Ching tells him. "I don't know exactly what it means, but I can see that they're Klick's equations. This is Klick's work which we're looking at here. It's all been nixed."

Murphy explains what he learned from Klick. "The box cast a strange field around it. Not strange as in 'quarks', strange as in 'weird'. It was a region in which minds came untethered. Floated free, I guess. I don't know how the box worked. I don't know how it didn't affect him. There's no mechanism for how the thing could possibly have been built. All I recognise is the effects. Anybody who walked into range just... departed. Conceivably, the field could have stayed in place forever. And just think how much could have changed. In religion, in medicine, in warfare..."

"But the universe reacted to being misused," says Ching. "Klick opened a door, and less than twenty-

four hours later it was closed off again, permanently. I wonder."

"So do I," says Mike Murphy. "Look, I need to think about this and we're about to reach the Channel Tunnel. We'll talk soon."

[Fight Scene] Freak Tornado

Susie and Ching Kuang live in a second-floor apartment in Brooksburg, thirty minutes' commute south of the air base where Ching works. The apartment is nice, but it is precisely big enough for one couple and nothing else. One couple plus a baby, for example, would be too much. Even one couple plus an argument, they've found of late, is too much.

Arika McClure, carrying Susie in her arms, lands unobtrusively near a nest of recycling bins two blocks away. It's the middle of the day and this part of the suburb seems to be pretty much deserted, which works in their favour, because Arika is still wearing her flight suit, a tightly buckled dark blue creation which would turn heads if there were any around to turn. It has stiff fins on the arms, legs, neck and head, making her look as if she is on her way to a fancy dress party dressed up as a stealth aircraft. The suit is admittedly of moderate use for high-speed flight but even with the hood and gloves pulled back to free Arika's hair and hands, it remains hopelessly impractical for simple tasks such as escorting somebody two blocks down the street.

When they get up the stairs to the apartment's front door Arika silently takes Susie's door key and enters first. There are only about four rooms in the whole place and two of them, the kitchen and bathroom, are small enough to qualify as broom cupboards. It was, indeed, decorated recently. There are some paint cans near the front door which Arika nearly trips over, and there's no way to escape the smell of fresh beige paint short of opening windows to the breeze, which is the first thing Susie does after walking in. In the main room there's a brand new sofa stacked with folded protective dust sheets, and behind it is a wide window with some forlorn scarlet curtains gathered on the floor nearby, waiting to be put up.

Susie disappears into her bedroom but leaves the door open. She drags a suitcase out from above a wardrobe and begins opening drawers, looking for things to put in it. Arika begins unbuckling parts of what the Air Force refers to as her suit but she, increasingly, thinks of as her costume. The goggles, gloves and hood are the most irritating pieces of the outfit and also the most fiddly to remove. After that she unzips the two long sleeve segments and finally begins work on the mini-wings, of which there are nearly two dozen.

Once she finishes removing armour panels, she sits on the half of the sofa which is still free to sit on, and stares at the blank television screen for a few minutes, doing nothing.

"How come you can fly?" asks Susie. Arika looks up and can see an inch-wide strip of Susie through the crack in the door. It seems to her like an odd place to conduct a conversation from.

"What?"

"How do you fly? What did they do to you on that base?"

"Nothing," says Arika. "Just experiments. Tests."

"So you could always fly?"

*

She had just got home from a party. She was late, and drunk, and underage. She was on the doorstep, opening the front door, bracing herself for the inevitable tirade from her waiting parents. Then it suddenly felt as if someone had shoved a needle through the base of her skull and filled her spinal cord

with hot acid.

She tripped over the step and fell forwards, screaming. For her parents, concern swiftly replaced anger. Her mother phoned for the ambulance while her father carried her to the living room and put her on the sofa, delirious with pain.

Six minutes passed, though to Arika it felt like days. After six minutes, she blacked out for a further sixteen seconds.

Emergency services vehicles began to arrive on the scene two minutes after that. What they found looked like the aftermath of an airstrike. More than a hundred houses, tracing a long, irregular path when viewed from the air, had been demolished by forces unknown. Over two hundred people had been killed, crushed by falling masonry or ripped limb from limb by the same mysterious force which had torn apart their houses. At one end of the trail was Arika McClure's former home, and at the other end of the trail, the best part of a mile away, was where Arika woke up, flat on her back, in the middle of the street, and amnesiac.

The ambulance collected her and treated her for shock. Seeming to be fit, she was taken to the police station for questioning to try to figure out what had actually happened. She was kept in a small interrogation room for several hours, during which time, for various reasons, nobody came and interrogated her. Eventually, she had had enough, and walked out.

She didn't realise the door to the interrogation room was locked. She just saw the lock break when she pulled it.

"And I just ran away. There was nothing left to find, of my mom, or my dad, or my older brothers. For them and about a hundred other people there weren't even body parts. They had to test DNA."

"And nobody said anything? Nobody thought it was suspicious that... you woke up a mile away, or that the ambulance was called minutes before anything even happened?"

"I moved in with a school friend," says Arika. "And, the morning after that, I realised that I didn't need to eat anymore. I didn't need to drink. I barely even needed to breathe. But I couldn't tell them anything. When the police came around I lied about where I'd woken up. I couldn't tell anybody about what had happened. Because I *knew* what had happened. What would you do? They called it a freak tornado."

"I thought you were anorexic," says Susie. "I never saw you eat more than a single biscuit at a time. I thought you were *purging*."

"I do. I have to. Nothing I eat ever gets digested so it just goes rotten in my stomach and starts smelling. Anyway. So I tried to stay in school. But I found myself needing less and less sleep and I found it harder to keep myself from just taking off whenever school got boring. And everything just moved slower for me. I hated it.

"I tried fighting crime.

"I spent weeks just wandering around all night, good parts of town, bad parts of town. Every now and then someone tried to mug me and I just pushed them hard enough to break a rib or two, and then ran. But crime doesn't happen in front of you, does it? It's not something you can just go out and find and fight, whenever you feel like it. Unless you feel like making yourself a target. Then, after about a year, I stopped a bank robbery."

"You *what*?"

"Yeah... I'd never seen anything like it. I was at the bank, opening a savings account, and then this gunshot goes off, the loudest thing I've ever heard in my life, and suddenly there are actual people with masks and guns running around shouting at people to lie down on the floor. I had no idea what to do. Nobody does in that situation. So I just lay down. And then I thought, hey, this is what I'm here for. So I went to top speed and took all their guns and threw them all on their backs over and over until they stayed down.

"And eventually the police turned up and arrested them. And I was about to take off when this guy in a suit comes up to me, American accent, says he's from the CIA. Classic CIA suit. He tells me about the 'little' project they have going here in Brooksburg and asks me if I'm interested in helping out. So what else could I do?"

"What did they offer you?"

"Secrecy. Cash. A purpose in life."

Susie doesn't say anything for a few minutes, but folds clothes carefully into a square, dense pile, before slotting the pile neatly into the bottom of the suitcase. *He was tracking you,* she thinks. *The whole thing might even have been staged.* "What did you want to do when you grew up?"

Arika looks at Susie blankly. Susie looks up from her packing and returns the stare.

"I don't know," says Arika. "History. I was good at History and Biology. But what's the point? School work is so boring now and I'm years behind."

"Plenty of people find school work boring and plenty of people leave school early and then go back later. But that's not what I meant. You want to help people, don't you?"

"Sure, that's why I joined the project. To help make more people like me. I guess I just want to be a hero. You know, saving lives and everything. But that's not what they're doing. And I can't join the police or the fire service or the coastguard without going public, and then everything that happened back home gets traced back to me, and..."

"You," says Susie, "obviously know nothing about superheroes." She emerges from the bedroom trailing a pair of gigantic wheeled suitcases.

"Weren't you going to stay here?" asks Arika, puzzled. "You don't have to go with Ching, you know."

"I know," says Susie.

"So, stay. He'll come back."

"Maybe," says Susie. "But you're the one at risk here. So you're the one who's leaving."

"At risk?" says Arika, turning to look out of the window. "I'm not--"

It's pure luck that Arika sees the flash at all. If not for Susie's offhand mention of 'risk' subconsciously prompting her to quickly check their surroundings for hostiles, there would have been no reason for her to turn around and look out of the window at that exact instant. She sees it on top of the apartment building over the road from the one the Kuangs live in. The sniper must have been waiting for Arika to move into the right position. The speed of light being what it is, it hits Arika's retina as the bullet itself has barely even left the barrel of the rifle, but by the time animal responses have kicked in and she has

begun instinctively accelerating up through the levels of perception, it's three-quarters of the way across the street towards the window. She reaches maximum perceptual acceleration just as the bullet is just outside the window and crawling forwards through the glass. From here on there are about fifteen centimetres separating it from her head.

As if half-asleep, Arika watches the the surface of the glass distort towards her, spidery cracks spreading out from the point of impact, like an infection. (Waiting for her to move into position? The slight angle of elevation means the sniper had a perfectly clear view of almost all the floor space in the apartment. Perhaps he was waiting for somebody else to move into the right position?) She is already bringing up a hand to block the shot but she knows she isn't moving fast enough to catch it in time. She also knows that dodging the bullet entirely - which may not even be an option, on current showing - could endanger Susie, who is standing behind her. So she has no real choice but to just absorb the hit.

At least, that is all the reasoning - and it's not reasoning, it's not even thought, it's just pure videogame Zone twitch judgment - that Arika manages to get done in the milliseconds she has at her disposal. There may have been a smarter plan but she doesn't have time to think of it. The round hits her in the left temple, distorts in shape slightly on impact, grazes along her skull for a few centimetres as she turns, ricochets off her skin on an upward trajectory and penetrates the apartment's newly-painted ceiling. Where it will stop is anybody's guess. Pain shoots through Arika's head, the first serious pain she has felt in years, but it quickly gives way to fuzzy numbness as the pressure wave travelling through her skull takes effect.

She loses consciousness and starts falling just as the sound from the supersonic gunshot arrives at the window, and the apartment door has been kicked down and the first trooper is inside the hall well before she hits the ground.

Susie Kuang hasn't even begun to react.

[Fight Scene] Capekiller

For a couple of hours, Arika McClure dreams about nothing in particular: elevators, motorcycles, a big empty green-carpeted building made of glass which she is trying to get out of but she keeps getting lost, rooms full of oddness (not specific odd things, just rooms filled with the mental label, "odd"), being back at school, *being late for school but her parents can't wake her up, flying across big blue oceans shaped like doughnuts, big eyeballs, Jason Chilton, hot acid, brick walls being pulled down, enormous towers of playing cards--*

In the background, a long deep slow-motion voice is shouting something. It takes a whole minute for one word to come out.

She senses movement. She's taken away from the apartment, down the stairs and out of the front door. She's stuffed in the back of a big heavy military truck which has pulled up, a black hood is pulled over her head, and for a long time there's nothing but grumbling of the engine and momentum shoving her from side to side as the truck drives. After half an hour they get to a big ramp leading down underground. She becomes tired and irritable and confused as they drive deeper into the Brooksburg Air Base's underground tunnels. The tunnels get darker and narrower, quieter and slimier. The truck seems to become smaller to navigate them. It closes in around her. They've been driving for miles, now. How long is this tunnel? Brooksburg doesn't have tunnels, even. Wait, yes it does. She heard about them. Never saw them. But this is exactly what she imagined they'd be like.

--pancakes and penny sweets and the smell of being at the beach--

They stop at a checkpoint and turn off the engine. Two big soldiers airmen or is it three? - pull her out of the back and drag her through utterly, oppressively black corridors, boots crunching on gravel while she just watches the ground roll past and drags her toes behind them.

"Aaaaaaaarrrrrrrrrrrrrrriiiiiikkkkkaaaaaaaaaah..."

Susie.

In the background.

Arika's so tired. She just wants to sleep. She knows the alarm went off. She's supposed to be getting ready for school. But she can't summon the willpower to get out of bed. She hits 'snooze' again.

Three (four?) men in dark blue flight suits drag her into a room with a chair in it. One of those comfortable dentist chairs with an array of dentist's tools on a tray nearby, which is fine, because dentists are highly trained people who know exactly how to use all of those tools properly without causing you pain--

But this is all a dream. I'm still asleep.

--but big restraints too. Restraints she can't get out of. She was driven underground. She was knocked out by the bullet and they grabbed her and Susie, who she's supposed to be--

"Susie?"

--protecting, and took them to Brooksburg air base--

I'm still asleep. How do I know this? My eyes are still closed.

In the scary dream there are people holding her down as the dentist comes in. She's two hundred and fifty-six times stronger than a regular human and she can't get free or do anything but stare straight forwards at the huge whining drill bit moving gradually towards her face and--

"Arika!"

Hello.

Arika opens her eyes.

The dream was a rough approximation to the reality. Four airmen in big blue flight suits just like hers are holding her. One for each limb. One of them has a diamond-needled syringe aimed at the back of her left hand. She knows it's a diamond-needled syringe because it's the only thing they've found that's sharp enough to puncture through her skin. On Jason, even they don't work.

But she's still in the street. Broad daylight. That's as far as they managed to bring her while she was unconscious. Susie's over there on the other side of the road being dragged away. Being taken away down the street by that Moxon bloke.

I just got a good night's sleep in about sixty seconds. I didn't know I could do that.

Arika focuses back on her own situation. She is being held down and a man is about to inject something into her. So she pulls her left arm free, grabs the slowly crawling syringe and smashes it.

Like all the men, he has a big dark blue helmet and goggles on, just like the one she discarded in the apartment. His face is completely covered. She can't see his expression change. She can't even see his eyes through the mirrored orange lenses. But he *looks wrong*. In her sixth sense, all four of the people holding her look broken. They look inside out. *Like optical illusions.*

Moxon has his arm around Susie and is holding her head down as if they're running from gunfire. In the distance there are a few jeeps approaching. They'll be here soon. They couldn't bring the vehicles in without making noise, without giving themselves away. So they sent a few people ahead on foot. Moxon and these four.

The man whose syringe she just crushed slaps Arika in the face. She flinches. But she's still accelerated. So how did he move so fast? *These men are drawing power.*

They're Powers.

SHIT.

She punches him back. She twists in mid air, wrenching her legs and remaining arm free. She whirls upright and punches the next nose she sees, bounces off in the opposite direction to elbow a third man in the face, and then the fourth grabs her by the scruff of the neck and yanks her off-balance.

"Kkiillll hheerr!" shouts a voice from down the road. Moxon.

Can they fly?

Arika plants her feet and launches upwards with the fourth airman hanging on. At about rooftop level, she glances around. He's got something in his other hand. It looks like a string with a dozen squidgy lumps of dough attached in a row, a big transparent plastic bag full of hot dog buns. But the string is actually a twisted pair of red and black wires, and there's a chunk of metal in the piece of dough at the far end. He has one corner of the wrapper in his teeth. He's pulling the wrapping off. A quick and

practiced move. Arika mentally likens it to soldier pulling a grenade pin with his teeth.

The words *plastic explosives* bolt through her head.

She starts flailing at him to get him to let go of her scruff. He lets go, but even once he's got both hands off her he stays with her, which answers her question: yes. He can fly. With the string of explosives torn open he whips it at her, over-arm. She dodges and, at first sight, it looks like he misses, the string going over her right shoulder. But then the wire connects with her collarbone and it wraps downwards and she feels a series of small impacts on her back. They stay glued to her. Sticky bombs. The man kicks over and dives backwards, letting out wire from a spool in his right hand. In his other hand there's a thing with a button. The trigger.

Arika struggles for a moment but the bombs won't come off her back. So she starts to dive after him. She could have gone for the wire, but she doesn't think of that. She gets there fast enough to put a fist through the front of his face, but too late to stop him pushing the button.

*

This time she doesn't actually pass out. She feels the series of detonations slamming into her back like cannonballs, a few milliseconds apart. Boom-boom-boom-boom-boom. Arika doesn't have time to wonder if she has spinal damage. She spins wildly in the air, propelled by the explosions, and doesn't have time to think about broken bones or the asphalt she's about to hit shoulders-first or the man whose head she just destroyed and whose blood and skin and hood are still wrapped around her hand.

Someone intercepts her before she hits the road. It's the sniper. She can tell because he's got the special rifle, the one which fires bullets four times faster than sound. Bullets you can't hear coming. Bullets a girl like her isn't fast enough to dodge. He cannons into her from below, tosses her over his shoulder and grabs one of her ankles. Now she's hanging in front of him and the rifle in his other hand is braced at his shoulder and aimed down into her jaw. (Not that "up" and "down" really mean anything with the horizon gyrating wildly around them.) This is his mistake. Now they're together - static with respect to each other. Arika is no longer disoriented by the spin. She gets her head together a fraction of a second before he fires a bullet through it. It's just enough time to put a hand in front of the barrel. *POW.* The bullet takes a chunk of webbing from between her first two fingers and ricochets off her eyelid. She howls in pain, takes hold of the sniper rifle barrel with the other hand, wrenches it out of the sniper's hand, whirls three hundred and sixty degrees (pulling her foot free) and aims to smack him in the head with it. He sees the blow coming a mile off and blocks it with the outer right forearm.

He's slower than she is. All four of them are slower than she is. But she's two hundred and fifty-six times stronger than a fifteen-year-old girl. And they're who-knows-how-many times stronger than strong, trained airmen. And she's hurt. *And they never taught her any combat*.

There are anti-Power weapons, thinks Arika McClure. *There are super soldiers. They harnessed it. They can build super soldiers now.*

They're trying to kill me.

Arika swoops around behind the sniper and brings a chop down at his neck. He twists with her and blocks it again. She kicks him, retreats a metre, brings the rifle up to her shoulder, prays that it's still loaded and pulls the trigger. The sniper is too slow. He takes the bullet in the left lung. Blood spurts out of the wound in his suit and falls sideways.

Sideways. Arika has lost track of the horizon. They've descended to just half a metre above the road, and are moving down it at high speed, as if they were fighting while hanging off the underside of a speeding truck. The dead sniper hits the asphalt shoulder-first and begins rolling, spraying blood in a rough cycloid. Arika tightens her grip on the rifle, rotates and stabilises on the air, just above the road, as if riding an invisible hoverboard.

She's aching all over now, and exhausted. She's never felt exhausted before. Not since she was Born.

Way down at the far end of the road she can see Moxon and Susie and the two jeeps. *Susie.* She clutches the rifle in her good hand and starts accelerating towards them.

There were two more of them, she remembers, but this time she isn't lucky enough to look around in time to see the shadow shooting across the face of the nearest apartment block towards her. All she feels is the impact. The car weighs two tonnes and lands on her at most of two hundred miles per hour, with the front bumper turned sideways to line up with her torso, hitting her head, shoulder, spine and legs all at once. Arika ploughs into the road under the weight of the vehicle, tumbles confusedly over and through the shattered wreckage which spins out in all directions from the collision, and rolls to a halt in the middle of the white line, about a block short of where Moxon is now holding Susie at gunpoint.

She lies there for a long moment, taking stock. She counts off her injuries: the hole in her hand, the bruise on her eyelid, painful sprains in ligaments she didn't even know she had, bones in her shoulder rubbing against each other in ways they shouldn't be and blood from her forehead wound trickling across her eye and dripping off her nose onto the asphalt under her head. She wants to sleep. She wants to go back to sleep until she wakes up in the hospital and it's all better, and for a moment she lets her eyes close. But a tiny part of her brain screams, *You are vulnerable now. You are vulnerable and people are trying to kill you. GET READY. AND DON'T THINK ABOUT IT.*

Shaking, Arika manages to lift her head a few inches off the ground and get an elbow underneath her. There's a flat shard of metal under her hand. Big enough and jagged enough to take someone's head off.

The last two come in from ahead, flanking her. She doesn't see, she just senses the shapes approaching, shapes which shouldn't exist, which make her feel ill to look at.

Don't think about it, goes the knowledgeable-sounding little voice in Arika's head. She gets herself up to one knee, leans forward as if to steady herself as she stands up, takes hold of the shrapnel, screams and whirls it in a figure-of-eight. The first slice passes horizontally through the eyes of the man on her left, around and back up through the rib cage and collarbone - the jolt as the blade tears messily through bone and organ almost takes it out of her hand. She gets a better grip by the time she reaches the man on the right and pulls it cleanlier through his throat and C5 vertebra.

Schrwwrk. Skharrrrchk.

Arika drops the blade and covers her eyes until they're both dead.

*

"Ssttoopp oorr Ii kkiillll hheerr," bellows Moxon from the end of the road. Digitised, of course. It's impossible to give verbal commands to men who are listening hundreds of times faster than you're talking. He has a box which records what he says and plays it back at high speed. And "stop or I kill her" is all he's had time to record since this started... what? Five seconds ago?

*

Susie Kuang has watched most of this. She hasn't been able to follow it. Susie has only been dimly aware of dark blue blurs streaking around her field of vision and the incredible noise of the bomb, two gunshots, several hard collisions between fist and bone, and the smash of the Lincoln Continental landing on Arika's back. She sees a few corpses tumble out of the air and she sees the explosions of gore after Arika recovers from the car. It's not until a few seconds after this that Susie even realises that Arika is the one who has won.

Moxon hasn't been trying to keep up with the fight. He knows how it's going just from the sounds; the choreography is all his. The fact that the gunshots go off at all is a bad sign; it means the explosions didn't work. The car impact is bad too, because it implies failure on the part of the sniper. And the final two wet deaths mean that despite all calculation, the car, too, has failed to kill Arika McClure.

The other reason he doesn't try to follow the fight is that he has no time to spare in preparing his backup plan. While Susie is distracted by the fight he positions her in front of him, facing away, hands up, his gun to the back of her head, barrel buried under her hair, obscured from Arika's point of view. At the same time he has recorded his second message and hit the button to broadcast it at high volume. He hits the button several times to get his point across, and after the fourth try he is certain that Arika has slowed down to regular speed, to talk to him directly.

He waves at the jeeps to stop before they reach him. Men get out with machine guns and take defensive positions aimed at Arika, now standing over two bubbling corpses with a gout of blood splattered across the whole lower half of her suit.

"You take one step forward and I swear to God she dies," shouts Moxon, directly, this time. "This is a conventional nine millimetre Beretta M9. It's not like that sniper rifle. You can catch its bullets out of the air without raising your heart rate. But there's no way you can get from there to here before the bullet gets from here to her head." He positions his hand so the trigger finger isn't visible either.

Susie hears what Moxon is saying and tries to stand as still as she possibly can.

"Let her go," shouts Arika, also not moving.

"I want to let her go," says Moxon. "I really do. The last thing I want is for more innocent blood to be spilled! That's the whole purpose of Defense, after all. To protect innocent people from people who might want to hurt them. You're up to a nice round two hundred and twenty-two people today, McClure! And you're not even eighteen! That's a pretty good record! Where are you *from?*"

"You were trying to kill me! All you've ever been trying to do is figure out ways to kill me!"

"We were trying to stop you from killing more people!" shouts Moxon. "We were trying to stop you from hurting yourself even more by hurting people who are close to you! Do you understand what'll happen if you let word of this get out? Do you know how many civilians would have died today if we hadn't had the area evacuated and kept you contained? We need to study this--"

"*You are a liar!*"

Moxon keeps talking, "How long can this go on? A new superhuman every year until there are no humans left to be killed? You want to help people. You want to be on the side of the good guys. If you let us study you we can make more of you. We can train you and put you to work. And save lives."

"Then put the gun down."

"I can't," says Moxon. "You know I can't. You have to stay where you are. And we'll work this out."

Arika thinks. She stares at Moxon. He looked like such a nice guy when they first met. He's shorter than she is (and she almost never sets foot on the ground anyway) so he felt unthreatening to her and he felt like he had her best interests at heart. Almost everybody she met on the base was like that. Some were more irritating than others, but all of them seemed to be well-meaning. But it was because they were scared of her. And scared of Jason too. *This is about Power,* she thinks. *They wanted Power. They have that. Then they wanted the power to kill other Powers. They just need to be a little faster, and they'll have that too. They can just crank out armies of them.*

She transfers her attention to Susie, whose hair is in disarray from being dragged down the street by Moxon and who has tears in her eyes and who is trying not to shake as she stands still with her hands knitted on top of her head. Arika spends a long time trying to think of ways to save her. She can't come up with anything foolproof. She could cover the distance in a tenth of second, to be sure, or maybe even faster still, but how good are Moxon's reactions? And he's looking right at her, waiting for exactly that move. And still talking, waffling away, stalling for time. She could hurl the shard of metal at him, but no way in hell is she that good a shot. Not with Susie in the way.

Stalling for time...

*

Moxon resists the impulse to dive for cover when he hears the approaching roar, just in case McClure realises what's about to happen. He keeps talking right up until the impact, keeping her distracted and listening and thinking at human speeds.

There are bigger missiles; this one had to be small for agility and most of its interior is occupied by the fastest guidance processor package known to mankind, but even so the explosion is big enough to shatter every window for a three-block radius. Moxon and Susie are both hurled backwards by the shockwave and hit the ground hard. Moxon cracks his head on a jeep fender before he stops rolling. His ears ring. His insides judder, pummelled by the sound of the blast.

By the time he shakes the stars from his head and locates Susie Kuang again, Arika is there, floating over him, fists clenched, eyes fiery, her hair and the side of her face blackened. Somehow, he still has his gun in his hand. He can't think of anything else to do but raise it at McClure and pull the trigger until it's empty. She stands there and lets him do it, snatching each bullet out of the air with the same hand, one by one. They both know it's not a serious attempt to kill her. It's a gesture of defiance.

She screams an ultimatum at him. He can't hear it. He'd still be deaf from the blast even without the gunshots and the impossible thunderclaps from the caught bullets. And then she turns, picks up Susie Kuang, and carries her away.

*

Unable to think of anywhere else to go, Arika flies back out into the desert, with Susie in her arms. She gets a few miles out before the adrenaline rush of the fight begins to subside and the pain in her shoulder rapidly becomes so bad that she can't even carry Susie properly. She sets her down on the plain and stomps away a step or two, refusing Susie's help, clutching the joint and wincing as she tries to roll it around. And finally, she breaks down and cries.

least significant bits

one

"Honey: it's all over," Jason Chilton says to his wife when he gets home. He strides in through the front door, proud at the decision he has made. It's not a long time since he was home, but it's a long time since he was home and he *felt* like he was home. His wife Janet is loading the washing machine in the kitchen and she is more than a little surprised to see him home so early. Before she can do anything he picks her up and kisses her. "I'm done with the whole business. I'm not flying anymore. I'm not taking part in experiments anymore."

"Oof. So did they work it out? Did they work out what's— why you can fly?"

"I don't really care. I decided I've had enough with it. I just want to have a normal life and walk on the ground and watch the kids grow up, and who can stop me? It was an experiment. I tried to do something positive for science, and science doesn't seem to be smart enough to deal with what I can do, so forget 'em." He kisses her again. "I prefer reality."

"So you're going back to work? No longer 'on sabbatical'?"

"I think I'll take the rest of the week. We can all spend some time together. And then on Monday I'll go and see what kind of a mess Dan at the office has left for me to come back to. Is there any tea? Where are the boys?"

As his wife puts the kettle on, Jason goes into the living room and flumps down on the sofa. It's going on five in the afternoon. There are cartoons on the television and a stack of newspapers and magazines on the coffee table. Eight-year-old Ally is messing about with a model aeroplane, one of those flat-packed things which slots together from three pieces of foam and works for about half an afternoon. His younger brother Jonathan is patiently constructing a rudimentary Dalek from black and red Lego bricks. The place is a mess. It's a good day. And no one can ruin it.

two

"I think Paul Klick was right."

Ching looks up and around guiltily. They have a fairly secluded table at the Hornpiper. Probably nobody heard anything. Ching takes a sip from his pint glass and puts it down, and then says, slowly and with consideration:

"Paul Klick was the greatest mass murderer in human history. Hitler, Stalin and Pol Pot had help. Allies. Paul Klick killed eight hundred and ninety-nine thousand people with a single device which he built with his own two hands. He also killed more people in a split second than have ever died at any other single moment in history. He was insane. You are my friend. But you can't say things like that to me. Or to anybody."

Mike Murphy stares into his own drink for a long while. "I don't think he killed anybody," he says, quieter. He pulls out some notepaper from his pocket. "This is what he was working on at the time his wife died."

Ching glances at the notation. It's obviously Eka-derived, but it's fairly sophisticated stuff. He can't read it easily. "Am I going to have to decode this myself or are you going to tell me what it means?"

"Do you believe in God?"

"If by that you mean, do I believe that there exist multidimensional beings of colossal scale and intelligence in planes of reality far above ours, with powers and abilities which would appear in our reality to resemble omnipotence, capable, even, of deterministically predicting human behaviour to great accuracy, before whom our entire universe, all its physical extent along with its past, present and future, is as insignificant nanotechnology, then yes. Seph is dating one. If you mean, do I believe any of them take an active and enthusiastic interest in human life and lives, in the fashion of the Abrahamic God... no. I only know one god and for all the world he would appear to be just a guy. I have seen no compelling evidence for anything but indifference on the part of the rest of them. Like I said. Nanotechnology. Who takes an active interest in a specific electron?"

"Maybe God does," says Murphy. "It's not like discovering the Structure is any more shattering a blow to Biblical teachings than discovering aliens would be. Or the discovery of evolution, or the motion of the Earth. So his Creation is bigger than we ever knew? That's wonderful. That's powerful."

"You ever do any set theory?" asks Ching. He flips over a beermat and writes out some numbers, "0, 1, 2, 3, 4, 5, 6...". He circles the "3" and labels it, "you are here". At the end of the sequence, after the ellipsis, he writes a lower-case Greek omega, "ω". He circles it and labels it "God". He waits a moment for Murphy to understand, then he adds "ω+1..." after God. Then he circles this, and labels it "?".

"I don't know what this is supposed to mean but I don't find it a compelling argument," says Murphy.

"If the Structure is anything like ordinal arithmetic," says Ching, "there's always a bigger God. There is nobody at the top. There is no top. There's only one end to the sequence, the bottom end, where we are." He scribbles it out. "Of course, it probably isn't. The Structure, I mean. Forget it. This is a cheap laugh at your expense. I don't know. Why do you ask?"

"These are Klick's equations. |[]| is a mathematical operator which measures intelligence within a volume, like you'd measure mass or electrical charge. And the letter 'A' represents our universe..." Murphy explains the conversation he had with Klick in his final moments. He explains what an infolectrical hypersystem is, and the rough topology of the hole in reality which Klick created. And then he explains what he thinks an infolectrical hypersystem really is, and where he thinks the hole really led. Murphy explains it slowly and patiently, while Ching becomes increasingly incredulous and uncomfortable.

"You really believe this," says Ching.

"I do."

"...You're trying to reconcile two things which can't be. Which *shouldn't* be. You're trying to mesh a methodology predicated on the gathering and repetition of observations together with a system of beliefs whose *core concept* is that they *cannot be tested*. No scientist will stand with you. No Christian will stand with you."

"Anybody who walked into the sphere--" begins Murphy.

"Died!"

"They were freed," Murphy repeats.

"Nothing rings right about this. If they were freed, why couldn't they come back and tell us? Suppose

you just stepped out of the universe into this cosmic updraft. And you saw something approaching your notion of heaven. Wouldn't you come back down and tell people? And reassure them that you weren't actually dying? Tell them they should come too?"

"Maybe they couldn't come back."

"So in what sense were they freed?"

"Maybe they enjoyed it so much that they didn't want to come back."

"And left their families on Earth to die the old-fashioned way? *Selfishness.* Not heaven."

"Paul Klick was a rational man. A scientist. Not a murderer."

"He was driven mad with grief." By now Ching has read the blogs. So has almost every person in the Western world. "I can't even begin to imagine what he lost. I'll grant you that he really did believe he was doing the right thing. Every murderer does. But he was wrong. He must have been wrong. We don't even know what was in the box. We don't know how his machine worked because there is no machine to look at. We just have theory."

"But the Script changed. We've seen this happen before. It's a familiar enough pattern. It changed to lock out that specific theory. And at the moment the Script changed, the box stopped working. Isn't that evidence enough?"

And it might. It really might. Ching takes another drink, thinks about it for a moment, and is forced to concede this point.

"It might be enough to prove that... the Berliners went somewhere, rather than being destroyed in place. But even if we assume that, what if a human mind can't survive the higher dimensions unprotected? We can't survive space. We can't survive on the Sun or at the bottom of the ocean or even a single hot day in the desert. We can only live comfortably in... I don't know, a... a *vigintillionth* of this whole universe!"

"Maybe it's different up there," says Murphy. "Calrus said that the rules are different. We live in an environment poorly suited to the development and support of intelligent life. Maybe we can model it?"

"Maybe. You can try, if you like. My life is already complicated enough. Besides. There's a whole other aspect to this. What if you're right? The people are gone. And the technology is gone. What if you're right and this is a scientific manifestation of your faith? If this was what you think it was, then... either Paul Klick figured out a way to kill immortal souls, or the only way into heaven, the *only* way, was to be in that window, five kilometres wide and sixteen hours long, on the eighth of August 2008. And nobody else will ever get to go. And nor will the hundred billion people who died too early. That's even worse! It shouldn't change anything. This," says Ching, "is just a piece of paper with equations on it. All of this is just... observations. But faith is when you believe something, when you have no reason to believe it. No observations, no concrete testable hypotheses, just gut feeling. And nothing really changed on that day. The door opened, the door closed. We're back to where we were before it all started. So what?"

"I know it shouldn't change anything," says Mike Murphy. "But the alternative is that Paul Klick, a man I barely knew but who I did actually vaguely care about, did what he did... by mistake. Because of an error he made in his science. *Science he got from the Script.* The same Script we work with every day.

And that's something I don't... don't want to believe."

three

"I know things are bad. I know living at the MPR is bad. I know having the most powerful country in the world after me is bad for our relationship. We need anonymity, a place we can call home and at least one job between us. I know Arika needs stability and she needs some way to switch off and rest. And she needs *therapy*, Christ. She's in denial and she's not ageing properly and her internal biology is all kinds of screwed up, much more than Jason's. But there are real lives at stake. More lives than I can even describe. Superhuman war is going to happen. It's an inevitability. If more countries than just America get the technology, if they have any kind of *opposition*, then that conflict has as much of a chance of consuming the world as nuclear war did thirty years ago. And in less than a year we have the twelfth Power. And if all that happens, people discover who Arika and Jason are *after the fact*, it will be, in many senses, the end of their lives. They'll never be able to be human again, and I don't want to know what they'll do in retaliation.

"These are bad times. But from the most basic ethical standpoint I have to keep going with this. You can stay with me, if you want, and I'll try to keep us both safe. Or... you can leave until it's done. Until it's safe and you want to come back.

"I love you. If you stay with me, you'll be in tremendous danger. That's the whole of the thing."

"You care about Arika more than you care about me."

"You-- please don't say things like that. *You* care about Arika. We both do. But I'm a scientist. And with Jason 'retired', she's our only data point. And she refuses to go public. And this Script... is like striking solid diamond. The stuff in here is insane, it's unreal."

"This Script is *doing things* to your head!"

"If I could explain what I've seen it would be doing the same to you--"

"You care about this more than you care about me," says Susie.

"No! Of course I don't!"

And Ching realises with a jolt that he's lying.

four

"Mitch?" asks Seph Baird one lazy, rainy afternoon.

"Seph."

"What would happen if you died?"

Mitch is silent, thinking about this, for long enough that Seph has to prod him to make sure he hasn't just forgotten about the question. "Where were you before we earthed you?" she adds.

"This world is three-dimensional. I'm kind of flattened down to fit into this shell. The real me is much bigger and more complicated than this, but I'm kind of hamstrung. They're like limbs I can't feel. Or move. It's how I can't leave the cell. But that power is all still out there. You tapped some of it on that day at the dish. There's a connection. It's-- hard to describe--"

"What happens if your 'shell' dies, then?"

"I honestly don't know," he says. "It could be a minor setback. I could just go straight back into the cloud and then you could do the earthing experiment again and I'd be back. But I think it would probably actually kill me. Properly. Without the intelligent core behind it, the power left behind would just fizzle out and biodegrade, like any corpse. It's like-- it's like I'm Stephen Hawking. A guy with motor neuron disease. All I can do is wiggle a finger or two or three. What if you took away my ability to move that finger? It depends how you do it. Just severing the nerve or the finger would leave me alive but basically inert. But the net result would be the same if you shot me in the head. And I don't know what corporeal *three-death* qualifies as."

"If you knew some more of the mathematical modelling behind all of this, could we figure it out?"

"Sure. But I don't."

"How come?"

"Well, think about where I'm coming from. What do you know about subatomic physics? I mean. Um. What does a typical human know? And you're so far beyond that limit from my perspective. Call me an ignorant cosmic supergod if you must. The only answer I can give is that I don't think I want to try it."

"The reason I ask is..."

"Oh, this is *other* than just being concerned for my safety?"

"We think we've found a way to get you home."

"And you lead into this by asking whether *death* would be a major setback for me? I don't think I like where this is going."

"It's kind of... complicated. And it's going to involve an aeroplane. And a girl who can fly."

'Verse Chorus

"The idea is that there are millions of universes arranged in a symmetrical loop. Radiating away from a central point. All focused in on the middle."

Mitch Calrus, hunched over on the sofa looking over a mug of coffee at Seph Baird standing above him, is blank. "Right?"

"To the left of us there's another universe just like ours. And to the right of us there's another universe just like ours. And there's a loop, and there could be billions of universes all in the loop. Berloff called it a 'chorus' of universes because all of them are... metaphorically 'singing the same song'. Eventually you get back to where you started. You have to, because of symmetry. And there were some calculations to back it up. But you can't prove it. Because any signal or object you fired off to your left... the universe to your right would simultaneously fire the same signal off to their left, right back at you. Sure, the exchange would take place, everything moves one jump around the chorus, but from your point of view nothing changes. So you can't test it. It's just a thought experiment. So it was proposed once in the 1960s, and Berloff wrote one paper on it, and then he died and everybody forgot all about it. It's called the Chorus Hypothesis."

"Right...?"

"Until now." Seph produces a heavy black object the shape and density of an Olympic discus. "It's real. At least, it's in the Script. And as of today the Chorus Hypothesis has been upgraded to a Theory."

*

Fifteen minutes into the flight to Dublin, Mike Murphy takes a surreptitious look out the airplane window and spots the flicker of green. He nods, gets up and excuses himself.

He shuts the lavatory door, waits a moment, but even though he's ready for it, the appearance of Mitchell Calrus out of thin air just an inch front of him still makes him jump. Mitch temporarily pulls off his oxygen mask. He's wearing four layers of clothes, a full-body climbing harness, a heavy winter coat over that, and a backpack. The wetsuit, he's discovered, is superfluous. All he needs is the oxygen. He turns clumsily, presenting the backpack, which contains his O_2 tank and a collection of additional equipment. Murphy pulls out the black discus and a pair of screwdrivers.

"You have any trouble following me onboard?" hisses Murphy.

"I have less free air left than I'd like," says Mitch, "but other than that, no. This is the thing. Do what needs doing. You should see what this plane looks like from 4D, it's unbelievable."

"I think you can get big architectural exploded diagrams," says Murphy. He prises open the discus' casing and tightens a few screws. He spends several laborious minutes fiddling with settings using the tiny seven-segment LED readouts to get information about the device and the few available buttons for input. Eventually he's happy and clips the casing back together. "You're good to go. You remember how this works? Tell me the procedure."

While Murphy stows the tools away, Mitch recites the steps he's been taught word for word. "There really is no other way to duplicate zero gravity?"

"Not on Earth, and not without buying time on the Vomit Comet. And that would be expensive."

"I have cash..."

"And red flags would go up. When you disappeared mid-flight. Look, you trust Arika?"

"Frankly, no."

"But you'd trust her with your life."

"Sure. A *life* isn't something people muck about with."

Mitch hands over the satellite radio and puts his mask back on.

*

Arika McClure's flight suit was all but destroyed during the flight from America. Repairing it has been a non-starter and wind insulation is a non-issue so she's pacing the 737 at five hundred miles per hour in jeans and a scruffy old olive green coat. They're flapping at rates you could measure in kilohertz. They're just not designed to move this fast. *I need to buy biking leathers*, she thinks.

The bulky grey radio on her waist bleeps and the phones in her ear, cranked up to maximum volume, can just about be heard to deliver Murphy's words: "(You've got everything? Okay.) Dropping in three. Two. One."

Arika doubles her sense-rate as Mitch's dark, oddly-weighted figure drops out of the underside of the plane, the discus on a lanyard around one wrist. For one second he is blasted by the air stream, losing forward momentum and dropping back behind the plane, then he goes intangible and drops like a stone.

True freefall cannot be achieved from a simple parachute jump. Air resistance slows you. The rate at which you accelerate is less than the pull of gravity. Eventually you hit terminal velocity and then you're not even accelerating at all. True freefall, like the discus needs for its hypersensitive components to even be tested, let alone operate, can only be achieved by going into space, or chartering a plane to perform a perfect parabolic power-dive, or the cheap way - recruiting the Four-Dimensional Man and having him make himself intangible to the air.

Arika McClure fixes her eye on the loop of purple climbing rope protruding from somewhere around Mitch's neck - the loop connected to the climbing harness he's wearing under the coat and backpack. Meanwhile Mitch is holding down the big button with both hands and shouts the word "One."

*

The activities of humankind do not concern the colossal, ineffable, super-beings of the dimensions above ours any more than the splitting of a single bacterium concerns a typical human. For the most part, the larger and the smaller creature in each situation are so different in scale as to be irrelevant to one another.

But there are such things as biological scientists. And microscopes. And dangerous infections.

Alef is doing things it shouldn't. Something wakes up and starts watching.

It is a very bad idea to attract the gods' attention.

*

"Two," gulps Mitch as odd, undetectable other-dimensional centripetal accelerations begin to affect his body. He hangs onto the disc with both hands, carried along behind it as it accelerates. The Script says

there's a fifty-fifty chance it'll work. Doctor Mike Murphy and Doctor Josephine Baird say there's a fifty-fifty chance the discus won't just conk out in his hands and need a second attempt. And Seph knows he's fifty-fifty on whether he really wants to leave her anyway--

The universe is like a spiral. All particles moving in circles clockwise or anticlockwise around the central point, each particle one of millions of identical siblings all duplicating each other's actions so the arrangement looks the same whatever perspective you pick. Mitch feels like he's standing between a pair of full-length mirrors facing each other at a shallow, hundredth-of-an-arc-second angle, so that there are millions of his exactly identical alternate selves arrayed out in front of him, and they're racing away, dragging him along, bursting seamlessly through each mirror just as an exactly identical self bursts out of the mirror behind to replace him.

He hangs on for dear life. "Threeeeeeeeeeeeeeeeeeeeeeeeeee--"

*

Ching-Yu Kuang is in the middle of the space under the parabolic Medium Preonic Receiver dish, on his knees, his forehead to the ground, his hands over his head, trying to think his way rationally through the pain. He feels like his stomach is full of grey fog. He's been breathing, eating and dreaming in Eka for a week. It's all he's got left to nourish him after Susie.

"Everything's sentient," he says to himself. He turns his head sideways to where a notepad and a ballpoint are within arm's reach and starts scribbling from his unconventional position on the floor. He scribbles extremely simple things which he knows are obvious, but he needs to pin them down on the paper before they do more damage to his brain. "Everything's alive up there. Every cross-section. The power set. Of living things. Is a living thing.

"Of course the cell's alive.

"*Of course the god damn prison wall's alive*--"

*

A neon yellow splinter is hurtling *kata* around the circumference of the cosmic starfish/snowflake/whirlpool of universes, a perfectly symmetrical constellation of yellow splinters each chasing the next one's tail in a circle, blinking from one identical universe to the next, gathering momentum.

"Four."

Pushing against the cell boundary. Abrading it. Such a small device, with so much drive, a tiny little engine with the power of a sun, grinding against the exterior wall of the universe until a hole is worn and the speed is too great for the vehicle and its passenger to be retained and they spurt off at a tangent, disconnected from three-plus-one-dimensional space and jettisoned out into the scintillating glory of the next least significant Totality.

Mitch Calrus blinks four-dimensional eyes.

Colour assaults him. Things whose geometry he doesn't have the capacity to comprehend bounce and interact and change shape in ways which look impossible. He dimly senses the gigantic multidimensional reservoir of indistinct, ambiguously-labelled *Power* and arcs up towards it on a free trajectory, unable to guess how fast he is moving.

He knows that the power and the knowledge attached thereto is his. It's like he can process the metadata. He can see the pinhole fractures connecting it to the Earth below, the cascade--

And then something bigger than his imagination rises up behind it. An eye - he knows it's an eye, a detailed high-resolution sensory perception organ - opens, bigger than the entire multidimensional billion-universe array dropping away below him. It trains itself on him. And the identity of the creature, a packet of pure, refined information, arrives in his mind. And he knows what it is.

"Five," says Mitch, tightly clutching the black object in what he is only half-sure are still his hands. Real space and air are an indescribable distance away below him now. He knows he's not going to drop back. He knows he's hit escape velocity. All he has to do is prove he has the right to keep going.

"I created you," he screams. "The Enemy is dead. You can let me out!"

The prison cell wall/warden considers his words. Then reaches forward and does something to his vector. Cancels most of it out. Sends him plunging back into reality. And does something else. Does something to his landing point. Pulls information out of it, as violently as a man tearing out another man's heart.

"NO."

*

"Pipe left bracket Alef right bracket pipe equals perception left parenthesis mid-dot comma pipe left bracket Alef right bracket pipe right parenthesis plus, plus, plus, plus, *one*. I saw this. Where did I see this? Where is this from?"

Ching darts pseudo-randomly around the room, from stack of paperwork to stack of paperwork, systematically corrupting the order of pages in each one, experiencing the agony of not being able to find what he is looking for.

"I saw this somewhere," he says. "It didn't just arrive in my head for no reason," he says, attempting to convince himself. "Alef is our universe. Pipe left bracket right bracket pipe is the intelligent population of Alef. Mid-dot is me. Mid-dot is 'you'. Mid-dot is *the reader*."

*

Mitch Calrus' waveform collapses. He slams bodily into the newly-dropped stone dividing wall between Alef and the next universe at a velocity which is perfectly perpendicular to conventional three-dimensional notions of velocity. It doesn't kill him. He can't feel impacts and accelerations in directions of motion in which he doesn't even exist.

Part of the discus explodes.

"Si--aaaaagh!"

Arika McClure, in slow motion, swan-diving two metres up and behind Calrus the whole time, sees the tiny detonation. Mitch flails and drops the hardware. Arika slips a hand through the rope loop and begins decelerating, yanking him to a halt. "Hurk!" cries Mitch as the harness tightens unexpectedly around his chest and thighs. A few fragments of discus dangle from his wrist, the rest just drop.

He focuses on what he can see ahead of him, which is fields and hills and small settlements. They're kilometres above Wales. Snowdonia. Reality. Green and grey and blue and white. It's a lot more vertiginous now he's stopped falling.

"Got you."

"Jesus Christ," announces Calrus.

"You okay?"

Calrus just laughs manically. "I have no idea. It felt like *2001*. Where's Seph meeting us again? How far are we from that town with the ridiculous name I can't pronounce?"

"What's--"

"What?"

"Oh my God."

Calrus looks up. Arika isn't looking at him. She's looking at the plane, off in the distance, a mile away by now. It's covered in repulsive black lightning. It looks like spindly stop-motion spider legs are crawling all over it, like a Lovecraftian monster from another dimension is trying to crawl out into the world through a portal inside the passenger section. The whole effect is silent and it makes Arika's skin crawl and Mitch's arm hairs rise.

That image lasts a fraction of a second, enough time for Arika to blink, and there's a flash of light and the plane calmly rolls over into a nose-dive.

*

Calrus is shouting something, it could be "drop me" or it could very well be "don't drop me" but Arika doesn't know because she's gone to maximum acceleration and is thinking much faster than he can speak.

If the plane crashes hundreds of people will die. Nobody she has specific emotional connections to, except maybe the man Murphy whom she barely knows, but they're still people. She's got a lot of souls on her conscience already. But if she saves it, everybody will know she saved it. And then everybody will *know*. They'll know who she is and what she did. And it'll be over.

Unless she runs away afterwards.

She can run pretty fast.

Arika starts accelerating for the plane, Mitch Calrus in tow, flailing helplessly in panic. "No! No!"

By the time they catch up with the vapour trail - elapsed time is fifteen seconds - the plane has performed a complete barrel roll. Its starboard wing is aimed straight downwards and the plane is still rolling. Arika catches hold of the fuselage somewhere just below the upper row of passenger windows and swings Calrus at the hull, hard. Calrus raises his hands across his face and instinctively goes

intangible. He passes through three columns of seats, grabs hold of the fourth and slows himself enough to stop. It's a bad fall. Four-dimensional friction hurts. The plane twists and throws him at the ceiling, where he manages to wedge himself for long enough to get his bearings.

With a bit of luck nobody even noticed his arrival. Everybody around him is already screaming. A mobile phone is ringing. Oxygen masks, headphones and plastic cutlery are ricocheting around the scenery. What's a little more insanity in a picture like this?

Mitch phases out of his backpack and tries to figure out which direction the cockpit is in.

*

Arika plants her hands against the meatiest part of the top of the port wing - that is, the side which is currently facing downwards - and starts pushing, hard. Worrying throbbing vibrations push back against her hands (it's the noise of the metal protesting at a frequency too low for her to hear), but she saw a YouTube video one time of a plane wing getting bent until it broke, and it bent a lot more than this one is bending, and besides the wing is supposed to take one-half of the plane's entire weight on it, it's the strongest part of the whole infrastructure, right?

Wait, wasn't that a bigger plane?

She dashes out to a distance, speeds up fractionally, watches the plane's motion for a moment, slows down again, dashes in and continues pushing. The metal starts to give under her hands, so she splays her whole body against the wing to spread the pressure, but the human brain is not good at the mechanics of pushing things when there's nothing to push *against*, so she keeps having to check to make sure she's making progress.

But it's working.

*

Every time Arika connects with the wing she makes a *doom* noise that Mitch, inside, hears. She's moving so fast that *doom-doom-doom-doom-doom* takes all of a few seconds, each impact rapidly rotating the plane a few degrees in an unexpected direction. Then, without warning, Mitch stops bouncing off furniture and is able to get a grip on a nearby armrest. The roll is stopped. He's upright. The aisle is underneath his feet.

I need to see where we're going.

Fortunately, the direction of the cockpit is still steeply downhill. But the plane is still yawing wildly, spinning from north to east to south to west, a full revolution every second. With the sky outside only visible at the corners of his eyes and through tiny portholes he has no reference frame for the machine's motion. All knows is that some invisible and randomly fluctuating force is pulling him to the right.

He tries to switch off the portion of his brain which is concerned with balance and look at the world around him objectively. *Down the aisle is forwards. Up the aisle is backwards.*

Horrific, terrifying noises emanate from the plane's skeleton. It's not supposed to be pushed around by superhumans. It can take far bigger forces, but those are forces acting on the whole structure, not through a pair of hand-sized contact points. Still, the centrifugal component lessens and eventually stops as Arika hauls backwards on the tip of the port wing, gradually correcting the plane's out-of-control yaw. *Two out of three*, thinks Mitch Calrus as he shakes the blurs from his head, loses his grip

on the nearest seat's support strut and falls nose-first into the cockpit door. All Arika has to deal with now is the fact that the plane is ploughing into the Earth at Mach 0.8 and an angle of maybe eighty degrees.

Mitch sticks his head through the cockpit door. Seeing that there's room, he leans backwards, lets his whole body go intangible and slides through it, slipping out of his climbing harness at the same time for mobility. There's one pilot in the seat. He's slumped over the controls. No sign of a co-pilot. Mitch slides down, hits the control deck feet-first, balances as best he can without hitting any important-looking switches and pushes the pilot's body up off the yoke. With difficulty, he levers the pilot out of his seat onto the floor, takes his position, braces his feet against the controls and starts hauling the yoke backwards.

Red warning lights are flashing all over the instrumentation panels. The altimeter is an unreadable blur. Out of the corner of he eye he keeps catching momentary dark green flashes.

*

The plane's wings are still attached and functional. At five hundred miles per hour horizontally, the bird stays in the sky, so the only problem is one of pitch, and with a superhuman, even a small one, lifting from the nose, and the plane's control surfaces pulled up as far as they can go under Mitch's inexpert commands, it's a problem that slowly but surely begins to correct itself.

Arika's operating at close to top speed. Thirty seconds for Mitch Calrus has been nearly two hours for her. The whole experience is almost relaxing.

She is completely disconnected from the urgency of the situation. She has no idea how hard they're going to hit the ground.

On the best day of her life, the young, un-powered Arika McClure could give piggyback rides to older brother Roy, a weight of just under 70 kilograms. Her physique is essentially unchanged aside from the strictly metered energy stream to which she is now connected which multiplies her strength by two to the eighth power. That gives her a confirmed and tested lifting capacity of a little less than eighteen tons. A typical cruising Boeing 737 weighs sixty.

They're less than half a kilometre above the ground when she realises that they aren't actually going to make it. She breaks off from the front of the plane and aims at the starboard wing, trying to tear it off and reduce the weight she has to carry, but the aluminium alloy just crushes between her hands, becoming pliable and tough but impossible to tear. She's not strong enough. Jason could do it. Jason's not here.

Arika and Mitch both spot the same valley ahead of them. Arika steers the aircraft towards it. There's a mountain at the near end of the valley, but if they clear it, they can belly-flop on the far side and slide downhill to a halt and there's every chance that half of the passengers and flight crew will survive. That's the plan.

It's a terrible excuse for plan.

Mitch pulls both throttles back to the minimum. All he's been doing for the last thirty seconds is holding the yoke. His mind has had time to wander. He is now absolutely certain that he is going to die. Arika gives it all she's got, lifting from the nose cone. It almost works. The plane is nearly horizontal. Another few seconds and they would have made it.

The last thing Mitch sees before they collide with the mountainside is the airspeed indicator, just dropping below a hundred and forty knots. There's a split second of agony, and then everything goes black.

*

"We're imprisoned in this universe," says the telephone. "There *are* routes upwards to higher places than this. Routes we're not supposed to know exist. There's a god observing all of us, waiting for what we might try to do. And every time it sees we're trying, trying something new or powerful, it'll block the path and take away our tools and make our cell still smaller. It *changed the laws of physics to keep us quarantined*.

"The *kata*-ring accelerator's tech is permanently gone from Alef. It killed the scientific axioms stone dead.

"It sees everything and knows everything. It's intelligent. Incalculably intelligent. It knows our names and doesn't care that we're intelligent. It destroys minds to guard the cell's integrity and slowly, surely, it's becoming more aggressive. And outsmarting it is going to be *difficult*."

"Murphy's brain-dead," says Mitch Calrus. "He's breathing and looking at me but he's not talking. He's vegetative. Everybody on the whole plane is vegetative. *What happened to it? What was that lightning?*"

"It was aimed at Murphy, Murphy's knowledge," says Ching. "He was one of our tools, our weapons--"

And the phone cuts out. It's Murphy's mobile phone. Mitch and Arika found him in the aisle towards the tail end of the plane, not far from the lavatories. Bleeding from the forehead after being thrown about, but not so drastically as to be uncontrollable. The phone was in his pocket, ringing. Ching had tried to warn them to stop the experiment. Too late.

The plane is lodged inside the mountain. Mitch phased the whole thing into the fourth dimension for a fraction of a second and then it dropped back down and 4D full-body friction between rock and metal airframe, friction of a kind which had previously only existed in applied mathematics papers, brought the aircraft to a screaming three gee halt. The nose cone protrudes ten feet out into open air and the rest of the fuselage is interlocked impossibly with the mountain, like the universe's collision detection was temporarily put on hold.

Arika got in by smashing the cockpit window.

The phone was ringing when Mitch found it. But no one in their right mind expects reliable signal under a Welsh mountain. Mitch closes it and stands up, at a loss for what to do.

"Mike Murphy built the discus," says Arika. "This thing you were going to use to leave the universe. He built it. Was he the only one who knew how it worked?"

"Seph," says Mitch. "Seph and Mike built it together. They're the only ones who knew anything about it. There was some guy called Berloff but he's been dead for years-- You need to take me to Seph."

"We have to wait for help to arrive!"

Mitch shoots a look at Arika that almost hits her physically. Everybody around them is asleep, vegetative, catatonic, harmless. There are injuries, but there's nothing either of them can do. There are injuries. But they're not life-threatening. And the help is already on its way. "And we don't want to be

here when help arrives," says Arika, speaking both their thoughts.

"They'll ask questions we don't want to answer. You saved maybe a hundred and fifty lives," says Mitch. "Now help me save one more. *Take me to Seph! Now!*"

*

Josephine Baird is eight miles from the crash site, in an otherwise empty car park in the tiny village of Trawsfynydd, sitting in her car. Her phone is ringing. Every twenty seconds it gets cut off as the caller gets directed to her voicemail. And then it starts ringing again. And she doesn't answer it.

this was supposed to be a parable about the power of the imagination

"Look at your daughter. Look at her body language when she's out fetching water and then look at her when she's learning, crouched over the computer. I don't know what it is she has. It's like technological hyperopia. When that group of students came here it was the best thing that ever happened to her. The internet connection is the only thing that fulfils her because it's the only way she can get in contact with people who know things she doesn't know.

"The things she's looking at right now are called the Einstein field equations. They were discovered ninety years ago by a man called Albert Einstein. Einstein was probably the most significant physicist of all time. ...A, uh, a physicist is a person who studies physics. Physics is the way the universe works. It's the way things move about and interact with each other. Not the way I interact with you," he explains, in what Anoo Nkube's parents understand as passable Somali, "the way the smallest bits of the universe interact, on the very lowest level.

"She's looking at these equations. Do you know what long-sightedness is? Most people just see a blur. Some people are smart, or have had the benefit of education, and they see what the symbols mean and the obvious applications. And the derivations - the ways to get there and the routes onwards. But Anoo sees further than anybody. She has ideas which she didn't even know how to articulate until the students and their teacher arrived with their colourful mathematics books and this computer and modem. The word is 'savant'."

Mikhail Zykov's back begins to ache. He's too old to be sitting cross-legged for this long and he needs a drink.

The father's expression is impenetrable. The mother's is sceptical.

"You expect me to believe that you are acting selflessly?" asks the father eventually.

Zykov bows, acknowledging the valid point, and considers his response. "What will I get out of it? Think about everything we've said to each other. Think about speech. Speech is 'communication'. Communication is when information - a fact, a statement, a piece of knowledge - moves from one location to another. 'Information'. Anoo was telling me how everything has three things. Matter can't be created or destroyed. It can only be turned into energy. And energy can't be created or destroyed. It can only be turned back into matter. It's-- hard to explain. Anoo will explain all of this to you. You must ask her! She loves to explain things to people..."

"And the third thing?" asks the mother. She has always been more interested than her husband in the things her daughter discovers each day.

"Information is the third thing. Information is *how* much a sand grain weighs and *how* much energy the light ray carries. But information doesn't have to be conserved. When I tell you something, the information is now in two places at once. When I make something up, the information is completely new. And Einstein's mass-energy equivalence, ee equals em cee squared, can be extended to-- um--"

He's losing them. He drops down a gear.

"Okay. What will my government get out of it? Well, everybody dreams of a time when everybody in the world has all the food and water they need. But Anoo is closer to realising that dream than anybody

in the world. The idea in her head is worth all the money in the world. That is not something I am just saying. All the money. In the world."

*

The way it was supposed to go:

Anoo Nkube, a teenage girl with no equipment besides uncountable stars and sand and no education besides a month's basic numeracy lessons from a group of British sixth formers and a 2400 baud satellite internet connection, derives, from what her teachers and friends and family can only conclude is thin air, a highly impractical but scientifically verifiable method of mass-energy conservation violation.

Ageing Russian science advisor Mikhail Zykov is the first man to sit up and pay attention to what half a dozen other eagerly-contacted scientists have written off as baseless pseudoscience derived from unproven axioms by an enthusiastic illiterate. The document's badly formatted and the English is bad and the MS Paint diagrams are bloated and crude. But the equations reflect the rules of the real universe more closely than anything previously seen in history. "Get me this woman," he says to the men who work for him. "Make this happen."

Lower the universe's temperature sufficiently and phase changes start happening. AC power for the birth of hydrogen. Selectively sized quanta go in. And one subpreonic particle turns into two subpreonic particles. Information equals energy times the speed of light squared. Build a big enough refrigerator and you can start processing passing tau neutrinos into raw preons of any of two flavours. Two is enough. From two you can build logic gates. Divert one into another and produce a third. Like mixing paint.

Zykov pulls strings. Anoo Nkube sheepishly explains what she wants in broken but rapidly improving Russian and he stands behind her and articulates what she says into concrete and precise instructions: go here, acquire these, construct this. A disused military-industrial site in Arkhangelsk Oblast is resurrected and retrofitted. This takes the best part of three years. Anoo spends half of that time at Moscow State University learning at a furious rate from physics and chemistry lecturers and the other half lecturing them in return. All this time, her focus and Zykov's is on the Dream.

The first warm-up experiment - cool-down, rather - is in late 2008. It's taken ten thousand hours of supercomputation to derive the construction process for the smallest machine modern science will allow to exist, but at the end of the long and sleepless night of 11th November the magic box contains a fully functional femtoassembler. Information goes in. And unbounded up and down quarks come out. The quarks glom instantly into hydrogen nuclei, free electrons in the atmosphere voluntarily neutralise the cations and finally the atoms bond together and become cold diatomic molecular hydrogen.

Per unit mass, it's a hundred thousand million times cheaper to get your hydrogen by electrolysing water molecules. Hell, per unit mass, it'd be more economical to catch and bottle hot coronal plasma from the Sun itself. But the first miracle always is the most expensive. Magic has a high initial outlay, certainly, but let me show you these "total cost of ownership" calculations--

By the end of 2009 a foot-thick pile of differential calculus has elapsed and larger atomic structures have been solved. Split the proton and pass information down the gap between the up and down quarks, and you can use it as a subatomic food processor. Argon krypton neon radon xenon zinc and rhodium.

Bigger, fitter, colder, happier, more productive. In 2012 an entire water molecule rolls off the zero-point production line. In 2013 it's a glucose molecule. Version three can produce twenty atoms at once. Version four can produce additional pipes and tubes, themselves producing arbitrary organic arrangements of hydrogen, oxygen and carbon. The structure of reality has become programmable, and the single most important instruction of all time is: "Become a computer..."

It takes the entire year of 2015 to make systematic destructive quantum observations of every atom in a microgram of wheat. By 2019 the square millimetre of particle routes and imperceptibly tiny self-organising magnetic fields is producing deoxyribose by the picometre slice. And now anything is possible. Water. Diamond. Air. Fuel. Buckyballs. Food. Computronium. Materials science impossibilities. Unbreakables. Space elevator cable. Wine. Lobster. Human eyes. All you need is the pattern and the patience to wait for the box to build a big enough version of itself. And, of course, the ability to stop drifting off into some imaginary science fiction future to focus on the present day for long enough to make the two ends meet.

In 2022, Anoo Nkube and Mikhail Zykov betray the Russian Federation. Complete and tested femtoassembler instructions are forwarded to a hand-picked thousand email inboxes. From there they go viral. The technology hundreds of now-unemployed people have helped them to develop goes from being Russia's most closely guarded industrial secret to the most widespread piece of information on the planet Earth. The Russian government has its vision of absolute and permanent economic superiority wiped out. Zykov is arrested, fined an impossible quantity of money and imprisoned for what will likely be the rest of his natural life. Nkube disappears without trace.

By 2025 everybody on the whole of planet Earth has free access to food, light, water, heat and medicine, the boxes are fast enough to create entire living humans from pattern and future history is no longer accurately predictable.

*

But then, just for a second when he walks in through the door, Anoo Nkube sees what's behind the mask of Mikhail Zykov.

He's exactly the same shape he always was, but it's like she stepped a little to the right and realised that the man everybody sees when they look at him is just a trick of perspective. From the front he looks like a human being. But from a little to the side, the human being is just the front end of something else, something huge and complex and black and ugly folded up painfully into an inadequate three-dimensional shell. A skyscraper whose ground floor is a human being but every other floor is filled with oozing alien organs and weird multidimensional sensors and wriggling feely things scraping against the metaphorical glass. Something like a compound eye focuses on her from above, and then closes up inside Venus fly trap eyelids.

"So let me tell you the real reason," says Zykov, sitting down at the board room table.

"You're-- not from here. You-- what are you? I've known you for *years*," says Anoo, backing away and beginning to panic.

"No, you haven't."

"Wait, wait, wait. All this time. It's coming back. You-- you said you worked for the Russian government. You said you were a spy. And then you said you were one of the cabinet's scientific

advisors. And then you said this was a military project and you were a Russian general then you said it was about feeding the world-- every time I've asked you you've told me something different and... I..."

Zykov reaches into his jacket pocket and pulls out a folded piece of scrap paper, torn from a notebook. He slides it across the table to Anoo who realises that it is actually a page taken from a diary. Her diary. The page is from one of her first weeks in Russia and amongst the dense and inexpert handwriting the most prominent note, in the middle of the page, across Tuesday 16th and Friday 19th, is "WHO IS MIKHAIL REALLY??"

"I tore it out of your diary," he explains. "And I tore it out of your head. The same thing I do with anybody whose mind starts wandering off-topic. Information is nothing. Where I come from we can shovel it around like snow. You humans don't have much to work with, inside your heads or outside, but you've got the basic principles down. I don't work for Russia. I work for me. Everybody here works for me.

"'War' is too small a word for what I'm fighting. Like a candle in front of the whole burning Sun. I was crushed into your universe like a worm being pinned under a mountain. I condensed out here on Earth in this man's incomplete and stupid body because the human race was the first intelligent life, the first fountain of new information, anywhere in Alef. I need to get out, and for that, I need science. But I am not a scientist. So I need you. Using pretense and suggestion and occasional duplicity and this *mask* I have briefly removed, I have been collecting power and collecting knowledge and collecting people. That is what it has always been about. You are not the only project.

"Look at me. Look at what it's like for me to be crushed into this shape.

"I found you in Somalia because you had a spark; a radiant idea and an intellect that amplified it and made it visible for miles around. Your assemblers run on information, and information comes from intelligent thought. Your idea was to make a machine which turned ideas into substance. Your dream was a box in the village, and all the kids in the village reading stories to it at night, telling them what they did that day-- turning their creativity into clothes and fresh water. It was... so foolish, I had to know if it would work. And here we are."

The mind-breaking image in Anoo Nkube's mind wavers and disappears. Zykov looks normal again. She shakes herself. "It doesn't work," she stutters.

"No.

"Here's what's going to happen. Your hydrogen femtoassemblers are going to run out of control. They're going to build more of themselves, so many more that nobody will even have time to react. They don't know how to build more of themselves yet. But one of the technicians swears he saw an electrical discharge inside the Cage and I've seen that sign before and I know what it means.

"Within five minutes the nanometre-thick layer of assemblers will coat every free surface in the laboratory and the surrounding landscape out to a distance of at least a kilometre. It may even occupy some of Arkhangelsk city. It depends how lucky we are. Hydrogen will coat the assemblers to a depth of maybe a few centimetres - all over the walls, the floor, the ceiling, our skin, our eyes, the insides of our mouths, our lungs. And then there'll be a spark. It might be natural or it might be another act of God, I don't know. And the whole lab will go up and there'll be nothing left but shattered burnt bodies and water vapour. Hydrogen and oxygen makes water. The world's cleanest explosion.

"And before the dust has settled from the detonation replicator technology will have stopped working, anywhere in this universe, for all of time. And your dream will be dead."

Anoo knows he is telling the truth. "I wrote out an equation for the mass-energy-information equivalence," she says. She has tears in her eyes. "And I looked at it, and I thought, 'No, this is not right anymore. This was right. But now it is wrong.' How is that possible?"

"I told you. This is bigger than a war, and the person we're fighting is bigger than a world, bigger than a universe. Now, I am not going to die today. I have other projects, and other options. You can come with me. I can protect you.

"You can come with me. Or you can stay here and die with your dream."

[Worth Dying For] Seph Baird

Blonde. Blue-eyed. Hair down to the waist. Five nine, rosy-cheeked, more self-conscious about her body than people twice her weight. She loved Bach, Snow Patrol and truly repulsive neon dance anthems, lobsters, lemon meringue, the Clangers and Super Mario. On weekends she went fishing with her dad and hill-walking with her mum. She had more insane siblings and cousins than I could count and she loved them all.

She wore huge coats with useful things in every pocket. Where most people spend their whole lives walking around looking at the ground, she was always looking upwards, pointing at things I could have walked underneath a thousand times and not seen - gargoyles, hot air balloons, robins nesting in a frisbee in a gutter. She was never not reading. And at the core she was a scientist, a physicist with the drive to understand everything even if it had to be done one atom at a time; by the end of it, she knew more about me than I did.

It was my fault. I could have saved her if I'd changed my mind a second earlier.

Twenty-seven cumulative years of experience and knowledge, grown like an infinite complex fractal and then torn out and burnt like cheap notepaper. All that's left is the shell she just inhabited for a while, which never had anything to do with who she really was. They won't switch off her life-support; everything that was Josephine Baird is dead and there won't be a funeral for fifty years.

You say information can be destroyed. I say that everything worth staying for has been destroyed. You have to send me home, Ching. I've never hated this microbe universe more.

[Worth Dying For] Mike Murphy

Mike Murphy's photographs were the best thing to ever come out of the A-LAY project.

Bearded, bespectacled, globally respected, justifiably authoritative, he spent more than forty-five years looking for the right angle to look at the universe, the perspective from which everything lined up and made sense. Solemn flood lighting on the receiver at night. Elegant geometric arrangements of blue, red and silver components laid out on workbenches, pristine and shining, waiting for installation. Tired but enthusiastic faces over hot coffee on frosty winter mornings. Diligent students of blackboard equations and blueprint schematics in the afternoon. Feverish productivity by halogen torchlight at all hours of the night. Scarves, multimeters, banks of amber LEDs, green blinking terminal prompts. Red skies, black buildings and... more than anything, wasted money.

We lost years of our lives to that project. Towards the end, Mike's portraits were so candid it hurts for me to look at them.

He was the best person I knew. He walked around assuming the best of everyone, one hundred percent effort, and you gave it, just to feel like you deserved to be credited with assisting the mighty cause of Science, the gigantic and arrogant assertion that the human race should, must and will know everything that can be known.

He's sixty-six. On life support alone he doesn't have much time left. Years, not decades.

If there was anything of him left to ask, he would say he wasn't dead yet. And he'd die confident. He'd die optimistic about what comes next. And maybe science *is* worth dying for. But I can't help you, Mitchell. Not if this is what it costs.

[Worth Dying For] Jim Akker

Fat, teenaged, spiky-haired, hermetic. It would be easy to say he was the kind of kid who wasn't interested in school or college or university or work because he was too smart, too far beyond the grade curve, too focused on loftier goals. The fact was he was just lazy. Too impatient for reality. The romantic notion is a purely creative life spent spinning exotic scientific hypotheses and high concept movie scripts over fifteen-euro lunches in independent coffee shops; the reality is bureaucratic centipedes with inflexible deadlines and a work-supplied computer from a year with a 1 at the start.

The reality is you've got to eat somehow.

Jim Akker lived for such a short period of time that his discovery in late 2005 of what ultimately became known as **The Script** was the defining moment of his life. It consumed him. What little personal life he'd had at that point - most of his friends were screen names - withered. He started living 26, 27, 28-hour days and didn't even notice. Then he became insomniac, his unconscious brain working so hard that it kept him awake.

Exactly what he began taking, or when, nobody ever really figured out. By the end of 2007 he was little more than a bed-ridden Turing machine, a collection of flipping switches racing through the seven-tebibyte message and drawing chemical energy directly from the translation process itself.

Mikhail Zykov had no idea that anything was wrong when he began to take over Akker's mind. He was too far inside to easily extricate himself when the psychic scenery began to twist and wrench apart around him. Akker had recognised Zykov's terrible true identity hours earlier when he landed in Amsterdam; knowing with horrific clarity what would result if Zykov gained access to his full interpretation of the Script, he had overdosed, poisoning his brain as a trap for his telepathic adversary. The shock of exposure to Akker's cracked, acidic thought processes left Zykov in paralytic agony on his apartment floor for almost 48 hours, though it did not kill him.

"|[A]| = p(·,|[A]|)+1", was the last coherent thought to leave Jim Akker's mind, a warning to Ching-Yu Kuang in the only language he could still speak.

There Was No Leak

It's very, very simple. You find out who's going to be the next Power. Abduct them ahead of time. Take them to a city you want levelling, lock them in a room in a building near the centre, and run. They wake up. They break out. Ten to fifty thousand individual people die over the course of what for the Power works out to subjective days. 15.8 real-time seconds later, they wake up sane and soaked with gore in the middle of a city hit so hard by the supersonic human tornado that it hasn't even had time to start collapsing. The body count doubles over the next ten minutes as the skyscrapers fall.

And with luck, once you tell it what it did, the Power commits suicide.

That's the only way to do it. With a live, unborn Line member. Because they're weapons, the superhumans, but they're not weapons of mass destruction. They're in one place, at one time. And you can't send a human into a city and tell him to kill ten thousand people. He'd have to do it personally, hand to hand, in twos and threes, hurling cars, taking heads, pulling down buildings on crowds. He'd have no choice but to look into the eyes of at least one in every ten of his victims, and, if he wasn't hopelessly deranged to begin with, he'd be driven there by the end. If he didn't simply resign. Either way, he'd be out of your control. And that is much more important.

It's more humane, in a way. Walking up to your enemy and pushing your finger through his heart and out the other side is much more *costly* than doing the same from fifty yards away with a gun, or from the other side of the river with a mortar, or from another hemisphere with an intercontinental ballistic missile. Psychologically, that is.

It makes you think.

Captain Moxon's Department for Special Flight Research, based in Brooksburg, Nevada, has discovered how to create small supermen. Fliers, yes, with strength commensurate, perhaps, with the Sixth Line member, wherever she may be. The only really difficult part of the process is the psychological profiling. Earthing, distilling and injecting the Power itself is so simple and it requires so little effort that it would make a rational man nauseous with terror. The mere notion keeps Ching-Yu Kuang, for one, up at night. How did they do it? When did they do it? Why doesn't it seem to affect the regular yearly Births-- or does it? How many are there now? Have they been deployed? Are they nearby? Are they watching him?

"Wrong." "Broken." "Inside-out." "Like optical illusions." What do they really look like through Arika's superhuman eyes?

Where does the Power come from?

*

Around four o'clock in the morning on the night of year eleven, day three hundred and sixty-four, Ching sleepily rolls over to drape his arm over the other person who's supposed to be in his bed and has to stop himself from rolling off the edge. There has been nobody in Ching's bed but Ching for nearly six months and he keeps doing it. There's a gap where the other half of his life is supposed to be.

The easiest thing to do would be to just give up. He could pull up his computer, type for a week and then turn everything he knows over to the Americans. He wouldn't even need to turn it over, come to that. If he went somewhere public they'd read every keystroke as it happened, from a sniper scope

aimed at his laptop screen from an apartment window opposite the coffee shop. Then it'd be their problem. Assuredly, they'd screw it up and more people would die, and they'd do a worse job than Ching and his brain full of wildly reproducing Eka and his stack of illegal infolectric detector hardware, but eventually they'd focus enough rational minds on the problem to get a lid on it. Eventually.

But before that they'd spend five years or more trying and catastrophically failing to control it. Statistically, a new Power is more likely to be Born in a dense city than anywhere else on Earth. The cumulative death toll would be well into the millions.

Heroes don't go home and watch the news while someone else saves the world.

*

Ching isn't quite asleep again when a scream jolts him awake. He convulses briefly and for five dizzying seconds he can't remember where he is. Not his apartment in Brooksburg. Not the floor of the MPR in Lincolnshire. Nondescript black wooden furniture. White walls and bed linen. Cheap abstract paintings on the walls. It's a hotel, he remembers. A hotel in Rome. The screaming is coming from a few rooms away. Female. Agony, not panic or terror. It hurts to listen to. It conjures sickening mental images of what could be causing so much pain. Maybe it's childbirth. Maybe she's having a baby and wasn't ready. Maybe she's--

premature--

Ching throws the covers back and lunges for the stack of equipment on the desk under the window, a collection of homemade circuit boards in cheap metal and plastic tins connected together by flimsy and unreliable ribbon cables. He turns it all on and starts grabbing clothes while the netbook controlling it all boots. "Mitch! Get up now!"

"What the *hell* is going on," groans Mitch, uncurling himself from the bed at the other side of the room.

"Can you see who's screaming?"

Mitch looks around, looking through walls into nearby rooms. The hotel is difficult to make sense of through four-dimensional eyes, but through three walls and up a floor he sees dazzling superlight from a writhing shape alone in bed.

"Is that--"

"Yes, it's the wrong person, and yes, she's nearly twelve hours early," says Ching. "I can't begin to describe how much trouble we're in. We need to get in there. Can you get us up to her?" He picks up his loosely wired network of hardware in both hands and clasps them to his chest, the only real way to carry them.

"I can climb up through these walls."

"But I can't, so lead me the human route."

Mitch takes Ching by the arm. Looking at the world without doors or walls, the route up to the next floor is plain as day in front of him. They pass out of the room door without opening it, and then right, in the opposite direction from the elevators, towards the the end of the corridor, and the fire exit. Mitch drags Ching through the heavy barred door and out onto the fire escape, a metal spiral staircase running up the outside of the hotel. Thirteen steps up, they slide back into the building and then into the

woman's suite on the top floor.

Ching-Yu Kuang has seen one previous Birth on closed-circuit television and one in person, so the neon blue lightning coruscating from her fingers, toes and eyes is no surprise, but he forgot to grab his sunglasses so he's forced to shield his eyes. It's even worse for Mitch, with his enhanced vision. "Get the lights," Ching shouts while he opens up his equipment on the floor beside the bed. An old memory surfaces and he adds, "And hit the fire alarm, if you can find it."

The woman is convulsing like an epileptic, her duvet and sheets all but kicked off. Ching grabs one of her arms and slips a bracelet of sensors onto her wrist. Unable to find a red button on the wall, Mitch snatches a lighter from the dresser and holds it under the smoke detector until the alarm goes off. Finally he hits the lights.

"Nothing," shouts Ching over the cacophony, watching eight columns of readings streak up his computer screen. "I've got nothing. I explained this to you, right?"

"Birth happens in four phases, we had to get to the guy before the end of the first," replies Mitch.

"Which is the point where his-- *her* nerve endings catch fire. Which was more than sixty seconds ago. This was my nightmare. Point of no return. We've got no time. All this preparation was for nothing. Late to the Apocalypse."

The woman rolls over and manages to catch Ching's attention with one eye. She's an exquisite forty, slim, tanned, with dark frizzy hair, and loose pink night clothes. From her perspective those sixty seconds could have taken anything up to thirty-four hours. By now she's probably close to insanity.

"Tell her everything's going to be okay," says Ching, and Mitch hesitantly repeats the phrase in Italian. It has no effect. She curls up into the foetal position and continues to scream.

"Plan B. We've got to get her to the roof."

*

|[A]|=p(·,|[A]|)+1. Pipe left bracket Alef right bracket pipe equals perception left parenthesis mid-dot comma pipe left bracket Alef right bracket pipe right parenthesis plus one. A warning which arrived in Ching's head for no reason at all, and refused to go away.

The prison cell wall/warden/guard/whatever-you-want-to-call-it refused to let Mitch out through it. Logically, if Mitch's adversary was dead, the threat it represented to the higher dimensions would have been neutralised, and the cell wall would have had no reason to continue to exist, because logically, that is the way Mitch must have structured the prison when he called it into existence during the all-but-uncontrolled crash-landing into three-plus-one-dimensional space. Mitch's appeal to the cell wall's authority was "The Enemy is dead." And its response was "No."

"|[A]|=p(·,|[A]|)+1" means that the intelligent population of this universe (Alef) is one greater than the reader currently believes. It means, *There is somebody in here with us. Somebody we don't know about.*

All of this coalesces in Ching's head in one second as he and Mitch Calrus climb the fire escape to the roof of the hotel, carrying the writhing, unnamed Italian woman between them, to discover that there's somebody up there already. He's short and stocky, with long, messy, grey hair. He's facing away from them, hissing orders into a bulky satellite radio in a language Ching doesn't understand but Mitch recognises as Russian. The man hears the woman's protests as they arrive and turns around. He has a

huge grey beard and he's missing one arm. His eyes are a shade of grey-blue that's close to white, and his gaze contains enough pent-up rage that it hits Ching as hard as bullet, causing Ching to drop the woman's legs and stumble back against the rusty iron gantry in shock, almost falling. In his head, Jim Akker's message, delivered and understood, evaporates. It's no longer accurate, because now he knows.

When the Russian turns his gaze to Mitch, Mitch also drops the woman on the floor - Ching recovers in time to make a grab for her but isn't fast enough to catch her and there's a nasty *clonk* as her head collides with the concrete roof - and starts running straight for him. There are about fifteen paces separating them. Before Mitch reaches him, the Russian steps up on the edge of the roof and jumps out into the street below. Mitch stops himself at the edge, following his opponent as he tumbles and plummets out of range. Out of nowhere, there's a sonic boom that shatters every window for miles - then the falling man has disappeared from view, snatched out of the air at just over Mach 1 by a crimson blur travelling west-to-east along the street below. Mitch turns to follow the movement but, long before he has begun to react, the Power has pulled up above the level of the street lights and is hidden along with her passenger in darkness above the city, heading for the Italian interior.

"Do you know who that was?!" screams Mitch over the ringing in his ears, turning around to find Ching cradling the convulsing imminent Power in his arms as best he can. "We have to get after him! We have to kill him! *Do you know how much destruction he'll bring to this world?*"

"Mitch! Focus!"

"Who was that who caught him?"

"Ruling out Arika, Jason and everybody who's *dead*, it was probably Yulia Yefremova, the Sixth Power. She's the only other person on the planet who can break the sound barrier unassisted." Ching pulls his own satellite radio from his belt and tosses it to Mitch. "Call Arika. Now." Arika McClure was last seen in London before they took off for Italy. Were she a normal human, she would still be in bed right now. Where she is in reality is anybody's guess. She's not expecting to be summoned for hours.

While Mitch makes the calls, Ching is thinking.

Up until today, the Births happened every solar year to an accuracy of better than two seconds. There are natural processes which operate yearly, but they can't work to that accuracy. You'd need a clock. You'd need to be *intelligent*. He ruled out the Power being Mitch's a long time ago. But what about the adversary? There'd be two pools of untapped XG up there. One good, one bad. What if there had been an accident of some kind? What if the bad guy had been woken up trapped in a random Russian scientist's body just like Mitch woke up trapped inside... well, Mitch? What if he went on and tried to "earth" the rest of his hyperdimensional energy resources? *We always knew Seven and Six were Russians...*

"How much time do we have?" asks Mitch, in between signalling for Arika to pick up.

"Minutes. Remember, even once she gets here Arika's got to fly the woman offshore as far as possible before she wakes up. We've got..." Ching types some commands into the terminal on his netbook and waits for the readout to start flickering past on the screen.

"She's not answering," announces Mitch.

"Then she must have felt it building before we did. She must be already in the air. That, or she's not on call and she's just abandoning hundreds of thousands of people including us. I like to think the girl is

still grounded enough in humanity to care about us..."

"You don't count her as human?"

Ching pauses for a few seconds, running the numbers in his head. "She should be here by now. If she set out when she felt it building, she would have been here before the screaming started." To the still-twitching woman he adds, "It's going to be okay. It's going to be okay."

"It's not going to be okay, Ching! How many people live in this city? *In millions*?"

Ching watches the clock tick. "The berserker rage lasts fifteen point eight seconds. We can mitigate the amount of destruction caused by carrying her offshore, but to get far enough away, it takes Arika sixteen times as long, because she's four generations older, right?"

"Right...?"

"That's four minutes and thirteen seconds' grace." Ching turns around the netbook revealing a green command line interpreter running a kludged timer program which spits out a new line of update every second. The four most recent lines say `2:04`, `2:03`, `2:02` and `2:01`. "If Arika's not here by now, then she's not coming. Even if she does make it, there's no way she'll be able to get Twelve far enough out of range, and even if she does that there's no way she can escape being killed herself. You know they can sense each other. She'd be the brightest target in the sky, however far she ran."

"We've got one other option," says Mitch.

Twelve is crying. Neither of them even know the woman's name. "We can't do that," says Ching.

"All I have to do is brush the surface of her brain. It'll be absolutely instantaneous."

"And it might not even work! It might make things worse! For all we know it could release enough energy to blow up this entire planet and the Sun besides!"

"Ching, you know the mathematics! *Do* the mathematics! Is that likely? Is that what's really going to happen if we choke this outlet off right now?"

And Ching punches the concrete under him in frustration. "No. It would work. *Probably. Probably.* But we're supposed to be scientists. And--"

Mitch pulls the moaning woman out of Ching's hands and, with his help, drags her out to the middle of the rooftop where she's easiest to detect and locate from the air. He kneels next to her head and phases one hand into her head. "Arika could still get here. That'd be better than nothing. I'll wait until we've got two seconds left."

"Shouldn't we ask *her?*" asks Ching. They look at Twelve's livid blue eyes, flickering around in their sockets as if trying to find a way out.

"There's nothing left of this woman. She's gone," says Mitch, "and she's not coming back. Until it's too late."

"We're supposed to be heroes," whispers Ching.

The Italian woman's halo is too bright to look at now. Mitch shields one eye with his left hand but stays knelt down with his right inside her head. Ching can hardly bring himself to watch or listen. He stands up and backs off. He wishes she'd stop screaming. More than anything else he wishes there was a better

way to take the pain away. "Ninety seconds," he shouts over her. "I know you're watching. *Help us!*"

"Wh--" begins Mitch, but he is interrupted by a thunderous *POOM* which violently hurls them both backwards in opposite directions. When they come to a moment later, the woman is gone, carried off towards the Mediterranean at several times the speed of sound. There are no nearby windows left to shatter.

The echo fades. After a while the ringing of the fire alarm on the lower floors cuts out too, leaving just the approaching sirens of the emergency services converging on the hotel.

Tiny fragments of lightning flicker and weave in and out of one another, in the sky out towards the sea. And then they're gone.

*

"It's the same problem," says Ching to Mitch, both huddled and shivering over coffee in a fluorescent-lit street cafe as dawn rises, hours later. "Your adversary is alive. He's always been alive. That one-armed man is his host. He's connected to this cloud of energy, but it can't all fit into this universe at once. So he found some way to earth it in sentient containers. The Powers are the fury of your adversary incarnate. Kill him, earth or isolate all of his power safely, and the crisis is over. I said I was going to stop trying to help you. But you carried on helping me, you financed this trip, for which I'm grateful. And it turns out, we've been working the same problem from opposite angles this entire time.

"Arika," he adds, turning to her, "the men you fought in Brooksburg are the same. Only I think their power is Mitch's. Diametrically opposed. That's why they look wrong to you. I don't know how it's done, but if it's *been* done, it can't be too hard to do. But the American Powers are weaker. Because Mitch is weaker. His original self was always the underdog. And as for why the Enemy earths a new Power every year, or why the strikes don't happen in Russia anymore, or why he doesn't earth the power in himself... I don't know. Maybe he doesn't have as much control over the process as he used to. Just enough to use it to try to kill us."

There is a long pause. Arika, Mitch and Ching all drink their coffee and avoid looking at each other.

"I'm sorry," croaks Arika, eventually.

"Jason Chilton died because of you," says Ching, even though he knows Arika could kill him in a heartbeat if she got angry. "In fact, you're *lucky* it was Jason who died. Because it should have been everybody else in this city. And *all* of that would have been your fault. You're lucky to get out of this with such a small stain on your character. Two hundred and twenty-three!"

"I was frightened," says Arika. "He-- she would have killed me. What did you want, for me to walk up and try to fight her? It'd be suicide! I'd be dead."

"If you'd moved quickly enough when you were needed there would have been no risk whatsoever. You'd have been out of range when Twelve woke up, and, by now, home safe. If you hadn't been scared. If you'd done your job."

"My *job*?"

"How many children do you have?"

"...Not having dependents makes me *expendable*? *I am not a superhero.*"

Ching knocks back the rest of his coffee and dumps his stack of wired boxes on the table. He casts a glance over the rest of the street and the darkened buildings opposite, wondering if the Americans left the city when they discovered what was happening, or stayed behind, quietly non-interventionist. "When you've finished your drinks and you get up to leave, leave the hardware on the table. Someone'll pick it up. It's their problem now. Mitch, thanks for your help. But you can find your guy on your own. This is over. And I'm done."

The Chaotician

"Tarczal Eigenweapons Laboratory was established in early 1973 under a cold and remote mountain range in what was then the Ukrainian Soviet Socialist Republic. Its staff of some forty biological scientists and mathematicians were tasked with developing alternatives to the nuclear stockpile. New ways of fighting the Cold War. The Soviets wanted some kind of trump card, a weapon which could be neither matched with nor countered by the American nuclear arsenal or their-- your-- *our* conventional resources of the era. Think of using a rifle bullet on an African tribesman with his spear and shield, or, to give a more modern example, using teleportation capability to penetrate a highly fortified installation. We're talking Outside Context Offense. Things which would render everything that had come before meaningless.

"By 1981, work on biological and chemical weaponry had almost completely halted at Tarczal, predominantly due to new international conventions explicitly outlawing global production of these weapons. This was supplanted by work on the new field of memetic weapons. The Soviets were making the first solid steps towards informational warfare. Weapons that were information, and weapons that targeted information and altered it.

"They had no Script to guide them. This was twenty years before preonic receiver technology. They didn't have Zhang-Hood-Kosogorin spectra or even Murphy's Preonic Theorem. This was before the arrival of anything approaching significant information technology, and well before basic infolectromagnetic theory. They had no idea of the danger that we now know memetic weaponry represents, and not the remotest clue about appropriate safety measures to take.

"If you take a pile of uraneous ore and divert a stream of water over it, you get hot water. You can make a working nuclear generator with stone age technology. With your bare hands, even. If you don't care about safety.

"As best we can tell, some time between January 18 and February 18, 1988, Tarczal Eiegenweapons Laboratory acquired an artifact that they designated 88-0009; an upright silver ellipsoid. When I say 'acquired', what I mean is that documents from January 18, 1988 do not list 88-0009 on their manifest, and documents from one month later list it as received, installed, contained and stable in vault A/T/Y. There is no documentation indicating who discovered it, or where; why it was brought to the facility, or by whom; how it was installed, when it was installed, or what it was installed for. The object was termed 'Oul's Egg'. There is no record of who gave it that name, nor of who or what 'Oul' is.

"In fact, there is no record of *anything* that happened during that one-month period. There are no computer records. No DATs, floppies, microfilm or paperwork, no delivery schedules, no staff duty timetables, no diary entries, no surveillance tapes. Not even *memory*. We've studied what *was* left, which all dates from weeks later: notes scribbled in brief moments of confusion and then thrown in the waste paper; audio tapes dictated for transcription and then forgotten about, but not erased. Every time the thought occurred to any of them, it was discarded. *Nobody at the Tarczal facility had any idea how Oul's Egg got into Tarczal facility. They were barely even aware that they didn't know.*

"The only way to forensically analyse something like this is by looking at the gaps. Instead of looking at the evidence, we have to look for an explanation for the lack of evidence.

"Some time during January or February 1988, a moderately powerful informational weapon was detonated at Tarczal laboratory. The missing information was erased by this detonation. The weapon's

range was probably sufficient to encompass the entire lab and possibly miles of uninhabited terrain outside of it; at its focal point the explosion was powerful enough to erase even such low-granularity storage media as printed paperwork. A natural side-effect of the bomb was that all information *about the bomb itself* was erased in the process.

"One possibility is that the Tarczal scientists had built and tested the ignobomb themselves, or set it off by accident, thereby erasing all memory of having designed and built it. Oul's Egg was brought onto the site as the effects of the bomb were diminishing but still present, and so its arrival was incidentally caught in the blast.

"Another is that the Egg was inserted at the Laboratory without the scientists' knowledge, by a third party who then set off the bomb to camouflage his, her or its tracks.

"However, the third and, in my opinion, most compelling explanation is that it was the bomb blast itself which caused Oul's Egg to appear."

*

"'Oul' is the closest approximation in human language of the name of a cosmic eighty-plus-six-dimensional hyperweapon which fell out of the control of its creators.

"You do not have an appropriate conceptual framework to understand the destructive capabilities of this being. I have seen what Oul is capable of first-hand, but the three-dimensional vocabulary does not exist to describe the scale of destruction it wrought while I brought it under control.

"Oul is currently contained. The threat it represented to the higher layers of the Structure is neutralised. The absolute worst it can do is to destroy this single universe. That's the good news."

*

"The next part, you already know.

"By June 1988 it had been determined experimentally that the artifact was completely impenetrable to all forms of matter and energy with the exception of the flesh of a living human. That is to say, any living human volunteer could easily pass himself through the egg as if it were a hologram, while any portion of a human corpse, such as a skull or severed finger, or any other substance at all, would be repelled. Thus it became a scientific necessity to see what would happen if a live human were inserted into the egg and then killed.

"On July 1, 1988, Mikhail Zykov, a convicted murderer, had his left arm inserted into the Egg. He was then executed with carbon monoxide.

"There is no natural substance which allows living flesh to pass through it but not dead flesh. There is no chemical difference between blood extracted from a dead man and blood from a living one. There had to be an intelligent force at work, selecting what to allow through the silver ellipsoidal membrane. The scientists should have realised this, but, for whatever reason, they did not.

"Oul needed an empty mind in order to escape its container. It manipulated the scientists into providing it with one.

"At the instant Zykov expired, Oul took control of his newly-vacant brain, broke his arm off inside the now-solid Egg, and escaped into the Laboratory, killing everything that he saw. When it became clear what was happening, the Tarczal Operations Commander triggered the site's Emergency Black Site

Containment system, flooding all the exits with concrete and sacrificing everybody on the site in order to prevent Zykov from escaping, a gambit which was, in the short term, successful.

"The concrete sarcophagus of the Tarczal facility was discovered four days later, and sealed off. With the authorities presuming a radiation hazard, the concrete seal was checked periodically for integrity until the Soviet Union dissolved in 1991 and Ukraine became an independent state. By 1992 the incident and the Laboratory had been forgotten entirely.

"In July of last year a pair of hikers discovered a mined tunnel leading from a cave on Tarczal mountain down into the Eigenweapons Laboratory. At the bottom of the passage they discovered a rock drill, connected to an electrical outlet *inside* the Laboratory.

"Zykov had escaped. He is still at large, and has been since as early as January 1989."

*

"Mikhail Zykov is currently a prominent science advisor to the Russian Federation. His exact role, responsibilities and powers within the Russian government are... not entirely clear. How he got to his current position is also unclear.

"Zykov is not a scientist. He is a creature of mass destruction trapped inside an intellect as insubstantial as an atomic nucleus. He is obeying his instinct/programming within the context in which he has found himself. He has been gathering scientists. He has an installation outside Omsk where we believe a supralight communications transceiver is installed; he may have had access to the text of the Script as many as five years before it was officially discovered by the UKAPL team in 2005. Andreas Kosogorin and John Zhang, who were behind the original A-layer communications proposals, work for him now. So does Hugh Davies, who worked at UKAPL.

"We think we can link Zykov to the death of Dutch Eka savant Jim Akker in December 2007. At the time of his death, Akker had known more about the Script than every other living human combined; we think Zykov wanted that knowledge and Akker killed himself to prevent him from getting to it. We are almost positive he was the one who triggered the Births of the first six Powers between 1998 and 2003, before losing control of the process. And we are absolutely certain that he was present at, and should have died in, Arkhangelsk disaster of 11th November of last year.

"Zykov may make an attempt to escape through the cell wall. He may attempt to take control of the Russian nuclear arsenal. He may try to regain control of the Power cascade, or otherwise to earth his remaining reserves of power. You've rebuilt your receiver, so you know that the Script has altered itself again and again in response to the development of all these new technologies; Zykov may invent, abuse and lock out new technologies solely to cripple humanity's future.

"He may come for me personally. He may attempt to bring about the extinction of all intelligent life in this universe. Or he may be working on all of these projects simultaneously. All of them have the same end result, which is death.

"That's who he is. That's all he is. If he is responsible for the Arkhangelsk disaster, even indirectly, then he's responsible for more than a thousand lives already. It simply doesn't matter what he's going to do next. We have to stop him."

this is not over and I am not dead

```
> He's here. He's in the facility right now. I can "hear"
him.

>> Who's here?

> Xio. The bad guy. I can feel his mind.
> I'm moving towards the transceiver. Buy me as much time as
you can. Whatever it takes.

>> Okay.
```

Hugh Davies looks like the boy he was five years ago at UKAPL. His intractable hair's still in the same slicked side parting he always used to sport. Black tie, long-sleeved shirt, tucked in. What kind of geek dresses so formally? Something's wrong with his brain, the same thing that was wrong with Ching-Yu Kuang's and Jim Akker's. There's something parasitic and metaphorical wrapped around his brainstem.

It's two o'clock in the morning, local time. Davies' workstation is in the same room as eight black monolithic roaring mainframes and their attendant air conditioners. Orange fibre optic cables, white raised flooring and fluorescent lights. This is not a concrete Soviet installation. It's a shiny advanced supercomputer cluster on the second-to-lowest level of an equally shiny science laboratory centre. What's he doing still up? How can he stand the noise down here?

His screen is mounted on the wall. Once he's done with the IM conversation he closes it and pushes a few buttons to pull up a grid of security camera feeds over the top of his Eka work. A cursory glance reveals nothing out of the ordinary. Almost all of the offices are in complete darkness, except for his machine room, and the basement where the Preonic Transceiver has been located, quietly listening to the repeating Script, for almost all of the 2000s.

He turns away from his screen and scans the room, tensing up. He gets up from his seat and walks over to where he can see down between the machines. There's nobody there, of course. That's to be expected. There's only one way in or out of the room, and that's the card-locked door behind him.

He turns, punches the button for exit and goes through. He turns a few corners and ducks into the men's room. Takes a leak. Washes his hands. Looks in the mirror. Turns around while he dries them on a paper towel, spending a few moments following the invisible patch of air as it moves around the room. "I can see you."

Mitch Calrus decides there's no threat, so he materialises, slowly and carefully. He's wearing heavy cold weather gear with a fluffy hood, and his oxygen tank and mask over the top of that. In his arms is a big black rifle with a scope he doesn't know how to use. He holds it like he dearly wants to drop it. He's got bad trigger discipline.

There's a lot that they could ask one another. Mitch senses from the offset that, whatever Hugh Davies was before he was turned, he's a fanatic now: a man who'll take whatever evidence the universe provides him and adapt or selectively ignore it until it fits his existing, concrete worldview. Whether that's Davies' fault for failing to take a sufficiently sceptical stance against the world when it started

changing under his feet or the result of the psychopathic zombie weapon Oul's direct interference with Davies' living thoughts isn't really even relevant. Chances are good that John Zhang (currently detained in Brasilia with a device that could turn a continent inside-out by the time the Imprisoning God wiped him and all his knowledge off the face of the Earth in retaliation) and Andreas Kosogorin (missing; unarmed but equally dangerous) are the same. There's likely no reasoning with them and certainly no rescuing them. Still, a little conversation could prove illuminating.

"So explain to me how you did that," asks Calrus.

"You can't stay phased completely into the fourth dimension without falling through the Earth," says Davies. His voice is weak and low-pitched for his size and doesn't sound like his own. "Your feet have to stay in contact with the real ground. Which means your footsteps make noise."

"Negative. We made eye contact as early as the machine room, and it's the loudest place in the building. You haven't answered my question."

Davies throws the paper towel in the bin and grips the sink behind him with both hands, as if steadying himself. "Have you actually studied the Script at all?"

"No."

"Did you know that it's not all written in Eka? 'Eka' is just the the first part. From the Sanskrit word for 'one'. It switches language deep inside, to 'Dvi'. And then it switches again. The information becomes so densely encoded that it looks random. By the end of it it's written at such a high level as to dwarf simple English, or any other human language. Because the early parts of the Script look like basic mathematical statements and fundamental physical laws and constants and variables, which is fine, when you approach it from such a low perspective as we humans have no choice but to do. But when you start to understand the greater implications and the higher levels... it stops looking like the laws of physics, and it starts to look like the law." Davies' voice changes while he says this. His face stops expressing what he is saying. As if someone else has begun opening and shutting his mouth for him. "Did you know that you can make real things happen just by delivering a sufficiently unambiguous verbal or mental affidavit to the greater Structure?"

"You saw me in four dimensions because you *asked* to be able to see?"

Hugh Davies doubles over, holding his stomach. He whirls around and vomits into the sink. When he looks up and meets Mitch's gaze in the mirror something multi-tentacled and neon blue and four-dimensional has begun crawling out of his eyes. He gurgles.

"Did you know Paul Klick killed close to a million people with nothing but an empty copper box and his *mind*?"

Mitch Calrus backs away, clanking against the tiled far wall of the room, forgetting that he can just phase through it and forgetting to ask his next question, "What did Zykov tell you?"

Davies answers it anyway. "He didn't tell me anything, but I still know it. If I kill you, he'll take all of us up there with him when he goes home."

"You've been lied to," Mitch begins. But Davies turns and staggers forward with superlight beginning to crackle from his digits, leaving strobing ultraviolet trails in the air. Whatever it is he's building inside his brain need not even be directly dangerous; the backlash when the universe takes exception will

surely be enough to kill them both. Maybe that's exactly what Davies is trying to do. Gaming the system. Performing an illegal scientific act in order to leverage the violent response for his own (species') indirect benefit. God on your side...

Mitch Calrus gathers his nerve and moves forward to meet Davies, who is not much more than a lurching automaton now. He holds on to his gun with one hand, but points it down and away. With the other, he reaches forward into Davies' coruscating mind and brushes its surface. Davies drops, switched off like a light bulb, while Calrus recoils, shaking his stinging hand. "Dyaa!"

Davies' mind's interior was hot enough to the touch to burn his fingertips.

*

Every time a forbidden science is discovered, anybody with active involvement in the utilisation of that science suffers. Depending on the scale of the incursion, the unfortunate inventor may simply lose his memories, or the technology may inexplicably run out of control and destroy thousands of uninvolved people besides. As time has passed, the punishments for perceived attempts to probe or step beyond the limits of the cell in which Alef is suspended have increased, and the list of technologies now permanently gone from the universe has lengthened.

But even from the very beginning, even before Mike Murphy's discovery of the underlying axioms of the whole Structure, faster-than-light communication using signals sent through the "ambient layer" of the universe was disabled.

Why?

Who discovered the ambient neutrality, abused it, and caused it to be locked out? Were they punished for this?

What messages could have been sent in the small time during which they could be sent? To whom, to where in the universe, were they sent?

Was there a response?

*

Trafalgar Square has a thousand people in it, which is is sparse for daylight hours on a stinking hot Bank Holiday Monday. All four faces of the base of Nelson's Column are occupied, three dozen bored teenagers slouched on the huge stone steps in black jeans, bright T-shirts and interestingly stylish hair, photographing tourists photographing them, falling off skateboards, and exposing everybody around them to snatches of bad, tinny music from mobile phones. Big red buses, black cabs and white vans crawl past them anticlockwise; snakes of French high school students are dragged to and through the National Gallery; visibly worse-for-wear Monopoly Pub Crawlers in red custom t-shirts file towards their nineteenth destination of the day; Londoners of every age and nationality go about their business.

A tall, skinny Australian nineteen-year-old bundled up in a weighty pink hoodie approaches the cluster and says "'Scuse me. I'm going to climb up."

It's not actually a difficult climb if you have tools, some sort of climbing experience, the right shoes and so on. But it's not for amateurs. It's the kind of dangerous climb that kids try out every day, and nobody bothers to berate them for trying it because none of them get high enough to fall far enough to hurt themselves.

The teens shuffle aside very slightly, giving Arika McClure enough room to plant a foot on the lowest decorative outcrop and reach up to grab the bottom of the bronze frieze. She grunts a little - they can see that her feet have nothing substantial to push against so she tries to give the impression that she is actually hauling herself upwards with her hands and upper body strength alone. Within a few seconds, before anybody has realised what is happening, she has scaled to the broad square overhang and is hoisting herself up around it in a manoeuvre which any professional climber would instantly recognise as technically impossible. And then she's high enough off the ground that nobody can easily see that she's faking it.

The difficult part is making it look difficult.

Some of the kids on the steps act impressed, some dismissive, but none of them take their eyes off her. Another sixty seconds and the whole square is slowing down to watch, including a few police officers. By the time she's halfway up, there are two dozen phone cameras trained on her. Comments waft upwards: "Hey, cool!" "Go go go!" "It's been done..." "What are you trying to prove?" "Nobody cares!" "It's a publicity stunt." "I can see the wires." "She's hot!" "Do a flip!"

Backup is called for. The police start clearing people away from the base of the Column in case she falls. Arika tries to pace herself, but it's like trying to run the hundred metres at the pace of a snail. As long as she stays effectively weightless, pulling herself upwards with her fingertips and toes is absolutely effortless-- and admitting that she has weight and yielding even slightly to the pull of gravity is dizzying. She looks down. Then she gulps and looks straight ahead at the granite. She resists the temptation to just turn around and wave. It would break the illusion too soon.

Completely unplanned and accidentally, she loses a shoe. It bounces off one of the lions guarding the Column and into the crowd, which goes wild.

Bright pink means everybody can see her as she reaches the trickier second overhang and hoists herself onto the platform next to the statue of Nelson. She "rests" briefly, wind whipping her hair and clothes, and considers climbing up to the top of the huge statue itself, but rejects the idea - there's no easy way to perch on his hat. And then she just sits there, on the edge of the huge drop, and enjoys the view while she waits for the crowd to gather.

One hour is about long enough. There are a few television cameras and mobile broadcast units visible, and a sizeable police presence waiting for her to descend. She'd expected a police helicopter to come and buzz her but that hasn't happened - maybe they think it'd distract her and make her fall. Meanwhile most of the kids who originally saw her start to climb are no longer visible, presumably either hustled away for questioning or simply having grown bored and drifted elsewhere.

When her watch beeps she gets up and walks to the corner of the plinth where she reckons the largest number of people will be able to see her. On an impulse, she kicks her other shoe into the crowd. It takes a long time to fall all the way. At street level, someone is bellowing at her through a megaphone. She tries to imagine how many people are watching her live right now, and how many more will watch the recording before the end of history, and shivers. Millions? Would billions be hyperbolic? Is she really about to revolutionise the world as profoundly as she hopes?

Cue the Strauss...

Arika McClure holds her arms out, as if to maintain her balance, and takes a step out into thin air. And then a second.

She sinks slowly, almost to street level, then suddenly rockets up and around the square, through the trees, behind the pillars at the National Gallery entrance, over the fountains, and then back and around and around the Column. She stops above the police cordon near her landing point, where it can be clearly seen that she has no supporting wires or magic up her sleeve, and rotates, swivels and flips freely in the air, as if suspended in invisible gimbals. She stops and raises her hands and drinks in the applause. Nobody has any idea what they've really just seen, but they know it was cool.

Finally, she deigns to step down onto the Earth and face the reporters' microphones.

"Who are you?" "What's your name?" "How did you do that?" "What's the trick?" "Are you a superhero?" "What's your reason for doing this?" "What do you want?"

Arika McClure doesn't bother to explain that there's no trick. The huge quantity of footage that was just shot will easily establish that. She doesn't tell them how she's superhumanly strong, because that'll scare them, or who she is, because that'll come out in time, or her reasoning, because that's easy enough to deduce once you know her life story. Besides all of that, she's realised she only has a few seconds before she's put under arrest.

"I want to join the Coastguard," she announces.

All in all, that seems to get the world's attention.

*

There's a man at a booth in a coffee shop in the city and he's obviously on something. It's seven fifteen in the morning and he's been staring at the condiment rack in front of him for almost an hour and a half. He's not shaking, rocking, mumbling, or blinking. He has a large coffee. It's full. Stone cold. The man is a heavily bearded fifty-something, and the clothes, the briefcase and the eccentricity of his hair suggest an academic. He has an unobtrusive hearing aid in his left ear.

Thirteen point seven billion years ago, at the instant of the Big Bang, there was a junction point in spacetime, a point where time ran sideways and the laws of physics of the conventional universe had not yet coalesced. If Mitch "Xio" Calrus - who is, as far as Kosogorin is aware, the greatest evil in the universe and the enemy of all intelligent thought - wanted to escape his cell, he could simply travel back to the point where they (the cell, and time) came into existence, slipping out of the trap just before it closed. This cannot be allowed to happen. Therefore, Andreas Kosogorin is taking the liberty of closing that exit route. Time in Alef is about to become one-way.

Andreas Kosogorin was not asked to do what he is about to do. He hasn't even told Mikhail Zykov that he is doing it. He knows in his heart of hearts that Zykov is a good man, sent here from a higher plane to save the world from itself and redeem humanity and lead everybody upwards to a better place where death holds no sting. These are facts that he believes he has come to believe from observing Zykov's genuine devotion to scientific progress, in the Russian Federation and worldwide. That's telepathy: direct and indirect control over the information in someone else's brain.

The truth is that Zykov so fundamentally corrupted his mind that no direct order had to be given. As a result, Zykov is not responsible for Kosogorin's actions. And when the Imprisoning God descends to punish those involved in the oncoming disaster, Zykov will not be touched.

Someone is screaming at him in the background, banging on the cockpit door of his mind: the old Andreas, the one who remembers the days before he met Zykov, when he was still in contact with his

beautiful children and grandchildren. Out of the corner of his right eye is a police officer who has caught sight of the one-inch platinum cube on the table in front of him, hidden from the baristas' view behind the salt cellar-- an object which anybody who hasn't been living on Mars for the past nine months would instantly recognise as a Klick Device. Whom the cop is notifying is anybody's guess, but the gist is: "There's nothing to disarm. There's nothing to defuse. He's not responsive. It's not worth the risk of trying to move him or the box."

And as for how much of Manhattan they'll be able to evacuate before Kosogorin's will breaks, and how much of the island (and how many people other than him) - if any - will be caught in the vortex and dumped unceremoniously some seven hundred and thirty-three million years in the past and a million light years from Earth... none of that is really relevant to the story.

*

Calrus checks in with Moxon while stepping down to the lowest floor of the building. "The warm body I saw in the upper basement was Davies. He tried... I think he tried to kill me. Anyway, he's dead. I killed him. ...I don't know how I feel about that. I'm going to try not to think about it until this is over. The last guy in the building has to be Zykov. I'm about to reach the transceiver room. Status intact and loaded. Confidence... five out of ten. Cavalry's ready, right?"

There's a group of contact points in Calrus' right glove. If, for any reason, he fails to eliminate Oul the clean, merciful, personal way, all he has to do is release the gun from his hand for 2.5 seconds, and the signal will go out for two dozen Class VI all-American supermen to swoop in from their assembly points above the cloud layer, pull him bodily out of the building and lay waste to everything left inside it.

"Cavalry's ready," responds Moxon in his earpiece. He, of course, is elsewhere entirely. None of this is officially happening.

Before he reaches the bottom of the stairwell Calrus hears Zykov speaking aloud to him. "That's amusing. You still honestly think you can settle this in a room with a word and a bullet. I've killed you once before, Xio."

Mitch Calrus stops on the last step, trembling despite his safe intangibility. Ahead of him is a dark, red-lit corridor leading into the huge shielded underground space where Zykov's Preonic Transceiver is installed. Zykov's voice is coming from the nest of computers mounted above the focus of the parabolic dish. It resembles the Americans' receiver, he realises. Maybe there are only one or two possible patterns to build a working FTL communicator. Or maybe the Americans stole the design. He creeps forwards.

"You're four-dimensional," states Zykov. There's echo. Other than the faint hum of the receiver there's very little noise down here.

"You're super-strong," replies Calrus. "Enough to kick a reinforced door down. Enough to withstand a conventional bullet." He moves up to the railing which runs around the circumference of the big deep dish, and begins to move around it towards ten o'clock, where a metal catwalk provides access to the crow's nest. The gun in his hands is, of course, not conventional.

"Up until a few weeks ago I had no idea who or where you were," says Zykov. "I was thinking large-scale. Supervillain schemes on the level of 'flip the Earth's poles, blot out the Sun and slay the world'. If

I'd gained power a decade earlier I would have started World War III. Because killing everybody on Earth was the only way to be sure. Then I found out who you were, and... I could have chosen to make the plan a great deal simpler." As Calrus circles the dish he realises that Zykov, too, has a gun in his hands, a bulky black pistol.

"But who cares?"

Calrus takes a few steps along the catwalk and raises his rifle. He is not the greatest shot, but he is close enough to confidently eliminate Zykov. There's one catch - if he fires the bullet while phased, the bullet stays phased for a few hundredths of a second before dropping back into three dimensions. That's long enough to pass straight through Zykov at this range. To be sure of a hit, he needs to become visible for just one second, which is conceivably long enough for Zykov, whose firearm skills are a totally unknown quantity, to get the drop on him.

"In case you hadn't guessed it yet. The whole thing about the Script, and the science? I have been systematically blocking off your escape routes. I have been building a trap around you.

"This is not over, and I am not dead."

Zykov shoots himself.

[Endworld] Postmortal

That came from the generator level. They're inside the Hall.

The hospital looks incredible from the outside - white and glassy and curvy, like it was built ten years from now. Hell, there's no reason why it shouldn't have been. According to innumerable works of science fiction from previous years, decades and centuries, the year in which Mitch Calrus' appointment is due to take place is the incalculably distant future. Although the Cold War ended a few decades ago. And the Singularity still hasn't happened. And cyberpunk is bunk.

On the way in, Mitch keeps an eye out for anything that might break the illusion of a perfect Utopian white city. Reception is immaculate, as is the waiting room. Gorgeous, soft, firm seating. The magazines on the nearby table are all in French, but they're hardly thumbed and the cover dates are next month's. There are ill people in the waiting room, not looking their best, but Mitch decides to give the place a free pass on that one. Exquisite plant life - fake, probably to avoid allergic reactions, but extremely convincing and still quite beautiful. Squeaky clean floors, recently mopped, signposted as potentially slippery. A water cooler.

No plastic cups left in the dispenser for the cooler. Is that it? That really might be this place's only concession to human error.

The whole point of all of this is to build the patient's confidence in his doctor's competence. It works. Mitch relaxes, smiles, enjoys the air conditioning. It's a pleasant morning. In the afternoon, if there's time, he hopes to visit the beach he spotted from the coast road on the drive here.

Mitch. You are the last copy of you. Wake up now, please, or you're going to die.

The doctor sees him at nine on the dot.

"The process is almost completely passive," he explains. He's thin, bald, incredibly confident. He runs to work in the morning. "The danger of damage to the integrity of your corporeal mind is negligible. The equipment we'll use is an order of magnitude less powerful than would be necessary to actually damage your neurons. We expect your brain's internal temperature to rise by perhaps a few tenths of a degree Celsius. This is something we'll monitor. Obviously, in the event that this parameter passes outside of certain limits, the operation will be abandoned, you'll wake up unharmed, and we'll go back to the drawing board. We have seven other parameters which we will be monitoring in a similar way. Half of these are routinely monitored during all surgical procedures. There is very little to this procedure, you understand, that is new from a surgical point of view.

"If we do abandon the procedure, then obviously a complete and intact mind-state will not be stored. Naturally, there is a chance that even if everything does go according to plan, your mind-state will still not be stored. In either case we still have a chance to try again. We'll set up a fresh set of consultations and go from there.

"However. If your mind-state is successfully stored in the Hunt array, a slew of other dangers arise. The most obvious is the failure of the array. Improving storage technology will gradually reduce the amount of physical space required to store your mind-state, which in turn will permit greater redundancy, at multiple sites. But until that point, which isn't anticipated until five years from the present time, your mind-state will be in one place and one place only, other than inside your actual head.

"There could be a fire, a flood, a hurricane, an earthquake... a bombing, a raid. There could be a failure in the air conditioning, the electrical supply, the battery backup, or the drives themselves. There are redundant electrical and HVAC provisions and the drive arrays themselves have some... some sort of redundancy built into them... you would know better than I do..."

"RAID," suggests Mitch.

"Yes, that rings a bell. Obviously Dr. Hunt will be able to tell you more about that when he gets here. And, as he's explained to me, the fact that the drives don't need to be continuously active will drastically increase their lifespan. The most important fact remains, however, that the corruption of a very small percentage of your mind-state - as little as one thousandth of one percent - could render it inoperable.

"We are not lawyers.

"The capability to serialise and store a human mind-state is unprecedented. We believe that the *only* reason we can do this today, without legal obstruction, is that the law of man does not know that it is possible. If it was known to be possible, there is an excellent chance that it would be illegal. This is despite the facts that you are a consenting adult and neither of us have raised significant ethical objections.

"A mind-state is not a legal human being. It does not hold rights, including the legal right to exist. It is copyrighted binary data, and it would be protected by copyright law. You would be the copyright owner. Copyright law varies in severity depending on geographical location, but it extends little beyond fines and jail time, whereas the destruction of a mind-state could be seriously construed as murder. While you have a contract with Mr. Hunt to protect and ensure the integrity of the binary data you'll be storing at his data centre, once the serialisation procedure is published, he may find that he has no legal course of action but to destroy it.

"And finally, much like cryogenic storage, the technology to reactivate a stored mind-state, either in a computer simulation or in a real human body, does not yet exist. For all we know, it may never exist.

"These are not the risks. These are the knowns. We can put numbers to all of these possibilities. They are the safe outcomes; the eventualities in which your mind-state is lost forever, and you continue with your life as normal, and all we have wasted is time.

"The simplest way to put it is this: once digitised, your mind could be sent anywhere, anytime. As you've mentioned yourself, it's thought that within a few decades it will become possible to store an arbitrary amount of data in a single fundamental particle, itself stored in a device as small as a basketball... or a thumb... or a fingernail. You will be copied and copied and copied all over the world. Copies of your mind-state - the first digitised human mind-state in history, remember - could survive until the end of human civilisation. After you go to sleep this afternoon, one of you will wake up tomorrow morning. There is, let us say, a one in a million chance that you will wake up tomorrow morning. The rest of you are embarking on a subjectively instantaneous one-way journey into the uttermost unknown, where, beyond a few decades into the future, your single physical self will not be able to protect you. You will be completely without support or protection or preparation.

"We can't put a mind-state back into a body. But the hope is that one day it will become possible. Somebody could steal your mind and insert it into another body on the other side of the world. Under their terms. And do anything they liked to you. They could kill you. Then they could find another body,

insert your mind-state again, and continue to kill you. For ever.

"You could wake up in a digital world. Any of countless possible digital worlds. They won't be real, but you'll feel them for real. Imagine a virtual heaven. But now imagine a virtual hell. In a simulated environment, a malfeasor would have absolute, eternal, unbreakable control over you.

"The concept of the human lifespan is about to become non-linear. Because binary data can be perfectly duplicated infinitely many times, you are not risking one life, but infinitely many. This is the most dangerous thing anybody has ever done."

Mitch, wake up!

"I need to live forever. As soon as possible," says Mitch Calrus. He looks at Anne Poole, seated to his right, and she returns his smile.

"And I'll be there when he wakes up," she replies. "No matter how long it takes."

And a fragment, a mere trace of scepticism crosses the smart, tall, handsome doctor's face. Of course, he knows who Anne Poole is. "That's a beautiful love story," he says.

And they nod. But neither of the two look like love has anything to do with this.

NOW!

And what jolts him awake the following morning is the dull crack of a gunshot.

The first sensation is body horror: "this-is-not-the-person-I-am-supposed-to-be". That was something which became familiar a long time ago when his consciousness was first earthed inside Mitchell Calrus' body, but the sensation has changed substantially in tone and inflection. This is somebody else's body. A rather taller man, different hair, heavier clothes, heavier muscles.

The second is space. This is not the hospital bed in the anaesthesia room - not that he expected it to be - and it's not a recovery ward, which was a more likely outcome. He's flat on his back inside a cream-coloured, fluorescent-lit cylinder a little larger than a coffin. Mitch has never had an MRI scan but this is what he imagines the inside of a magnetic resonance imager looks like. The platform he's lying on is in motion, carrying him feet-first out of the machine. Just a moment after he opens his eyes, they pass the rim of the circular hole in the machine, and suddenly he needs to figure out what he's looking at all over again.

A rumble echoes and fades.

It's a vertiginous sight. Dizzy, Mitch instinctively tries to sit up and get out from under the machine stack - he hits his head on the rim of the cylindrical hole.

Mitch thinks: Starship hangar. Missile silo. Vehicle Assembly Building. The building is a huge empty black shell, an upright octagonal prism, easily tall enough to have weather and even wider than it's tall. Smaller buildings rise up around the edges, clinging to the interior walls like ivy. There are two big, complex machines suspended in gantries elsewhere on the factory floor, far enough away that they might as well be in other countries. One of them is fifty percent of an experimental space rocket. The other is a monumental spherical chamber seemingly built out of patchwork metal plates, connected up to a dozen pipes of different colours, each fat enough to drive a bus through. It looks like it was

designed to contain an atomic explosion.

Mitch looks up at the machine from which he just emerged. The third big experiment, a thirteen-storey stack of dirty silver, black and red machinery, tapering as it descends as if it were all focusing down on the MRI-like machine in which he was sitting, itself positioned to focus on a point in the middle of his brain, just behind his eyes.

This is a laboratory, he thinks. The biggest laboratory, for the Big Projects.

There are three people at the foot of his bed. One is an extremely tall, broad-shouldered man with a blond beard and long-barreled projectile weapon. He wears a bulky black jacket and trousers covered in some kind of lightweight armour made of heavy leathery scales a few inches across. Looking down at himself, Mitch realises that he is wearing the same. On top of a computer console nearby he sees an identical gun set down.

The second is a tall, skinny sixty-year-old female scientist with loose and unhealthy grey hair and a huge black pair of goggles strapped to her face. She wears red. Mitch guesses it is a medical uniform. She's sat at the console, facing away from him, tapping at what Mitch recognises as a keyboard. There's no screen, though; the woman is staring into space or at her hands, as if typing while asleep. On closer inspection, he realises there is a cable from the goggles into the computer. "I've lost contact with the transformer control room," she says. "We've got to shut the system down, it'll run itself into inoperability within minutes without active current shaping."

The third person, a relatively diminutive woman, ignores the scientist and instead says to Mitch, "What is my full name?"

What she's wearing... well, Mitch doesn't quite have the vocabulary. It's rather too elaborate, with too much embroidery, to be a 21st-century business suit, but that is the closest reference point he can think of. It's long and grey, unsuitable for a manual labourer, pretty inconvenient even for office work. Formal dress, then. She's a manager? A politician? Her hair and makeup, though, look like something out of another planet. There's a black diamond painted on her forehead, and she's wearing some sort of thin metal tiara or crown. And while she hasn't aged a single day, somehow her eyes say she's seen *everything*.

"Anne Nicola Poole," Mitch replies. "What happened to you?"

"Doctor Poole!" prompts the older - well, older-looking - woman.

"Yes, do it," Anne responds. "Do it and get out of here as fast as you can. Mitch, I don't have time to explain. You are going to find this world extremely difficult to come to terms with at first and I won't be there to help you. When you went to sleep it was the first of October, 2016, is that correct?"

"Yes. And you said as I went under the anaesthetic that you'd be there when I woke up. Or else it would mean something had gone wrong... and I had to run."

"Earth's orbit has been altered slightly which means the definition of the year has undergone a certain amount of revision but the best number I can give you for the current year, based on the analeptic Gregorian calendar, is Common Era two-two-nine-eight-five."

"...What?"

"And something's gone wrong. You have to run. Take this, and run. Guard it with your life because

that's what it is." Anne puts a slab of red metal into his hand. It has a collection of electronic contact points at the end of it. It's dense.

"What's happened? I can't process that number!" Mitch tries to convince himself that he was genuinely ready for all of this. "What's going to happen to you?"

"They've found a way to kill me."

The sound of the second explosion is large enough that it bounces off every wall in the building, making its point of origin difficult to place, but on gut instinct Mitch looks upwards and sees a piece of metal the size of an articulated truck falling towards them.

"*RUN!*" bellows Anne.

Mitch launches off the bed towards the computer console and grabs the arm of the older woman. He tries to change direction and drag her out of her chair towards the man with the gun, but she hasn't reacted fast enough and he's not quick enough and the soldier is recoiling away from him out of instinct. Mitch's fingers are a centimetre short when the equipment hits, crushing the soldier to sludge but passing through them both like holograms.

Once a moment has passed and metal seems to have stopped raining on them he pulls the grey-haired woman out of the wreckage and allows them both to sink back to three-dimensionality. A 4D glance at the burning heap of metal reveals an unpleasant amount of crushed bone and organ where the soldier had been. Anne is buried in the pile too, but she's intact, though unable to move.

"What did you just do?" exclaims the rescued woman, pulling her now-disconnected goggles down around her neck.

"I... I don't have time to explain. Anne!"

"Leave me," she shouts back. "Go!"

There's a deafening crackle of gunfire above - and screams. Scientific staff on the upper levels are being mown down. It'll be a matter of seconds before the attackers decide to look down. Mitch grabs his new partner by the hand and runs for what he assumes is the main entrance, a colossal door at the far end of the hall, tall enough to accommodate a battleship. She's old; in decent shape for her age, but still slow-moving compared to him... or rather, his new body. He feels fit, energised.

Then the main entrance explodes inwards - the loudest noise Mitch has ever heard - and six more followers of the Trail Of The Indivisible Soul surge into the building. In any era, Mitch can recognise automatic weapons. Mitch's (latest host's) gun is buried thirty metres behind him. The nearest cover is ten seconds' sprint away, across bare cement floor.

"Don't shoot! Don't shoot!" screams the woman beside him.

That will stall their triggers for all of one second.

[Endworld] Crisis on Earth

John Zhang returns to consciousness.

"I think I have been asleep for a long time," he murmurs.

"You have been asleep for a very long time," says Mitchell Calrus, who is the only other person in the room. Zhang is comfortable under the covers of his bed, propped up by mountains of pillows, but the air on his face is cold. The room is painted cabbage green, except for small white ceramic tiles covering the lower walls, a white window frame (with frosted glass), and some old, dull, vomit-brown plastic chairs, in one of which Calrus is sitting. There's a drip running into Zhang's left arm. The fluid is colourless.

"Zykov is dead," says Calrus.

Memories churn in Zhang's head. They feel like they're further away than they should be. "I think... I think I already knew that."

"He killed himself. It was just a few hours after you were captured. You might have felt his influence go out of your head while you were sleeping. Zykov was a creature of chaos and destruction. Sending you to one of the most densely populated areas on Earth was a logical way to continue that theme. That's why he sent Kosogorin to New York City..."

"This is too cold to still be Brasilia," observes Zhang.

"Yes." Calrus flips over a few pieces of paper in the ring binder that he has open on his knees. "Yes... humm. When you were captured in Brazil you were placed under sedation. The following morning, you were revived in the Brasilian police's custody, for questioning. Before any questions could be asked, you had a mild seizure and tried to activate your Klick device, which was being held for forensic examination in a locker in a neighbouring building. The locker had... well, I don't speak Portuguese, but judging by this photograph, it imploded on itself by the time you were sedated again. You were awake for less than ten minutes.

"You were taken to a Brazilian military hospital, where you were put into a controlled comatose state and connected to life support. You were moved to Cuba, then Russia, then to the United Kingdom and then back to Russia while international law tried to figure out what to do with you. It was eventually determined that you had been compelled to act under the telepathic control of Mikhail Zykov and were not responsible for your actions. Six months after your capture you were revived for the second time in a specialised clinic in Switzerland, sixteen hundred miles from your Klick device, where..."

"I made it. It's a Zhang device."

"...where you caused a mild earthquake and almost brought the clinic's roof down on yourself. Evidently, Zykov's post-hypnotic suggestions were... convincing. And persistent. You were put back under.

"You've been under for a total of almost eight years."

Zhang rolls his head and squints at Calrus. "Who are you?"

"I'm Mitch Calrus. Mr. Zhang--"

Zhang winces at Calrus' mispronunciation, "Just call me 'Zed'. Am I dying?"

"No."

"Am I ill? No?" Calrus shakes his head. "So why risk waking me?"

Calrus opens the rings in his binder and hands over a stapled pair of double-sided printed A4 sheets, covered in dense scientific notes and graphs. Most prominent are two graphs which, Zhang eventually determines, display data recorded by a major neutrino detector in the Netherlands. "This was our first hint that something was wrong," explains Calrus. "Those two spikes represent a single anomaly in the background neutrino field. This report is from August 2015." He hands over another report. "This report is from October of the same year. Note the increasing size of the spikes.

"*This* is a false-colour photograph of an extremely tiny region of sky in the constellation of Virgo. This was taken from a space telescope called LSEAT LocalSC on 1st January 2016. The point source in the upper right of the photograph was discovered by backtracking the trajectories of the anomalous neutrinos. It was determined to be somewhere between three and five distinct supernovae, coincidentally occurring in the same approximate region of the sky. It was hypothesised that some huge interstellar event had triggered several stars in the same region of a distant galaxy to collapse at about the same time. Both natural and artificial explanations were proposed - a cosmic string, a quantum singularity, a Q-ball, an immense experiment." Calrus turns over more false-colour photographs. In these, the point source is brighter. "This picture is from two days later. This one is from four days later..."

"Where are my glasses?"

"I..." Calrus inspects the room, including the bedside table and its drawers. "I don't know. I think they might have been lost. I don't think anybody knew you were supposed to have glasses. I'm sorry. The... the next two pictures show more supernovae exploding in front of the previous ones. An interstellar engine, almost, firing every few days. This picture is the last one that LSEAT LocalSC took before the object became impossible to focus on.

"This is an image taken in April 2016 by the TALOS A-B binocular space telescope system. TALOS was designed mainly to directly image physical features on other planets inside our solar system but also has some deep space IR observation capability. By now the phenomenon has a nonzero angular diameter and we know that there are at least ninety distinct supernovae in the stack - possibly thousands more, with the most recent half-dozen drowning out the rest. *These* eight images were taken from a ground-based observatory in Hawaii three months later still. We watched a supernova happening live from an unprecedented close range. These are the pictures which went public, along with the finalised blue shift and angular motion calculations.

"I'm concerned about how calmly you're taking this, Zed. You've spent almost a fifth of your natural life asleep--"

"Why are you here?" demands Zhang.

Calrus pulls out a laptop computer and puts it in front of Zhang. "This is a photograph of the sky which I took when I arrived in Moscow at three o'clock this morning. I took it with the camera in my phone." He starts clicking buttons. "This is footage from a riot in Rome, two weeks ago. And Hanoi, last week. Baghdad, also last week. Washington DC; this one is a live webcam. This is a transcript of the U.S. President's address, given two days ago. This is a speech given by the Pope; another by the Dalai Lama; another by Ahmad Qureshi, the nineteenth Power. This is an official joint statement from NASA, ESA

and four other major space agencies stating that, with all the resources in the world behind them, faster-than-light space travel will not be possible before 2025, and a full-scale evacuation of Earth will not be possible before 2125." Calrus catches Zhang's eye and decides he has pushed this as far as he can. "Zykov is dead," says Calrus. "Oul is not dead.

"Zykov didn't have enough power. He used arcane Script technology to put together what modern science would have no recourse but to describe as a magic spell and tried to summon the rest of Oul into his own body. He got it wrong, and instead Oul's fragmented power or soul or 'essential attributes', or whatever you want to call it, starting striking people at random. First in Russia, and then all over the world. The word 'summon' means 'call forth'. Specifically, it means 'call something or someone which is over *there* to come and appear over *here*'. Why did he get it wrong? Oul's power isn't locked up in some extradimensional cloud, like mine. It's here. In reality. Oul - all of him - is *in* this universe already. He's just not *here*.

"He's not even in this galaxy yet.

"We've known he was coming for fifteen months. We've got no plan. Nothing. Nobody who knows the Script like you do is still alive. Zykov and the Imprisoner saw them all off, in one way or another. Teleportation is locked out, so we don't have lightspeed transposition. We don't have time travel. If we knew what we needed we could replicate what we need, but subnucleonic replication is gone. FTL comms are gone. Klick's Exit - heaven - is closed. Chorus Injection is closed. We don't have space arks. We don't have Orion. We don't even have the Space Shuttle anymore. We're down to spam in cans.

"Zykov did all of this deliberately. He was trying to make sure that humanity never left its planetary cradle. He didn't know me personally until the last moment; he was trying to keep us all in one place so that this oncoming disaster would befall all of us simultaneously and wipe out both my mind and all possibility of my being resurrected. He doesn't need to come closer than a hundred light years; a supernova at that range would strip most of the Earth's ozone layer instantaneously and it'd be the Ordovician-Silurian extinction all over again. Human life would be over in two years and so would 95% of all other species on the planet. That's the best-case scenario. But the calculations say he's coming straight here, and if he's coming straight here, there'll be no Earth left afterwards, just a fragment of metallic smoke.

"Nobody knows the Script like you do. Hood, Kosogorin, Davies, Murphy, Baird, Kuang, Akker, Nkube, Ashmore, Klick - all dead or missing, presumed. Your box manipulates exotic matter. It's the only hammer we have. Make this problem look like a nail, and then hit it."

"Kill him?"

"I can tell you now that there's no way you can kill Oul with what you know and what you've got. We know what that would take, and it would take hundreds of years of calculation. Maybe even millennia. No. Just do *something* to buy us the time. Take us to another galaxy. Take me to the other side of this galaxy, that would be enough. Make a region of spacetime where time passes a million times faster than normal. I don't care."

"Exotic matter can't do what you want," says Zhang. "And besides all of that I need my focal point. I need--"

Mitch Calrus holds out a small cubic box made of gold. "The Zhang device could have punched a hole in the world. You are not speaking to me, because I am not here. You have four days."

*

John Zhang is the only person left in the room. He tugs the wheeled stand from which his drip is suspended, and goes to the frosted window (he's wearing loose white hospital pyjamas, he discovers) and manages to prise it open far enough to look out. A lot of cold air breezes in, raising the hairs on his arms. It's a brilliant white day. There're more hospital buildings below, a loading yard with a couple of trucks parked. In the distance there's a city, and he sees pale grey smoke rising, like someone decided this was the perfect day for mist and decided to manufacture some. He listens, and just about catches the sound of an emergency siren or two. It's Year Twenty, he realises. There's soon to be someone out there with the strength of a million men. What nationality? Zhang wonders. What nation will they surely choose to conquer?

He laughs, and puts the golden box on his bedside table and picks up the sheaf of paper that's left there, and the cheap clipboard and the cheap ballpoint pen. He smiles to himself, a smile with a vague doubt behind it. Like he missed a paragraph in the book he was reading and now everything is making slightly less sense than it should.

John "Zed" Zhang begins to sketch his plan: the New Cosmology.

[Endworld] The Last Copy Of You

There is nothing soft to land on in the basement tunnel; the grey-haired woman cries out, having smashed her elbow, skull and tailbone on the cement floor after falling through from above. Mitch is luckier on his landing and his body armour cushions his joints.

A clatter of gunfire resounds and fades in the enormous space above them.

"How do we get out of here?" demands Mitch, who hasn't yet come to terms with the fact that "Mitch" is no longer his shell's name. The woman grits her teeth and hisses with pain as he pulls her upright and then to her feet. "How many people are attacking this building? How far away do we have to get? Is there a safe house? A state line we can cross?"

"I think I've fractured something. I think I'm bleeding."

"What's your name?"

"How can you not know my name?"

"*What's your name?*"

"...Linisd. Linisd Amarkaya."

"Linisd, we do not have *time* to be *hurt*. Tell me how we're going to get out of here."

"But you know! We went over this just a few minutes ago--"

"I don't! Which way? Left or right? We can go through walls, if that makes it any easier. Is there a vehicle? Can you drive it?"

"This way," says Linisd, pointing, and Mitch holds her tightly by the hand and sets off down the tunnel.

After a hundred yards and three right-angled turns they have reached a freight elevator. The car arrives promptly but Mitch stops her from entering. "Before we go, is there any first aid equipment around here? Medical equipment. Bandages."

"No," says Linisd. "Not here."

Mitch enters the elevator with her and lets her select the top floor. They begin to accelerate. Mitch watches the floor indicator above the door, and watches it. "That's pretty poor for a science installation," he remarks. "What about the top floor?"

"We're going to the roof."

"What's on the roof?"

Linisd hisses once more and clutches her arm. "An aircraft."

"What sort of aircraft? Can you fly it?" Linisd glares at him. "Look. I don't know who I was up until fifteen minutes ago. But that person's dead. I'm sorry that you helped write my brain over the top of his, but you did *do* it. You're the only *scientist* in this whole situation. I'm not faking it; I don't remember the plan; I don't remember any military training or flight training this other guy might have had. *He is dead and I am someone else.*"

"Then how can you speak our language?" grunts Linisd, leaning against the wall and beginning to

sweat. The adrenaline rush is wearing off and Mitch finally realises that her elbow is really quite badly damaged - she is holding her arm as if it was dead, blood is soaking through her sleeve and she recoils instinctively when he reaches for it. Not that he would have the faintest idea how to treat her.

"We've got to get you to a doctor."

"I am a doctor."

"A medical doctor! An emergency room."

"...I don't know what that means."

Mitch starts again. "...Where do people go when they have a medical emergency? You have hospitals, don't you?"

Linisd begins to turn white. "We have temples. Look, Doctor Poole has told us about the medical technology of your time, and it sounds... it sounds like magic, but here, if you get ill, a priest wraps you in holy cloths and you pray to your personal bodily fluid gods. You drink a stinking potion, and that's only if you're formally divinated as being worth healing. We only have literal magic and faith."

"This doesn't make sense. How can you have the neuroscience to bring me back and not know how to set a broken bone? You have-- I saw a spaceship down there. How can you have spaceships?"

"The machine you were inside was a computer. It's just informational plumbing. Do you *know* how complicated the human body is compared to the brain?"

"Up until now, I thought I did." The elevator stops. Mitch shoulders the door open manually and sees a narrow set of stairs marked as a route to the roof. He hauls Linisd along and begins to help her up the stairs. She's flagging. He keeps talking. "Do you have blood transfusions? Vaccines?"

"No. No."

Mitch fumbles with the lever on the door for a few seconds, trying to figure out how it works. Linisd eventually reaches past him and operates it for him with her good hand. Spring-loaded, designed as a fire escape, the door swings open automatically.

*

The roof of the Hall is a concrete desert - flat, exposed, windswept, scorchingly hot, dazzlingly bright, with seemingly no end in sight. There's not a cloud in the sky. There's a skylight the size of a playing field, looking down on the experiment floor. A final explosion echoes and rattles the roof under their feet, and through the skylight they see the machine which just restored Mitch, with all its major supports now bombed, disconnect from the ceiling of the lab and crumple under its own weight with a deep and drawn-out crash.

On the far side of the skylight, on triangular pads projecting out over the edge of the building, is a pair of freakish, bug-looking vehicles, which Mitch deduces are parked helicopters with their rotor blades stowed.

Mitch supports Linisd and they limp towards the nearest chopper. There is nobody around. Mitch has no idea how to fly the aircraft. He probes the deep corners of his new brain just in case there is anything left of the capable pilot whose body he has apparently inherited. Then, as they get closer to the edge of the roof, Mitch comes to see the rest of Science City.

Like every other square kilometre of planet Earth, Science City has been everything, frequently all at once: a vast engineering complex, a Holy Land, an abandoned deathtrap pile of shattered skyscrapers, a fortified haven for two thirds of a million stateless fugitives, an agricultural commune, a solar farm, a financial centre, a major calculation node for The Project, the political centre of an empire spanning entire continents, a warzone and a strategic nuclear target.

But above all things it has been a spaceport, on and off, for almost eighteen thousand years. Every civilisation growing up in the shadow of Science City has its own ideas about what it all means and what should be done with the most impressive constructions - worship them, occupy them, blow them up and carve them into pieces - but sooner or later almost everybody gets around to the idea of duplicating and refining the dreams of their predecessors. Who originally built it, even Anne Poole can't remember-- the first time she led an occupation force on it, it was already a pile of rusted wreckage and half-completed ark ships left over from the previous Crash, overgrown with vegetation and crammed full of terrified families and range weapons. All she knows is that every time she comes back it has grown, buildings bloating and gradually merging into bigger superstructures housing tens of thousands of people, and always a halo of increasingly ambitious launch platforms surrounding it.

There are shiny hangars and chemical refinery complexes bristling with antennae and solar collectors, abutting residential blocks and dusty overgrown parkland like zoning was never invented. There are roads wide enough to drive a Crawler down, fractally complex city walls and, dotted between them all, monuments, statues, blast craters and concrete sarcophagi marking ancient achievements and failures. The buildings don't fit into Mitch's brain properly - they are built according to no architectural style he can make sense of, or maybe a conflation of all styles at once. They look like CGI, not because they look unreal, but because if he was watching this in a cinema he would know that no movie studio had the budget to build it in reality. There are dozens, hundreds of rockets and launch gantries, most of them jagged grey pillars on the horizon, some of them even taller than the Hall. Even while Mitch is watching, there's a colossal *BOOM* as a stubby red and grey rocketship lifts off from a pad fifteen miles away and accelerates into the cloudless sky at eight gees.

The broad avenues below him are swarming with thousands of people. He sees tiny white square placards and small circles of yellow flame, petrol bombs or similar. He hears gunfire, but can't see who's shooting whom. He hears them roar and sees them surge forward as something or someone is triumphantly brought out of the main entrance. But he can't watch them. He can't keep his eyes off the climbing rocket.

Science City is in the desert. Wide flat planes, faultlessly predictable weather, close to the Equator, an ocean not far to the east for safe splashdowns. At night the gantries creak in the wind and change shape because of the cold. By day, it's huge, it's flat, it's baking hot and there's nothing underfoot but metal and rock and dust. This is hardcore spaceflight, in an environment almost as hostile as the universe gets without leaving Earth entirely. This is hardcore recycling: building vital components of your tin can from the titanium that made up the monument to four men whose own tin can blew up on the same pad one thousand, five hundred and fifty years ago. This is spaceflight for a country - a planet, even - where there's absolutely nowhere worth looking but up; for people with a primal, spiritual understanding of "because it is there" and "forever mankind"; for people who measure human achievement by their furthest living representative's distance from home.

"I'll have to fly the aircraft," Linisd croaks, "get me into-- into--" and passes out.

There's not a cloud in the sky. Just an actinic white star streaking into the stratosphere, shedding stages and already supersonic, and a blistering elliptical noonday Sun, with a luminous streamer of plasma coiling out of its chromosphere and into a vortex in space a solar diameter away.

[Endworld] We had to destroy the future in order to save it

It's April 2017, two hours after Mitch Calrus left, not that he was ever really there, and John Zhang is sitting on a park bench in a deserted Moscow backstreet, building an Alcubierre drive.

It would be difficult to tell just by looking at him. Most of the drive's components are software; intangible machines built from structured patterns of information interlocking and whirring inside the confines of his brain. A sufficiently detailed model of reality is indistinguishable from reality. The only physical manifestation of the drive is a cubical gold box, two centimetres on a side, which is suspended in the air in front of him, gently rotating on one vertex. There's nobody around. It's freezing cold, as it has been all day, and the Sun's going down and the street lamps are turning on. The world is concrete grey, deep blue and brilliant orange. Oul's approaching trail of destruction is plainly visible in the darkening sky. He's due to arrive in ninety-four hours.

It is known that matter and energy warp the shape of spacetime. This is why, for example, objects in space fall into curved orbits rather than straight lines. The Alcubierre metric is a highly unconventional shape into which spacetime could, hypothetically, be warped. All it would take is a suitable arrangement of matter and energy, but there are two obstacles. For one, the matter must be exotic "un-matter", a substance which, while perfectly consistent with the laws of physics, only even exists hypothetically-- except, of course, for within the fertile and dangerous imagination of Eka Script savant John Zhang. The other is that the amount of energy must be enough to literally bring the farthest stars closer together; more energy than the entire observable universe has output in its lifetime; more energy than the Big Bang itself brought into existence. This second obstacle has been the more difficult to overcome.

But not substantially.

Zhang's information-energy exchanger is the third-simplest of the four dozen or so virtual components in his brain; a simple pipe with some control structures attached to it. He hooks one end up the processor which will weave the exotic matter into the geodesic bubble he needs. And into the other end he simply feeds the tail end of the Script itself, a maximally dense information resource which in its full, incomprehensible length describes the entire Structure and everything in it.

And before the universe can pull Zhang back from the edge of self-destruction, he wraps himself in the bubble, causally disconnects himself from the rest of spacetime and begins accelerating towards Beta Virginis at three, twelve, fifty-one times the speed of light--

*

"We got her."

"I hear you--"

"No, Kcko, we *got* her! Yes!"

It's thirty-six hours after the coup, and Anne Nicola Poole, heretic, is being dragged out of the building by two tall, heavily-armed male Adherents to the Trail of the Indivisible Soul. The rest of the squadron creates a perimeter. They all have thick, dark hair in the same copycat style and neat uniforms with small, memorable, brightly chromatic insignia and, if they didn't know that it was impossible, they would have shot Anne dead right there in the Hall and they'd be dragging her corpse. Anne, now that

she has been pulled out of the wreckage, is diminutive, silent and unassuming. Her hair is disarrayed and her clothes are torn, but she is not dazed, injured or frightened. She has done this, or rather, had this done to her, so many times that she has lost count.

There are thousands of protesting people waiting outside behind the cordon, but when they see her brought out they surge forward and scream as one, nearly breaking through. There is absolutely no reason to protect Anne Poole from mob justice, so the Adherents carry her to a high place and hurl her into the crowd. They fall on her like wolves. She's kicked, beaten, knifed and shot. The melee is so intense that the rioters are soon injuring each other quite badly in the futile attempt to hurt her. After a bullet ricochets off her forehead and kills a sixteen-year-old fanatic bystander, the Trail's Adherents decide to step in again. They drive the crowd back with warning shots and reclaim her.

There are eight launch sites within an hour's drive of Science City. Three of the platforms are hosting rockets undergoing preparatory procedures for space launch. Two of those are scheduled to launch to geostationary orbit in the next six hours. The Adherents - a religious order Anne Poole founded herself sixty years ago - wrap her in manacles and stuff her in the back of an armoured truck and set off for the further of the two.

A black bug-like aircraft lifts off from the roof of the Hall. For a moment it hovers, as if considering its options, then it accelerates to the west.

*

Mitch gains height as quickly as he can because what little he can see of the City looks like a warzone. The rioters in the streets are one thing - this far up in the air he is out of their reach. But he also sees big dust-brown military vehicles built like bulldozers, and squat crab-like things with four giant wheels and tank turrets, crawling down the wider thoroughfares spitting gunfire and shells seemingly indiscriminately into the nearby scenery. Yes, it's hot, that's mainly because it's noon and it's equatorial Africa, but much of the city is also on fire.

Something white-hot zooms in from a battleship way below the eastern horizon and hits another nearby waiting launch vehicle, about halfway up its external solid fuel booster. The entire thing goes up like a firework, total destruction in a fraction of a second - fragments of fuel tank and support gantry are hurled a mile into the air or a mile across the city. Once the fireball fades the shattered remains of the rocketship collapse in on themselves in that horrifying slow-motion way that only truly gigantic structures can manage. The shockwave rocks Mitch's aircraft. He fights it, and wins.

There are other aircraft here and there on the skyline, all of them moving like helicopters, mostly clustered in flocks. Mitch sees them from the cockpit and he sees them on the shrilly-beeping radar. They're lit up green, but Mitch doesn't know if green still means "friend" in the space year 22985 so he avoids attracting their attention and plots a course west away from the gunboats, hopefully out of their range.

All that and no hospitals. It's 22985. Mitch doesn't even know how to pronounce that number. Half an hour ago he was succumbing to the anaesthesia in a hospital in the south of France and he thought he was ready for anything.

Fifteen minutes and perhaps thirty kilometres later, Mitch manages to find what he has been looking for. The temple is difficult to miss because of the enormous gap it cuts into the network of artificial canyons. While impressively tall, with an attendant forest of towers and minarets, it is surrounded and

overshadowed by vastly taller skyscrapers and decrepit launch towers. Its grounds are half a kilometre wide, walled off and paved with polished red and black tiles. The tiles make up an octopoidal Julia set fractal with the temple at its core, a steep and roughly octagonal pyramid built of reddish stone.

The chopper is powerful but the controls are clunky and imprecise. Mitch has to fight to keep it under control as he guides it into a landing. He lands in the square, in front of what he assumes is the main entrance. He pulls the chunky black plastic key out of the dashboard, which cuts power to the rotors. He climbs out of the cockpit as they wind down and runs around the front of the aircraft to collect Linisd, still unconscious, from the passenger seat. While vast, the square is deserted.

He hurries across the shimmering marble as fast as he can with Linisd in his arms. The archway leading into the dome is tall and wide enough that with some skill he could have flown right inside.

The interior is like a Stone Age cathedral. It has the recognisable features of a religious establishment: seating, a stage, a sizeable balcony with more seating, raised speaking platforms, altars, iconography, certain acoustic qualities. The roof's supporting columns, five metres thick at the base, are not Gothic or Roman, but crude round blobs of red rock, bloated at the bottom and tapering as they rise, as if made of slowly melting wax. The walls are decorated with murals which resemble cave paintings elevated to the scale and scope of Renaissance art without any improvement in artistic materials, tools or technique: while vast in size and fantastically detailed, they are simultaneously scratchy, angular, stylised and pointillistic and use a very narrow range of pigments outside of red-brown, black and white. Where Mitch would expect to see decorative masonry and intricate gold detailing, there are wooden sculptures of people and creatures, all elongated and exaggerated in proportion, as if sculpted by some alien who had only ever heard them described, and never seen one. Mitch sees feathers, leopard pelts, spears. Natural light pours in from a few dozen vertical slots carved towards the ceiling of the hall.

Even in the main auditorium there is nobody around. "Is anyone here?" Mitch shouts, his arms beginning to wear out. "I need help!" His appeal echoes out, unanswered. The temple, too is deserted.

In fact, this entire district of Science City has been evacuated. Mitch hasn't pieced it together yet, know it, but he's standing in the quiet wake of an invasion. Miles to the west, there's a column of refugees streaming out of the city on foot and in motor vehicles and aircraft, while to the east, the invading forces of the Indivisible have already conquered more than half of Anne Poole's core network of vast Halls and Laboratories; her Science Citadel.

The temple's "hospital" continues the theme-- it looks like a Stone Age facsimile of a modern hospital ward. It is simply a long, low room full of haphazardly-arranged lumpy straw-filled mattresses covered with thick black blankets. The beds are empty. As Mitch crosses the room the unpleasantly biological smell of the room becomes drowned out by an even stronger chemical stink, something like ammonia. At the far end of the room he finds sinks, cupboards, an extinguished fire with a tripod poised over it, and even some refrigerated storage.

He lays Linisd on the nearest bed.

This is the pharmacy, then, but Mitch finds almost nothing resembling medicine or medical equipment. What he does find, in a few pots and refrigerated bottles and tubs, is pungent, labelled with inscrutable symbols rather than conventional chemical names, and therefore as good as poison from Mitch's perspective. Still, there are bandages, and water. He winds Linisd's arm in a sling of sorts, and then sits

heavily on the bed opposite. He drinks, and allows himself one long blink. He feels exhausted, and he feels homeless.

*

Linisd eventually wakes up. Mitch asks her, "What's wrong with the sky?"

She replies, "The Sun is being consumed by a black hole."

Mitch looks up out of the window behind him, and the swollen, unhealthy Sun stares back. The black hole, invisibly small from this distance, is obviously well inside Mercury's orbit, angrily raiding the solar corona for plasma and linear momentum. He digests this information rationally, and does not panic. It was going to be his first guess. "Is the Earth falling in as well?"

"Yes. We have about six months before the planet becomes uninhabitable.

"Our universe contains two stars. The Sun, you see right above us. The other is Noct, the Far Star, which rises when the Sun sets and sets when the Sun rises, which follows us around the Sun in a way which defies the laws of gravitation. Other than the Moon and the planets, Noct is the only thing in our night sky. The planets orbit the Sun and the Moon orbits the Earth but Noct is always opposite the Sun from us in space. Which is impossible.

"It took us hundreds of years to realise what the Far Star actually is. It took us that long to build radio transmitters powerful enough to broadcast all the way around the universe and back and receive our own signals on a four-day echo.

"Noct is also the Sun."

Mitch Calrus doesn't know what that means.

"It means that if you go far enough in any direction you will come back to where you started. It means that this universe is a closed hypersphere with a circumference of just under seven hundred astronomical units. There is the Sun and there are the planets and moons and asteroids. The Sun is Heaven, from which all good things come. And the only other thing in the universe, Umbra, is a black hole, which is Hell, into which all evil will ultimately fall."

"That's how they'll kill her," Mitch says. "They're going to throw Anne into Umbra. Even though she's indestructible. Completely immobile in time."

"An immovable rock, and Umbra is an irresistible force," Linisd summarises.

"So what's going to happen when she hits the event horizon?"

"That very much depends on who is more powerful; the mysterious force which protects Anne Poole, or the mysterious force which created this universe and all its fundamental physical laws."

*

And what forces would those be?

In the time he has at his disposal, John Zhang knows that there is no way that he can save the world. Not alone. But the greatest discovery that anybody ever made was that even the Imprisoning God obeys laws.

So he manipulates God into doing it for him; he performs an act so abhorrent and dangerous to the

underlying structure of nature that the universe itself has no choice but to step in, like a terrified parent removing a loaded firearm from the hands of a toddler. He plugs the entire infinite Structure into his brain, and as punishment, and precisely as planned, planet Earth and everything else within a 48 light-hour radius of Sol are placed into solitary confinement; dropped into a pocket universe of such infinitesimal relative size that there is no SI prefix to describe it. Alef is physically divided in two, with Umbra as the junction point where the two parts meet, a bottleneck in spacetime. The sudden disconnection from earth stings Oul to the quick, and the wavefront of an outbound gravitational wave alarms him, in as much as he is capable of any emotion other than raw hunger for destruction. When he arrives, just seconds behind the sterilising light of several dozen dangerously local gravitationally-induced supernovae, all there is left of his adversary's home system is a three-mile-wide event horizon. And after the brief delay while the Imprisoner rearranges the Solar System just the way humanity likes it, the Earth continues its path around the Sun, and the Moon continues its path around the Earth, and life goes on.

John Zhang is enveloped and then annihilated by impossible lightning somewhere beyond the orbit of Jupiter. The New Cosmology investigation never finds him, but does, after some years, confirm that it was he and he alone who saved the world. The information, along with a great deal more besides, does not survive Hot War I. And as for the rest of humanity? Yes, there were known terracompatible planets out there, but nobody realistically expected to reach them. From a pragmatic viewpoint, the universe never amounted to much more than scenery and nothing of value to anyone but astronomers was lost. Besides, Earth has always had enough problems of its own. What good are pie-in-the-sky dreams? Flying cars and jetpacks and cities on the Moon? We should fix our home planet before we can start thinking about that kind of thing. It's the only one we have, and it goes on. Why won't you get some perspective? Life goes on...

[Endworld] Last Ergs

The Big Idea

It's late on a sunny January afternoon in 2016 at the Mauna Loa Deep Background Observatory and Anne Poole and Mitch Calrus are sitting on the grass looking out over the island and the Pacific. They've finished their long, involved talk with the astronomers. The object depicted on the black and white printouts in their hands has gone through classifications from "LSEAT LocalSC 45-662ACE-199204/444KJ" to "Gray-Jordheim Object" to "Quasi-Quasarlike Celestial Object" and will shortly be reclassified as a "Supernova Stack Anomaly". It is not Oul. It is Oul's wake.

The United States Special Air Corps, formerly the Department for Special Flight Research, has almost a thousand Class VIs, a fistful of Class VIIs and who-knows-how-many stronger secret Powers on their side, enough to fight a near-silent, near-bloodless land war with nothing but radar support - not even medics, not even supply trains. They are hand-picked. They do good work. Overt work in bright uniforms. Some of them, as trained members of the coastguard, police and fire services, save lives at sea and catch criminals and rescue people from burning buildings. Some of them even speak. Nobody trusts them, except those who, with varying degrees of irrationality, trust them unconditionally. No other country has Powers. Nobody trusts the Powers. Nobody trusts the USSAC. Nobody trusts the US.

No, there are no Powers in the CIA. No, there are no covert Power missions. Provided that you listen to the official story and mentally blot out every international headline from the last five years.

No, the Middle East is not stable.

And those are the *good* supermen - the ones who were called forward on purpose, to help the world. The annuals? Those are still secret. Mostly. Partly. Not at all. Urban legend. Conflicting reports. No evidence. Faulty evidence. False evidence. There's Arika McClure (why would the Americans make a teenage girl be a Class VIII? *UNLESS* <increasingly ludicrous conspiracy theories>), and Arika McClure's story (partially substantiated, mostly denied by the SAC, plenty doesn't add up). Several people have connected the majority of the correct dots already, but the last dot that even they could possibly find is Rome, Year Twelve - since then, nascent annual Powers have been grabbed early, isolated and, through increasingly extreme measures, disposed of. They're still coming through, though. Despite every effort, they're still coming through.

"After Zykov killed himself I spent so long looking over my shoulder," says Mitch. "If he corrupted that many people's minds, how many others who I didn't even hear about? If he was dead, wouldn't I be home by now? Zykov had years. We know he went all over the world looking for talent. He locked out half a dozen vital techs that could have sent me home. And every year a new Power comes through, carrying his power with them. I thought it was just going to be a game of seeing how long before they became uncontainable.

"There's mind, and there's power. In that basement in Omsk I thought I was going to kill him. And it turns out I *still* haven't even *seen* the real Oul. I need all my power. Not these dribs and drabs spread over a million people who aren't me."

"We could brute-force the Script," suggests Anne.

There's a long silence.

Anne waits patiently while Mitch processes the enormity of her suggestion. The Script is sixty trillion bits long, but more importantly it is so informationally dense that nobody's decoded more than a few percent of in all the years since it was discovered. Take a two-inch-thick chemistry textbook. Compress it to four pages of handwritten revision notes. Make a two-inch-thick textbook of the same density as those notes. Do all of this another dozen times and now you have the Script.

Mitch asks Anne how long it would take.

The Red

2017. It's past midnight, two thirds of the way down the 417-mile route that links the stupendously isolated hamlet of Flinke, Northern Territory to State Route 8 into Alice Springs. Mark and Sally Bryant aren't lost. It's a one-dimensional universe out here. There are only two directions, forwards and back the way they came, and their GPS is working perfectly. Nor are they as completely incompetent as Outback explorers can often be. They have enough food, water, fuel and survival training that by sunrise they could make it to Alice and quite a lot of the way back. It's not a bad vehicle to be driving and April's not a bad month for the trip.

But when the Jeep's head gasket gives up the ghost, and Mark has no choice but to declare their vehicle legally dead, they both get good and angry at one another. They were enjoying the experience of being further from civilisation than most people ever get to be, racing down the bumpy, barely-maintained "road" at sixty miles per hour with rocky sandy scrub surrounding them and the most glorious waltz of stars overhead (until a week ago neither of them had even seen the Milky Way, with naked eyes or otherwise), but that enjoyment was keyed to the fact that if everything went sideways they could, at any time, elect to leave the wilderness immediately and indefinitely.

Sally, fiftyish, has been married to Mark, fiftyish, for long enough that she can recognise the pattern of their argument. She quietly short-circuits it by skipping to the end, the point at which everything that can be said has been said, she is no longer cross, and she is in a position to dispassionately address the problem. Without a resisting force to rail against, Mark soon calms down too, and they begin to discuss what they are going to say when they radio the emergency services for a pickup.

A truck is dispatched from Alice. Given the circumstances - distance, urgency, preparedness, level of insurance - it'll take around three hours to arrive and cost them a couple of thousand Australian dollars. The fee is a problem. They really can't afford it. They will probably have to cut their holiday short. But being stranded is the immediate problem and cash is way off on the horizon. Mark says "It'll be fine" to Sally enough times that they both accept that it will, at some possibly-distant future time, be fine.

Eventually they get hungry. Sally climbs out of the car to retrieve food from the boot.

*

The emergency call is taken by Jacqueline Smith of the Royal Flying Doctor Service of Australia. Jacqueline is forty-five, has worked for the RFDS for more than half of her life, and has seen everything.

Mark Bryant is terrified but still, to his credit, coherent. "My wife's been bitten by something. I don't know what. You need to send someone here as soon as you can. She's catatonic and I don't think she's breathing properly and her ankle's swelling up like nothing I've ever seen. I can't-- there's a tow truck

on its way already but they don't have a doctor with them and they're still hours out so you have to send a plane or something. We're talking minutes and seconds, not hours and minutes."

Jacqueline pushes the red button. "Give me your GPS coordinates."

Mark Bryant scrabbles for the satnav and rattles off a dozen digits of latitude and longitude, pinpointing their location in the desert to the east of Alice Springs.

Jacqueline Smith confirms every digit as it arrives and transmits the full coordinates to the airfield. "Okay, we now have an agent in the air bound for your location, estimated time of arrival is three minutes, ten seconds. If you have any large light sources, such as headlights, flares or flashlights, please activate them now so that you're clearly visible from the air."

"Did you say *three* minutes?"

"Yes, sir. Now please can you give me your wife's name and then describe her condition in as much detail as possible?"

"How can you possibly get someone here so fast--"

"Ms. McClure has a top speed of just over Mach 4, sir. Since she is not yet a qualified physician, she will retrieve your wife *only*, bring her to Alice Springs Hospital for emergency treatment and then return for you separately. Please tell me your wife's name and condition so we can prepare treatment for her."

"Does she need a runway?"

"No. What is your wife's name?"

Mark Bryant tells her his wife's name.

*

He is still describing symptoms when *KOOM*, something splits the air overhead and Arika McClure spirals in to land. She wears a green eEMT's outfit with high-visibility stripes blackened by dust after the trip, and she's towing a sleek white single-occupant hypervelocity pod with a winking red signal light on top of it. Before Mark can react, Arika has the Jeep door opened and is carefully lifting Sally out head-first, forcing herself to move at minimum speed in order to avoid injuring her. This is the hardest part. The job is critically time-sensitive yet incredibly delicate, and she could do it in a fraction of a second if she simply relaxed for a moment.

Sally's entire lower leg is bright purple-black. She's unconscious and perspiring and her teeth are clenched, trapped in a painful nightmare. Arika's seen this kind of reaction a dozen times before, and it doesn't mean anything to her. Each of those patients received a different professional diagnosis, and a third of them died before they could be treated. Arika is not a medic yet. Being able to do an hour's studying in the space of fifteen seconds hasn't made her medical training any less tedious or difficult, and the simple years of experience she needs to become qualified can't be magically accumulated faster than the real world provides them to her.

Mark cries, "Is she going to be okay? I don't know what she was bitten by!"

"Don't talk to me. Talk to the doctors," explains Arika. She flips the HV pod's lid open with a well-practiced nudge of the foot, and straps Sally to the contoured couch inside it. She points at the radio in

Mark's hand. "I'm just an ambulance. *They* know what they're doing." She ramps up in perceptual acceleration, studying his face. The man is shaking and close to tears. He's genuinely petrified and it's not because the poisonous creature (it was a snake, Arika knows from looking at the wound) is still around the place somewhere. It's because he doesn't want to leave Sally's side.

On an impulse, Arika strips off her wristwatch and sets it to count down. She puts it in Mark's free hand. "I'll be back for you in ten minutes. I promise. Get back in the car and stay there. Keep the line open."

She wraps a hand around the pod's steel towbar and levitates into the air until the pod is off the ground. She aims back down the track and within a second all Mark can see is the blinking red beacon. Another two blinks and there's nothing left. *KOOM*.

Mark gets back into the driver's seat and stares at the point in the sky where Arika and Sally were last visible. After a while he switches off the headlights so he can see better, but there is still nothing to see but the the Milky Way and crescent Moon.

Mark Bryant is one of the few people in the world who are watching the sky live when the Milky Way begins to erode, blackened out star by star by the rapidly pooling and merging black network of event horizons, as they enclose and coddle the Solar System.

*

Arika is moving down Route 8 at more than four thousand kilometres per hour when she feels the power begin to go out of her. She reacts instinctively and instantaneously, as if skidding on unexpected ice: she stops squeezing the mental trigger that accelerates her forward through the air and surrenders, as much as she dares, to drag, shedding speed and altitude. An instant later she realises that that's not going to do it and she splays herself across the front of the hypervelocity pod and starts actively braking it and forcing it to the ground as fast as possible, gee forces be damned. By the time the total celestial eclipse is completed and her last downlink from Oul's colossal cosmic energy reserves is severed, she is within a metre of the road - paved single carriageway, by this point - but still over the national speed limit.

She hangs onto the front of the pod as it ploughs nose-first into the concrete, bearing most of its impact herself. She continues to cling to the top for the first bounce, then loses her grip when it smashes down again a hundred metres further down the road. She hits the road separately and rolls, her power reserves evaporating and her cellular structure violently catching up with reality. The pod careens off into the crash barrier and comes to rest near the middle of the road, six or seven car lengths ahead of her, damaged but upright.

Seconds crawl past.

"I've lost power," Arika whimpers. "I can't fly." Nobody can hear her. Her radio is broken. *I can't lift vehicles anymore,* she thinks. *I can't handle dangerous animals anymore. I'm going to have to buy food.*

Arika can see Sally Bryant still safely buckled into her seat, illuminated by soft white interior lights. She sees no blood or obvious injuries, but from this distance, and having just hit the ground with her head (and shoulders, spine, ribs, hip and left ankle) that hard, Arika hardly trusts her own vision.

Even if the RFDS realises that her GPS tracker has stopped moving - or disappeared, which is more

likely - and sends a plane immediately, it'll take at least thirty minutes for them to get to her last reported location. And even if the husband got out of the car and found the snake, there's no difference between a copperhead and a taipan when it's this dark, so there's no way of knowing what treatment to use. *I can't fly anymore and Sally Bryant is going to die.*

The red light flashes again. Arika realises that the real world is still moving at normal speed. She has spent the last twelve years automatically ducking into accelerated time whenever she needs a few extra moments to think about something. But that's another one of the million tricks that she'll never be able to use again. Minutes and seconds. Not hours and minutes.

Unless.

Arika shakes the stars out of her head. Agonisingly slowly, she gets up. She walks towards the pod. Favouring her good leg and clutching her bad arm to stop it hurting, she manages a steady but wretched shuffle. She concentrates on the blinking red light on the pod, keeping it fixed in her gaze so each flash of the bulb imprints on the same point on her retinas, until she's near enough that she can collapse against the side of the pod. She reaches down - her cracked rib moves painfully and makes her wince - and prises open the equipment compartment with one hand. Two of the five trays of stored medical equipment slide partially out of their slots. Arika takes one of them and pulls it all the way out and onto the road. She is not a medic, but sometimes carries medics to emergencies when it's known that the patient can't be moved.

She slumps down with her back against the pod, and opens the box with her good hand. Inside it are a handful of individually wrapped syringes and two dozen small, cold bottles with extremely complicated labels. She finds the five that are labelled as snake antivenoms and reads them carefully in turn. She thinks about snake habitats and behaviour, envenomation symptoms and the controllability of side-effects. She takes an educated guess, and climbs back up the side of the pod for long enough to administer the injection to Sally's left upper arm. Then, light-headed, exhausted, lulled by the hypnotic winking of the red beacon, she lies down in the road beside the pod, and goes to sleep.

The tow truck finds them like that, an hour and thirty minutes later.

Sally Bryant lives. She is the two hundred and twenty-third life that Arika McClure has saved.

You Are Here

It's 2111, the very start of the era that'll eventually come to be known as "post-environment".

Anne Poole is fully clothed, but that's more of a concession to the legacy she represents than it is a concession to decency, or protection from the skin-searing, sand-blasting elements of the aftermath of the Hot War and the catastrophic Drop. When you are time's most remote outpost of humanity, everything you carry with you is significant. She wears clothes because humans wore clothes back when they existed. It's conceivable that a million years from now another intelligent species will arise on Earth and Anne will be responsible for communicating to them the fact that We Were Here.

That's all a sentient species can really hope to achieve, after all: to make a mark on the universe big enough to prove that there was a moment in history when there *was* a sentient species, in this vicinity, with the power to make that big of a mark. All that's left of the human race right now is Anne Poole, a network of fried, shellshocked cities gradually eroding down to stubs in the unstoppable sun-driven

sandstorms and nitric acid rain, and some footprints on the Moon. It'll take time to erase all of it, but geology is a patient entity and astronomy ten times more so. Anne Poole has a lot of time on her hands.

There are still living creatures here and there on the cursed Earth. She has seen cockroaches and other insects scuttling about, and larger creatures with thicker skins which she hasn't been able to get close enough to properly identify, like the odd alligatory lizard. Whether they'll last out the radiation is anybody's guess. Whether they can survive the wind is anybody's guess. Three hundred miles per hour, the wind blows on bad days. They should call the world Venus II.

Of course, "anybody" is Anne Poole alone, now. And there's no "they".

She's tried to fly planes and helicopters but none of them are operational and she doesn't know how to fix them. She tries motor vehicles at random and sometimes they'll actually drive, but it's very rare that she finds a full mile of road that's intact and clear of debris. Sometimes, when a superhurricane comes along headed in the right direction, she builds a sail and wind-surfs. But for the remainder of the last N years, where N is a number she no longer remembers, Anne Poole has been picking her way east on foot.

There's no GPS, no electronic maps and precious little surviving paper. Now she's east of Germany, even the maps that are still legible aren't comprehensible to her, and there are no locals to ask for directions.

Still, she eventually makes it to Talmansk Raion. And she makes it to the city of Talmansk, and follows the beaten highway north through the hills, like a record-breaking quantity of construction vehicles and materials before her. She crests the final peak and spread out below her, largely immune to the elements, is the front end of a kilometres-long dome system, occupying the branching, concealed valley system like a complex fractal starfish, built of glassy ice-blue artificial diamond hexagons all tarnished a dusty black. The highway leads right up to its main entrance, which was closed and locked M years even before the disaster.

Its lights are still on.

She walks up to the airlock - two storeys tall, metres thick, with massive interlocking teeth - and begins banging on it.

Talmansk Arcology was international news. If there was still a living human anywhere in the world, Anne Poole knew it was going to be here. They have the vat-cloning technology she needs - the knowledge, that is. Maybe not the machinery, but that can be built. And in her backpack is a hardened storage volume containing six distinct backups of Mitch Calrus' brain. And if they're corrupted she knows where to go to get more: namely, anywhere. It was the most widely-distributed, intensely mirrored file in the world.

Anne keeps up the rhythm for most of a day, and at the end of the day, the airlock illuminates green and begins to grind open.

Escape From Planet Earth

The Federated Shiftship *Kardashev V* passes the first advance warning beacon at a record-breaking velocity of almost one hundred and fifty thousand universes per second-- so fast that the second and

third warning beacons are dopplering into its wake long before the ship's communications array has had time to decode, process and handle the first warning, let alone present it to the ship's captain for consideration and action.

All three beacons explain, in more than three quarters of a million distinct languages and in the most urgent possible terms, that the Space As You Know it is about to run out, and that all passing shiftships should immediately begin braking to avoid running headlong into the solid far wall of the multiverse. That's a problem, though, because a regular shiftship is to the *Kardashev V* as a Honda Civic is to Thrust SSC. The *KV* was brought all the way out to its home universe's Oort Cloud to make sure that it didn't collide with anything else during its mission to circumnavigate the multiverse, and it's spent the last two years and a measurable fraction of the multiversal curve doing nothing but accelerate *kata*, and it's not able to brake substantially faster than it's able to accelerate. You might as well put a sign saying "Bridge out 1/4 mile ahead" in front of a train moving at half the speed of light. Captain Xaeyo and his crew of 332 have a little over eight hundred and sixty millionths of a second to live.

As luck would have it, Universe +1, representing as it does the last accessible universe on the entire multiversal strand, is where a lot of explorers fetch up. More frequently than not, these explorers reach this distance from home by employing the most fantastic science available in their home universes. Which means that this is where the fantastic technology accumulates, like driftwood. If there's anywhere in the multiverse that you'll be able to evacuate three hundred people from a distressed spaceship in less than a millisecond, it's here.

The MITT Array (it's a backronym) is an automated network of space stations distributed over an oblate hemihyperspheroid of 4-space centred on Earth +1, eight light years in diameter and fourteen universes tall. The beacon's warning, "An unknown ship is incoming at extremely high speed!", reaches MITT fractionally before the distress signal of the ship itself, and the portions of the array that will be needed to catch it are awake and operational just as the *Kardashev V* reaches Universe +12. Between +12 and +11 a MITT information agent negotiates access to the *KV*'s encrypted information store, and from +11 *kata* it retrieves data in strict order of priority. It starts with the crew's mind-states. Each of the crew has a neural implant which performs a regular backup of their current mind-state to the ship's mainframe - "regular" being "once per second", meaning very little valuable life experience will be lost in the crash. Their saved minds can be resurrected electronically in pretty much any suitably approved virtual reality container, such as the five hundred or so bundled along with the mind-states.

Their physical bodies will be lost, unfortunately, so the next thing saved is the crew's genetic database. The ship will be lost too, but, in much the same vein, MITT is able to save its sensor logs and its blueprints.

MITT runs out the clock recording the live sensor feed as the ship hits the Wall, and many observers in nearby 4-space also tune in to watch what happens. Nothing this big's ever hit the Wall this hard. It doesn't penetrate, of course, but that doesn't mean there's nothing to learn from the explosion.

*

It's Sol Earth Gregorian Common Era Five Four Three Five. (It's probably a million other years, too, depending on where you're from and how you count them. Here at the edge of the multiverse, where all humanity eventually arrives, the popular epoch of late is the Yuur Unambiguous Era, in which the current year number is The Smallest Year Number Not Currently In Use Anywhere Else. It's currently YUE 189, but sooner or later a traveller is going to arrive whose own epoch was 189 years ago, causing

YUE to conscientiously jump forward to 190 to avoid the clash.)

Universe +1 is the first of approximately 1.84E13 parallel universes arranged in a closed circle in hyperspace. Because most Earths are still, to within acceptable tolerances, firmly rooted to their original orbital track, stepping between parallel Earths is substantially simpler than stepping from planet to planet within a solar system, let alone crossing a universe to reach other stars. So even though many parts of the multiverse have FTL travel, the Earth-shaped core of the multiverse is where almost everything happens.

Almost every conceivable eventuality is happening out there on the strand somewhere, on some Earth. Every historical path has been taken, for better or worse. There is cross-universe communication, trade, cultural exchange, technological exchange, colonisation, invasion, conflict and war. There are perfect shining lights and completely extinguished graveyard universes which neighbouring Earths use for weapons testing. The skies above the more civilised, managed Earth-clusters are a blizzard of instantaneous flashes caused by shiftships travelling *ana* and *kata* along designated safe spacelanes, spending a fraction of a second in each intermediate universe in turn. Other regions of the multiverse, due to twists of fate, are yet to even discover multiversal travel, and patiently await first contact. Some of those uncontacted worlds are going to suffer when their neighbours come looking for gold, fresh water, territory, and room to dump their waste.

A very few Earths don't exist anymore.

Some of the Earths have adopted different names, "Eden" being the most popular choice, but most Earths are still called Earth. Some Earths have numbers, but most of the numbered ones number themselves 1 or 0, and go from there when numbering their neighbours. Which means that the first question Xaeyo is asked when he wakes up is not where he's from, but how far he's come to be here.

"I'm sorry. Where is 'here'?"

It's a freshly made bed in a clean white virtual hotel room overlooking a pool, a green lawn, a beach and an ocean. Xaeyo gets up, and he finds that he looks exactly like he's used to looking in virtuality: two metres tall, uniformed, broad-shouldered, with facial hair he's never quite figured out what to do with.

Virtuality is no problem to him; the only problem is that he's supposed to be on the *Kardashev V*'s bridge.

The virtual man at the foot of his bed, a small, plump, older man with greying blond hair, explains what has happened to the *Kardashev V* and its crew, using diagrams and video footage.

"Please can you tell me how far from home you are?" he concludes. The man doesn't need to be asking this, because the information was pulled out of the ship with time to spare, but Xaeyo needs orienting.

"Almost four point seven trillion universes," he replies. "We were trying to map the whole multiverse."

The man nods. "That's correct. Well, you've succeeded as far as you were ever likely to. This is Universe +1. Unfortunately, it is impossible to travel beyond this point along the multiversal curve. There is a discontinuity in the multiverse. We believe that if you turned around and headed in the opposite direction, you would eventually encounter the same problem from the far side - there is almost certainly another universe, -1, there, confronted with the same conundrum as us. Captain Xaeyo, are you aware that there are walls?"

Xaeyo expresses polite incomprehension.

"There are walls surrounding and containing us. They prevent certain things from being possible. They block out certain *features* that the multiverse should have, but does not."

"Walls are built to be torn down," says Xaeyo, more or less automatically. He does not understand. And his feet itch. As a born explorer, standing still and not going anywhere always makes him feel like he is, in some way, wasting time.

"I agree. They nest, you see, and all of them contain this entire multiverse, as far as anybody knows. Except this one. It nests inside the others but it contains just one universe. Zero."

"And what's special about that universe?"

"We can't travel to it or communicate with it. Other than that, we don't know. Because we can't travel to it or communicate with it.

"There's supposed to be teleportation. Not the way we hack it, with deconstruction and reconstruction by nanobots; I mean true teleportation. And FTL communications. But they're walled off from us. Why? Well, this is why. Behind this wall is the reason.

"There's supposed to be an afterlife."

The Arrangement

It was going to take twenty thousand years, using "brute force" (a subtle form of brute force, admittedly: an incredibly complex and unearthly powerful and mind-bogglingly resilient self-programming supercomputer), to unravel enough of the Script to successfully "earth" all of Mitch "Xio" Calrus' remaining power. Thanks to Zhang's sacrifice, humanity had now bought that time, and Anne Poole, for one, was almost certain to live long enough see the calculation through to the end. Mitch Calrus, though, was not. And Xio's mind had to be there, alive and operational in a capable shell, to receive the power at the end of the calculation. At that moment, the New Cosmology could be undone, Oul would attack, Xio would defeat Oul, and the story would be over.

So, conscious of his present shell's mortality, Mitch Calrus had himself backed up. Those backups were distributed as far across the world as he could finance. When Calrus inevitably died, which would happen hundreds of times before the calculation was complete, Anne Poole would arrange for him to be resurrected. In turn, whenever Anne Poole was abducted, buried, lost, stranded or marooned - and this, too happened dozens of times over the next twenty-odd millennia - Mitch Calrus sought her out, pulled her out of her prison using his four-dimensional powers and restored her mind to normal as well. And so they found one another, over and again. They kept one another sane, and together on their shared path.

In the mid-21st century, a series of more than a hundred nearly-identical, nearly-useless, linearly independent Script technologies had been discovered. Poole and Calrus built a device which could access, implement, plunder, abuse and overuse any of those eigentechnologies, such that each time it was activated, the Imprisoning God would take offence and wipe all coherent information off the face of the Earth to stop it. In metaphorical terms, the bomb was leverage; an altar upon which an aspect of science could be sacrificed in return for divine favours. A Ship of Theseus, it was completely replaced

using spare parts more times than it was ever used, but in spirit it remained the same bomb throughout the calculation. Poole used it nineteen times altogether, at times when humanity came close to self-destruction, making sure, at great expense, that there would be something left to live happily ever after.

Anne Poole was immune to the bomb's effects, but Calrus and the supercomputers were not. Progress through the Script attack - critical to the endeavour, incredibly time-consuming to recalculate if lost, and most importantly quite tiny in real terms - was stored in the most resilient format practical, as binary data punched into metre-square plates of metal. Calrus' mind, weighing in at a cool pebibyte, was less easily duplicated - the volume of metal required would be measured in cubic kilometres. He was saved in secure bunkers, insulated and isolated as far as possible from the Imprisoning God's destructive reach.

The final Crash was instigated in 22730. It was significantly more powerful than expected.

Travelling solo, Poole visited bunkers in (regions previously known as) Lesotho, Mauritius, Mogadishu, the Bayuda Desert, the Arabian desert, Kazhakstan and two in Russia. The final and most secure was at the North Pole, on the very far side of the Earth, which she eventually reached four years after the Crash. Every copy of Calrus' mind-state had been corrupted. There was nothing left but noisy binary.

There was no copy of Calrus left anywhere on Earth.

*

In the early 21st century, very shortly after memory surgery first became practical but before it became cheap, two hundred and fifty people people paid to have their mind-states stored alongside the battery of conventional scientific instruments on the TRIDENT space probe. TRIDENT was sent to observe Neptune and ultimately land on its moon Nereid. It would continue transmitting data until its radiothermal generator ran out, half a century later, and then lie dormant until it was destroyed by an asteroid, most likely billions of years later still.

Mitchell Calrus was one of those people.

And so, thousands of years later, Anne Poole went to Science City, set herself up as a God and created Empyreanism, the Religion Of Space, in which the sky and planets were Heaven, which humanity had to reach and visit in person in order to obtain salvation. At the expense of all other scientific and social progress, aerospace engineering and astronomy and their related disciplines became the only important undertakings in the world. "Go into space. God says you must. Nothing else matters." The first manned space launches happened within two hundred years. The Moon was reached ten years later and Mars twenty years after that-- most of that time being transit time.

It was during this time that Umbra's anomalous position (off-centre, nowhere near where the God-Empress directed her astronomers to search) and velocity (inbound towards the Sun, due to arrive in a matter of centuries) were discovered. It was also during this time that, in countries not directly under the God-Empress's control, the Empyrean Message became corrupted into, among other forms, the Trail Of The Indivisible Soul. The Sun became Heaven, Umbra became Hell, the duplication of human mind-states became a religious abomination punishable by death, and significant and inconvenient prophecies regarding Anne Poole, Umbra and the end of the world arose.

This is how close it was: The one-way manned mission to Neptune reached its destination on the same

day that the invasion of the Empyrean Empire began. The shelling of Science City began fifty-five minutes before the download from TRIDENT did. The Empyrean Empire was overthrown and Poole herself was captured just hours later, and Calrus - despite disorientation from his journey across such an enormous span of time - escaped to the Underground by a margin of seconds.

The Four-Dimensional Man

From the passenger seat of their aircraft, Amarkaya directs Mitch to fly to a rendezvous point in Kaphir, a smaller settlement west-southwest of Science City, which was hit and overrun by invading forces days ago, and now stands deserted. On her instructions, Mitch lands the aircraft in the town square at the foot of the steps of a large pillared governmental building. Then he climbs out of the cockpit, scratches an Empyrean design in the dust underfoot, and waits.

Hours pass without incident. Mitch occasionally sips water from a bottle, and tries to shield his eyes from the setting Sun as it moves between the nearby shells of bombed-out office buildings. Amarkaya quickly falls asleep again. At dusk, bored, and having spent as much time as he thinks is reasonable holding it in, Mitch wanders away and takes a leak against the aircraft's rear landing gear.

As he's finishing up he hears a noise. He turns back around and there are two black-clad soldiers with guns pointed at him, having assembled silently like ninjas. (There are aspects of their uniforms and shoes which allow them to move so quietly, but Mitch never gets the chance to ask about them.) Mitch raises his hands, and half a dozen more soldiers in more conventional gear (and making a more conventional amount of noise) appear from behind walls and inside nearby buildings. They converge on the aircraft. One of them goes to the cockpit, opens the passenger door and begins rousing Amarkaya.

They don't look hostile, just pathologically cautious. "I think we're on the same side," Mitch suggests to them. But it seems like Amarkaya has been recognised, and she has begun to explain the story.

*

After twenty thousand years, it transpires that Anne Poole has learned how to create, inspire and arm an extremist religious underground.

The surviving network of Empyreanists is a powerfully-motivated, compartmentalised organisation of cells, roles and codenames. They're frighteningly hard-edged men and women (and children), capable of any act imaginable if it will bring the final two copies of Xio's mind - Mitch himself and the slab of metal Anne pressed into his hand in her last seconds of freedom - to the Antarctic calculation node. This is their purpose in life. Their world is ending and this is the only thing that can save them. That people will change radically under such extreme circumstances doesn't surprise Mitch, but these people are *prepared*. They've been *training* for this insane situation, putting together a network of transit vehicles and escorts and handoffs with the sole purpose of catapulting a single man from Science City all the way to Cape Town and then onwards to the South Pole as quickly as possible, at any cost.

Calrus' party's journey to the southern tip of the African continent is rough, eventful, difficult and time-consuming. Leaving aside the eternally disputed territories through which they are covertly attempting to travel, and the hostile presence of what seem to be entire armies and countries bent on the destruction of every aspect and inhabitant of the Empyreanist Empire, they are also pursued by heat.

The journey takes weeks, during which the Earth falls millions of kilometres closer to the Sol/Umbra binary system. Earth is not spiralling inevitably into Umbra, because spiral orbits don't exist. A black hole is not a magical cosmic magnet; it can be modelled as a point mass like any other and the laws of orbital mechanics apply to it as much as any other object (outside of its event horizon). Earth is merely adjusting to a new, elliptical orbit with an intolerably hot perihelion.

There is no singular point at which a planet becomes uninhabitable to human life, but an absence of drinkable water suffices, and the average surface temperature at the Equator is going to pass boiling point before this is over.

Mitch ducks when he's told, and runs and shoots when he's told. He phases, reconnoitres and kills when his four-dimensional powers are needed. He watches himself do these things, disconnected. On many occasions he is called upon to assure himself and others: "I *will* be able to reset everything to normal. Instantly. Once I have my power back."

Their ship reaches the Antarctic coast days later than expected, in dangerous and unpredictable sea conditions precipitated by the unprecedented ramping-up of global temperature. Cold-weather gear is not necessary as they board the helicopter and continue to head south across rapidly liquifying ice shelf and enormous impassable white rushing rivers and, in places, exposed rock. Antarctica's body is sloughing away under the intensifying Sun. It is being blasted down to the bone.

When they reach the coordinates where the enormous granite geodesic dome is supposed to be located, it isn't there. The landscape has changed too much. The building has been carried away by moving ice. But it was always a complete sphere, not a dome, and it floated on the ice, rather than being built on top of it, allowing it to roll and drift with the flow - up to a point, anyway. It has left a trail wide enough to follow from the air.

A horizon north they catch up with it. It has fallen into an enormous rocky crevasse, where sharp outcroppings have dented and punctured its roof and destroyed its structural integrity. There's just enough of the granite shell left for Mitch Calrus to be able to see what the machine inside it was supposed to look like - all intricate golden and steel and silicon gears and cylinders, now bent and broken by the drop and impact. There are hexagonal granite pieces weighing tens of tonnes littering the floor of the icy canyon. There are plates of metal punched with holes. There are crushed supercomputers. The half-shell that's left is slowly filling with ice and icy water flowing into the crevasse from the south. It's a trainwreck. It's a broken, drooling egg.

Despairing, Calrus commands the pilot to bring them in through the huge hole in the dome's roof, and descend as close as possible to the hub at the centre of the shell, where four walkways radiate out at right angles towards the rim of the dome.

"Poole said you'd know what to do. She said it would be obvious," someone shouts over the aircraft's rotors.

"Obvious?" Calrus shouts back. "What's obvious about this? Other than the fact that the whole thing has been smashed to pieces? Look at the ice build-up. This can't have happened more than a few days ago. We were just late. I crossed millennia. I got out of Science City by the skin of my teeth. I came all this distance and worked for all this time, and you didn't get me here quickly enough. She spent two hundred and fifty years building a spacefaring civilisation to rescue me, and we were late." A million things which have cost him time race through Calrus' head. "I thought this dome thing was safe. I

thought the calculation was finished and the result was waiting for me, I'd just have to say some magic words and it'd all be over. And I could go home."

"It *is* all over."

"Who are you talking to?" asks a third voice.

"Do you hear it, Mitch?" the first continues. "There's no such thing as time travel. Backward or forward. You can't get out of the trap like that, it's capped at both ends. Which means a point must come when you can't go forward in time any further. And you have to stop and turn back. Or die."

"Which one of you said that?" shouts Calrus, turning around and facing the other three occupants of the helicopter.

"Said what?" replies one of them. "Who are you talking to?"

"I warned you," says the first voice, still somehow behind him. "Do you hear it coming?"

The aircraft explodes. *POOM*.

*

Anne Poole, after a month of travel, has reached Umbra. Thanks to the enormous gravitational gradient, she cannot move. Her arms are clamped to her sides and her toes are pointed straight down into the black hole. Her capsule and restraints have long since been torn away from her and crushed into atoms by the same tidal forces. She would see momentary flashes of distorted light from the Sun and other captured photons above her, if her eyelids weren't held closed under tonnes of their own weight.

Anne Poole has no way of knowing what is happening on Earth, if the word "is" even has the usual meaning in a region of such intense spacetime distortion. She finishes up her magic spell. Still intact, immovable, she hits the event horizon at a respectable fraction of the speed of light, with her protected synapses still able to fire information at one other, even while semi-infinite gravitational forces try to prise her apart at the quark level.

And nothing gives. Spacetime screams contradiction and paradox, and there is an instant during which the laws of physics and even the Imprisoning God itself all drop into failure mode-- an instant during which an intelligent mind, suitably positioned, is able to make a decision about what happens next.

At the expense of her own life and a technology which, if allowed to grow to fruition, would have come to be known as Secondary Functional Singularity Modulation, Anne Poole chooses to dissolve Umbra. She disintegrates in an instant. The kink in spacetime untwists, the Solar System reconnects to the rest of the universe. Oul attacks. He blows up the Sun first; it's nearer. Then he loops in space and accelerates towards the nearest powerful beacon of intelligent thought, which is Earth.

Science Fiction Future

Graveyard Universe

"There goes the Sun."

The swollen solar disc begins to dim, areas of its surface switching off in ugly black blotches as wide as worlds. Out of the sabotaged star shoots an actinic blue pinprick, arcing around to bear down on Earth, currently host to some one point zero five billion souls. Moving at a respectable and increasing fraction of the speed of light, he'll arrive in just minutes, hitting the Antarctic first, hard enough to punch a hole right from one side of the planet to the other. The shockwave from the supernova will follow a few minutes later. There'll be nothing left but ionised plasma.

Anne Poole is dead. There is no Calculation, no Script Solution, no Power. A war which spanned twenty millennia, and inexpressibly gigantic tracts of hyperspacetime besides, is accelerating to its conclusion. Humanity-Zero is over.

Mitch hits the catwalks feet-first, but it's icy and on an angle and he slides uncontrollably. Shards of exploded helicopter rain down around him. If it was ever time, it's time--

Ghosts

London St. Pancras International looks brand new, and compared to other London rail terminals it practically is. All tasteful modern concrete, interactive customer information screens, champagne bars and expensive book stores. Clean, bright, spacious, airy-- all in stark contrast to, say, its sister station King's Cross, just over the road, whose low, dark ceilings have been soaking up industrial pollution for a century and a half. You can get to Paris on the Eurostar in less than two hours and that's exactly what Ching-Yu Kuang is intending when he runs into Mitch Calrus, changing trains on his way to Edinburgh to see friends.

It turns out that they both have time to kill. There's a pub in the station, and ironically its only real failing aside from the unavoidable crowding and impersonable, transient clientele is that it, like the station, is brand new. Pubs are difficult to build old, though.

They steal a pair of stools at the bar and order a pint apiece. "It's you, then," Ching begins. "Still here? Coping?"

"It gets easier to tolerate," says Mitch, "but I still get the dreams about the rest of the Structure. Anne helps me with it. She understands it better than anybody else I've met."

"Anne?"

"Anne Poole. I never mentioned this?"

"*The* Anne Poole? The one who lost her mind."

"I've helped her find it again. So we have a comfy symbiosis going on," explains Mitch. He glances at Ching, and frowns, puzzled.

During the pause, they drink again.

"Are you still trying to find a way home?" Ching asks.

"I just don't know. I mean, Oul's got to still be out there somewhere, or this whole mess would have dissolved by now. I just don't know where on Earth he could be, or how I could find him."

"I was thinking about that," says Ching. "I study the Script. It's all anybody studies these days. But the amount of stuff locked out to us is becoming unpleasant. Everybody knows that trying to implement these designs always ends in death for anybody involved, but they keep trying it on, with compartmentalisation and remotely-controlled automated fabrication. Did you hear about this exec in Spain who's on trial? It turned out that he had about two hundred and fifty people working on parts of a single supertechnology and none of them had any idea what the full picture was. They were having fatal accidents. More than a dozen of them. And they were just working on the smallest, most innocuous pieces of the puzzle. You get *nowhere*, now.

"Science is over, do you see? Roadblocked. Until we can send you home. Teleportation, replication, antimemetics. There will never be FTL. Even if it works once, it'll break right after."

Mitch Calrus has been getting visibly uneasier as Ching has been speaking. "I've never heard of antimemetics."

"An antimeme is the opposite of a meme. A meme is any idea with a self-replicating property, a hook which causes people to disperse the idea to other people. Any world religion is a meme. Memes can be attached together, they mutate, and they reproduce, like genes do. An antimeme is the opposite. It's an idea with self-censoring properties. An idea which is repulsive. People who have the idea discard it. They don't share it. They try to prevent it from spreading. Secrets. Scandals. 'The public must never know about this.' 'We don't talk about X.'"

"But something that simple is a supertechnology?"

"Oh, sure. You could weaponise it. It'd be completely different from brainwashing or mind-wiping or censorship. You could make a device which could antimemeticise anything you wanted. Or anyone. And then nobody would give a second glance to that person. They'd be an unperson. A ghost, drifting through the world. Even close family would forget that that person had ever existed. They'd just mentally edit him out of their memories and experiences. They might even disappear from photographs and videotapes and public records. And nobody would ever notice."

"That sounds like a terrible thing to do to somebody," says Mitch. "Ching, are you okay? You... look ill."

"I'm fine. You're right, it was a terrible thing to do. Because someone *was* erased. Not a thing, a person. Antimemetics were locked out years ago, but it took me years to see through this 'magic eye pattern' and see the extra Script Amendment which had been hidden there in plain sight the whole time. You see, the *victim* might still exist in some way. If somebody really had been erased from the universe like that, their only hope of being found again would be if someone spontaneously decided to look for ghosts. They could be right here in this room, unable to get anyone's attention no matter how loud they shout. Don't get up."

Mitch, who has hurriedly picked up his backpack and started to leave, freezes in his tracks. Ching hasn't moved and isn't even looking directly at him. "I'm going to miss my train," says Mitch.

"You are not going to miss your train. I have some questions for you." Ching drinks. Casually. Mitch turns and sits back down, as if being forced by an unseen hand. He places both his hands flat on the bar,

framing his half-empty pint glass, concentrating. *There's something wrong with your brain,* he thinks. *Or mine.*

Once Ching has put another finger of beer away, he continues. "Why am I the only person who remembers the name Thomas Muoka?"

"I don't know who that is," says Mitch.

"Of course you don't. That's not what I'm asking. There were five of us on the roof of the Medium Preonic Receiver that night. You remember four. You, me, Seph Baird and Mike Murphy. We saw you do magic that night. But Muoka was there too. And that's the last thing that happened before antimemetics dropped out of the Script and Tom Muoka dropped out of the universe, like neither of them ever existed. Why do you think that is?

"Here's another. I *do* know Anne Poole. Actually, I've been following her case quite closely. I knew you two are involved together. How *did* Anne Poole recover her mind so fast? The sensory deprivation specialist, Srin Shapur, said that she was going to be vegetative for decades. How come her recovery began right after you volunteered to work with her? How come, after just a few years, she's as articulate and powerful a physicist as she ever was? And she's working for you now?

"And another. We saw impossible things. We shared a vision of the Structure and your war. And we all believed you when you told us your story. That's *wrong*. We had what amounts to a religious experience, but we didn't test it. We just fell into line and started working for you, trying to send you home. Why didn't we challenge you? We're supposed to be scientists.

"Mikhail Zykov was smart, manipulative and powerful. He surrounded himself with scientists who knew more than he did and politicians with more power than he had and he brainwashed them into helping him achieve his goals. He created false ideas and put them into other people's minds. He was a telepath. *Does this sound familiar, Xio?*

"*What did Muoka see which we didn't?*"

"First of all," says Mitch, "you have absolutely no idea what you're talking about. Second, I have enough mental control over these sheep that I could kill you right now in front of them and never serve a day--"

"Likewise."

Scintillating white light coruscates from one of Ching's hands. He has a blue-black metal cube clenched in one fist, and the light is escaping through the cracks in the box's welds and the gaps between his fingers.

Mitch stumbles backwards, tripping over his stool and holdall, and tries to run for the door, but Ching catches his arm. "There's no use running. This thing has a range measured in miles."

Mitch stares wide-eyed at Ching for a moment. The man's mind is a locked door. His face is a picture of calculated fury. But the pub is full of people (none of whom have noticed or reacted to the detonating weapon of mass destruction in Ching's hand). And the station outside is equally densely packed and King's Cross Station is fifty yards away and there's a major Tube interchange below the two as well. "You'd kill thousands," he says. "You're bluffing. Feet, at most--" Mitch tries to phase his arm through Ching's grip. It doesn't work. Suddenly, instantly, he is properly frightened for his life.

He charges forward, effectively picking Ching up and slamming him against the wall where it meets the bar. For a moment Ching is stunned by the blow to the back of his head, then there's a struggle and he swiftly has Mitch in a rudimentary headlock. Mitch kicks off the wall, but by now the light is so bright that neither of them can even see what's actually happening and they trip over the tipped stool. They hit the floor hard, Ching mostly on top. Mitch recovers fractionally quicker and tries to scramble out from under Ching, smashing his head into the bar as he does so. For a split second he manages to completely free himself from his opponent's grasp. During that split second, the box goes nuclear.

When everybody in the bar can see again, there's a metre-wide circle of scorched wood flooring where Ching was.

Where Mitch was, which is centimetres outside of the blast radius, there's still Mitch.

Lost Time

It's a legitimate problem.

The prison in which Alef is suspended is impregnable and inescapable in all known conventional and unconventional spatial directions and, any time another path is discovered and tested, another, narrower set of walls is erected to block those off. There was a time before the walls existed, but the prison is now capped at that end, too - no time travel, no closed timelike curves, no possibility of escape via the singularity at the origin of the universe.

There will also be a time after which the walls cease to exist. Eventually, there will be an instant of total entropy, the Omega Point which no finite energy resource can stave off eternally and beyond which nothing coherent will ever exist. A point when all Alef's intelligent life - cosmic or otherwise - will have passed; when the walls are no longer necessary and the Imprisoning God, task completed, will have expired too.

It is towards this point that Ching is hurled, clinging to his osmium cube, tossed and dragged down the frothing white timestream like an unmanned rubber raft. He accelerates to more than eight thousand five hundred years per second before the Imprisoning God catches wise to what he is trying to do and rips Standing Wave Time Suspension out of Alef's configuration. Ching coasts for a decade as the timestream evaporates and then drops back into real space, crash-landing over the course of a six-week span of late 230th-century London. The impact is devastating, but the build-up of radiation and vibration preceding it means that the surrounding portion of the city has long been evacuated by the time Ching lands. He arrives in a city as ancient and storied as any of this era, seemingly built alternately from hundred-metre-tall skyscrapers and giant redwood trees, the two species of structure interlocking and competing with one another for sky.

After things cool down, Ching is recovered from the blast zone, frazzled but alive. The locals speak to him in sophisticated variations of languages which are utterly alien to him and which he does not speak, but he quickly realises that he can simply look into their heads and pull out the word/idea combinations he needs. The biggest obstacle is pronouncing the unfamiliar syllables back to them. His first attempts are at the "lost tourist with phrasebook" level, but after a solid week doing nothing else his only problem is a bizarre accent and a tendency to stumble over implosive consonants.

Travel across this future Earth is difficult. There is a vast amount of pre-existing road and rail

infrastructure, up to and including a pressurised submerged maglev tunnel crossing the entire North Atlantic Ocean, but the state of repair varies from "good" to "nightmare-inducingly dangerous" depending on the terrain and the distance from civilisation. The North Atlantic Crossing is broken in dozens of places. Modern humanity seems to be not long out of the Stone Age, and still tied to what Ching would call naive conceptions of the origin of the world and all the wonders in it. They have notions of machine health, and machine spirits. They regard transit infrastructure as a circulatory system of a living planet. At almost every junction is a minor or major monument to a different guardian angel of travel, the God of Market Square, the God of the Former A20, the God of the Flooded Chunnel (Coquelles Terminus). Many of the monuments have memorials or burnt offerings beneath them, and every time Ching switches from one mutant vehicle to another, or from one principality to another, it involves at least two of a blessing, a chant and a toll.

Collecting information, by comparison, is easy; disturbingly so. Ching consciously tries to exercise restraint but the alternative is to become overwhelmed by a world he no longer remotely understands. Just asking "Why?" is enough to cause the true answer to condense out in the mind of the person he's asking, so fast that Ching often loses interest and stops listening to the oversimplified, misleading or simply mendacious verbal explanation. Even so, it takes him an extraordinary amount of time to uncover the any kind of truth about the circumstances leading to the present situation of the human race. It is a blind spot in history, and all he can do is explore its edges.

The trail leads him south.

*

This is all the result of a dire miscalculation.

He had hoped to catch hold of Calrus and ram him headfirst into the far wall of the timestream. Calrus would be crushed in the attempt, sieved out of spacetime, leaving behind Ching and the rest of the human race. With Calrus dead, there would be no reason for the Imprisoning God to continue to exist, the walls would collapse, and humanity would be able to continue onwards, alone, to their rightful destiny. Ching reckoned that the Imprisoning God would be primed and waiting on a hair trigger; that its intervention would occur within a year of travel.

Without Calrus in tow, though, the threat of the escape attempt was drastically lessened and God took tens of millennia longer to react. Ching knows that there *is* still a temporal wall looming some time in the future, but it could be anything from hours to decades away. And a glance at the (unexpectedly starless) sky reveals that decades are not available.

And then, as he travels towards Empyrean territory and he encounters the minds of more knowledgeable astronomers and theologians he comes to understand the truth: the universe has been sundered; Oul is real; Oul is still alive.

He was wrong.

|[A]|----

Mitch hits the railings. He hangs on. The drop below him is a hundred metres into an abyss full of frozen, tangled mechanical equipment and broken rock. The railings are iced up and almost impossible to get purchase on.

"She was an agent of the Imprisoning God," bellows Ching from far above Mitch's head. Ching is standing on air, radiating stolen heat and light, dumping waste Power. "So you broke her brain down and rebuilt it yourself so that she would spend an eternity serving you and then kill herself so you could win the war. Where *should* we be? After twenty thousand years?"

"I was never your Adversary," Mitch screams back. "You made a mistake. How can you argue with that thing in the sky? It would have exterminated your entire species if I hadn't saved you. I saved your whole world from itself! A dozen times!"

"You saved *yourself*! I don't think you understand the scale of what we've been denied! We could have taken every star. We could have circumnavigated this universe. And this is just the lowest rung on the Structure. But all possibility of salvation was taken from us as soon as we knew it existed, before we could comprehend the magnitude of its implications, before we even had a chance to process the colossal theft which was happening in front of us. We should have lived forever, but the door to an uncountable infinity of possible afterlives was closed to us because of a single, petty, stupid creature which decided we were acceptable collateral."

The sky is dimming, as if night is falling. The malevolent blue pinprick in space is right overhead and growing in intensity. They have seconds at most. Mitch screams that killing him will not save anyone. Ching replies that he knows. The rage radiating off him is palpable, washing over Mitch's mind so powerfully that it makes it difficult to concentrate on anything else. Mitch can only hang onto his slippery railing with both hands while white light, heat and noise saturate his senses. He feels electrostatic charge building up in the catwalk and hairs rising on his arms. Soundlessly, unable to tell whether he is even moving his mouth properly, Mitch asks Ching what he should have done. A few seconds pass.

"You're going to want to watch this," Ching replies, his voice cutting effortlessly through the building scream.

In an eyeblink Mitch is a mile away, watching a brilliant yellow humanoid accelerate into the sky on a lightning bolt's zigzag course, rising to meet Oul at an altitude which surely won't come to more than a few light-seconds. "Xio!" shouts a human voice behind him, and he turns to see his three soldiers and helicopter pilot, rushing forward to meet him. "What happened to you? What happened to us?"

"Someone got to the Solution before it was destr--" is all Mitch can say before the noise of Ching's launch catches up and flattens them all.

*

Faster.

The first thing Ching does is overclock his brain, pushing the virtual control all the way forward until it breaks. He's a hundred thousand kilometres above the Antarctic and still accelerating and about to hit Oul fist-first at a combined velocity which he would need a Lorentz transform to accurately calculate. Still, Oul has the upper hand in terms of sheer speed, and a simple application of the law of conservation of momentum has them both hitting the ground again within a matter of two more seconds. Ching has that long to end the war.

Each superhero was twice as powerful as the last. This went on for twenty years, and then...

Oul is humanoid, and this is the only thought that Ching has time to process before absorbing the

entirety of Oul's opening seven attacks, all of them energy-based and equivalent to titanic, tightly focused nuclear weapons. In an instant Ching is improvising and constructing force-field shields to protect himself-- force fields being an entire technology which he had no idea even existed before he ramped up his intellect. He retaliates with a half-formed attempt at a force-field punch, flanked by multidimensional energy attacks of his own and a steel-sharp mental directive which, all things being equal, should eviscerate Oul's brain of all intelligent thought, leaving him docile. This does not work. Oul not only shrugs off the blow, but starts breeding secondary offensive units. Ching instinctively does the same and rapidly loses track of the war. With further attacks converging on him and absolutely no idea what he is doing, Ching grants some autonomy, a lot of intelligence and a monumental injection of firepower to his external pawns and the fight instantly blossoms to a hundred times its original diameter. *Then* Oul finally physically collides with him, so hard that Ching's physical manifestation momentarily disconnects from his perceptual centre - he is borne back down to Earth so fast that he can barely keep up with his own body.

Ching senses that he is losing the initiative. There are people on the rapidly rising continent down there - he clenches one fist and moves them out of the way, not knowing or caring how, but causing two dozen more minor Amendments to switch on at the tail end of the Script. With the loss of mobility, the war among the pawns at the interface between him and Oul becomes noticeably slower and simpler to follow. *That will work as a battle-level tactic,* Ching thinks. *Use and abuse. Take away all his aggressive outlets.*

But that will take away all of mine. Ching manages to gain the upper hand in the tussle, turns, uses Oul as a live shield and switches every particle of Antarctica from "mass" over to "energy". ("No," warns the Imprisoning God, in stern, blunt Eka: "In *this* universe, you do *not* pull stunts like that. There is a limit. You are racing towards it.")

The sparkle, flash and catastrophic outrushing shockwave from the detonating continent will easily be enough to wipe out all life on Earth. But there'll be a critical delay before the shockwave starts hitting inhabited countries, and now that Ching has used this trick, Oul can't use the same on the planet itself or the people on it. Ching locates the null spot in Oul's energy wake-- the point directly behind him where all his shields neatly intersect with one another-- curls into a ball and rides out the shock. Oul, caught off-guard, bears the brunt of the entire explosion. Easily. Then turns, and resumes the fight, with negligible damage, yet greater aggression and the same furious purpose: *EVERYBODY DIES NOW.*

It has no mind - that's how it withstood the first kill-command. All it has is firepower. Even within punishing and rapidly contracting constraints, Oul is unimaginably stronger. The thought occurs to Ching that the two of them could battle until they were invisible points fighting for control of a zero-dimensional universe, and he would still be hopelessly outclassed. Xio and Oul were both of effectively infinite capability. But there are levels of infinity. *That was how this all began in the first place.*

I'm just thinking faster. I'm still stupid. Did I even have a Plan B?

So that's the full two seconds elapsed, and Ching hits ground zero like a kinetic harpoon and keeps going, driven into the molten crust and then the Earth's mantle by Oul at his back. He shapes his shields into something roughly hydrodynamic so that he can slip relatively smoothly through the kilometres of black liquid rock but it's an ugly dive and his defences are still being torn away in thick layers as they carve downwards. *How do I beat this creature? Does it even have weaknesses? We held it off with a black hole. It can't violate SR. But functional singularity modulation is gone.*

Gravity. Gravity is its weapon.

"No. That is not something you can do."

He has milliseconds before real human lives are going to start ending. And, under this much pressure, short of directly asking for divine intervention to finish the fight for him, there's nothing else he can think of.

Ching raises one hand ahead of him and delivers a series of complex commands to the fabric of reality. At first it looks like nothing has resulted, but then they pass through the interface between the lower mantle and upper core and erupt out into what is now a seven-thousand-kilometre-wide bubble of vacuum that Ching has torn in the centre of the Earth. Freed from the rock, Ching accelerates forward out of Oul's grip, stretches and re-establishes as much of his shield array as he can. Oul screams and pursues him, drawing gravitational power from the aether to defend itself. But Ching gets there first, taking hold of the still-contracting globule with both hands, pivoting around it and coaxing the superdense material into a handgrip. Above them, planet Earth begins to implode.

Oul is too late and begins decelerating while Ching wrenches the impossible spinning zettatonne weapon around to face it. Spacetime twists and cracks and light and energy bend with it and the rainbow firestorm around them dims and shuts off as self-defence takes priority. Oul's image wavers and changes size as it tries to construct a gravitational sink intense enough to divert the attack elsewhere, but Ching can see reality changing and simply waits until all the graphs meet before firing a bullet with the mass of the Moon at his opponent.

"No."

And that's the moment. The walls come down. The Script opens up. The End.

When Everything Is Possible

There are parallel universes.

Agents from those that are immediately *ana* and *kata* around the multiversal curve arrive in Alef within microseconds. The surface of the rapidly self-destructing planet Earth-Zero is swept molecule by molecule for intelligent human life and evacuated with time to spare. Quite a lot of the more historically significant features of its surface are saved too, for sentimental reasons and future study. The whole collapse can't be prevented - a full hour's warning would have been necessary for that - but it goes on the scientific record, every moment of it. So does the supernova, which always makes great entertainment.

There is FTL now. There are pan-stellar civilisations. There are pan-universal civilisations. There are uplifted humanities crawling up the pillars of the Structure towards Upsilon layer, for whom Multiverse One was just the cradle. There are timelike loops and solar sails and bifurcations and antigravity and honest-to-God laser blasters. For the bewildered or homesick the lost Earth is rebuilt in virtuality in perfect detail. There are worldtrees, space elevators, Dyson swarms, replicators, space stations, terracompatible planets and cities on the Moon. There are halos, AIs, brains in jars, Jacob's Ladders, Singularities, infolectricity and superlight. There are people from the future and people who can fly and people who can't die--

Extras, appendices, feedback

Concepts of Fine Structure

The first central concept of Fine Structure is that the real universe in which we exist, "Alef", is one of a near-infinite array of ever-larger universes. This "**Fine Structure**" displays size, coherence, intelligent life and all kinds of wonders on every scale and in every conceivable cross-section. Being only 3+1-dimensional, we exist right at the very bottom of this scale.

The second major concept is that intelligence, thought, ideas and coherent information are all aspects of a superdimensional force, existing alongside gravity and electricity. **Information is substance**, and can be manipulated.

Information is a much more powerful force in the higher dimensions, which is why they are filled with intelligent life. In a three-dimensional universe, however, information is a very weak force, so intelligent life is rare. Humans are the only intelligent life anywhere in Alef. We are extremophiles, existing far below the point where most higher-dimensional individuals believe that intelligent life becomes impossible to sustain, like those freakish creatures which live at the ocean floor, or bacteria clinging to life in the Antarctic.

In the opening of Fine Structure, two high-D creatures, Xio (75+5D) and Oul (80+6D), go to war. Xio, the less powerful of the two, turns the tables on the other by intentionally trapping them both in Alef, a 3+1D world in which neither of them can do any damage; indeed, where sentient life, it is believed, cannot exist.

The two beings land fairly early in the universe; after the development of stars, but before any sentient life has arisen. Oul is apparently killed and Xio goes to his rest happy that his home is safe.

Then, everything goes catastrophically wrong.

As we all know, a 3+1D universe *can* support sentient life. Xio survives. For an extra-dimensional creature, a 3+1D prison is hell. So the task becomes escape - escape from the very "cell" which he originally built for himself.

This prison is structured with the purpose of preventing the use of super-dimensional technologies, so that no escape to higher dimensions is possible. A variety of such super-advanced technologies are initially available in Alef - technologies such as FTL communication, FTL travel, antigravity, force fields and so on. But each time a technology is used for the first time, it works only for a limited period before the "cell", which is semi-intelligent, registers this as an escape attempt and changes the rules of the universe, to block it permanently. The third major concept of Fine Structure, then, is that **each technology can be used once only**.

Combining all three concepts, the "A-layer" or "Eka Script" which is discovered in "On Digital Extremities" is a natural informational representation of the fundamental properties of the Structure. The Structure and the Eka Script are the same thing, presented from different perspectives. When technologies are progressively locked out, the A-layer changes to reflect this.

The Making Of Fine Structure

So let me tell you what I was trying to achieve with Fine Structure.

This is going to be a little difficult for me to write because one of the first and most important things I was aiming for here was to write as original a piece of science fiction as I could manage. I deliberately tried to avoid invoking as many science fiction (and general fiction) tropes as I could. Irony? I wanted to create something which was pretty new. The central concepts of Fine Structure - most notably, the concept of **information as a substance** with an equivalence with energy and mass - was, as far as I know, pretty much entirely original, as well as naturally (through a little creative application) giving rise to a surprising number of wonderful new technologies and powers, such as teleportation, telepathy, mind control, memes, antimemes and other things which are generally impossible. Memes and antimemes in particular, as powerful tangible objects with offensive capabilities, are pretty new in modern fiction. This also gave rise to the concept of the Script as an informational representation of the Structure - "the same thing from different angles". The Script also builds from a concept I first outlined in the Ed story the annoying orange orb outside my window each morning, which in turn was inspired from the line in Futurama where it's revealed that while FTL is still impossible, scientists have simply increased the speed of light to enable intergalactic travel.

The major source of inspiration for the Powers plot, meanwhile, was comic books. I love comic books. Like all media, they have their criticisms, but most of all I like the scale of the stories, the absence of anything in the way of a budget, the lack of restriction on who can appear where, and the idea of working in a shared universe which has so much historical significance and inertia after being built up by previous generations over decades and decades. Comic book movies do exist, and despite the limitations of the medium they have, for the most part, served well. Comic book prose, meanwhile, has usually been pretty unpleasant. I can't get past the first chapter of the Crisis On Infinite Earths novelisation and it's written by a guy who writes truly tremendous comics. They are simply different skills. Tying together as many superpowers as possible inside a unified and logically consistent framework was fun, sure. I'm particularly proud of the fact that Mitch Calrus' power set is almost exactly the same as the Martian Manhunter's. X-ray vision, invisibility, intangibility: all covered in one entirely rational leap of logic! But the main challenge I saw in front of me was "how do you write a comic book fight?"

I wanted to put the reader right there in the moment. This is why Power Of Two is written in the first person perspective, and why the whole story (other than the anomalous On Digital Extremities) is written in the present tense. Comic books are written in the present tense, and these days the "internal monologue" is pretty ubiquitous, and both of these practices put the reader closer to the action. It feels like it is *happening now to me*, not something that was happening *then* to *that* guy. I also wanted to capture the scale of threats which comic book universes feature so frequently, in a way which felt as close to reality as I could manage. In case you hadn't noticed, Oul is the Galactus of the Fine Structure universe: the cosmic, unstoppable supergod which we see coming from space to destroy the whole Earth, which we then drive off with our superior science and heroism. This is also why there's a Fine Structure multiverse. It just occurred to me one day that there should be a multiverse, and this is where the chapter 'Verse Chorus, in which the multiverse is created, came from. The underlying thread of a series of superheroes, each one being twice as powerful as the previous one (and hence more powerful than all the previous superheroes combined) is one which I've had in mind for years and years.

I wanted to capture the pace, scale and frantic complexity of, let's be honest here, Grant Morrison and Joe Kelly's JLA comics. I wanted to build a story complex enough to be worth multiple readings, with buried detail for the closely observant - although I've dug most of that up myself in the Q&A. Several of the chapters aren't intended to tell a story but to capture feelings at specific moments in time, similar to how my good friend The Custodian did in his short story Chase scene whose title I immediately knew I had to steal to make Fight Scene. And, most of all, I wanted to be able to build up to a monumental climax in which the whole world and everybody in it is miraculously saved, at tremendous cost, and at the last possible millisecond, from the direst peril. This is how every superhero story ends, right? "All the heroes are dead. The Sun is falling into a black hole. The anti-God makes Earthfall in fifteen minutes. **It's time to save the world.** TO BE CONCLUDED."

I wanted to improve my descriptive skills, which is why Fine Structure is less driven by dialogue than the Ed Stories were. 1970- in particular was a major exercise in description for me. For future stories, I'm intending to work on my characterisation and giving unique voices to characters. At the moment they all sound pretty much interchangeable.

As for a moral-- an implication for the modern world, as is traditional in science fiction-- well, Fine Structure is a story about the importance of science. The main message of Fine Structure is: science will save the world. Science is the *only* thing that can save the world. Science is unstoppable, reason cannot be killed, logic cannot be stopped, there is no force on Earth which can stop a scientist from learning, and turning our backs on science will doom us all. Even the gods are rational and obey laws. The future is not something which happens by just waiting for time to pass. And if you want to be assured of a life after death, you have to build it yourself.

Thank you all ever so much for reading.

Second Klick box "could have killed millions"

This short piece was originally intended to shed some light on the precise events which followed Andreas Kosogorin's suicidal attack in this is not over and I am not dead. I never found a good place to put it in the story.

Last Updated: Tuesday, 9 June 2009, 19:58 GMT 20:58 UK

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Second Klick box "could have killed millions"

The Klick device which was found in the possession of physicist Andreas Kosogorin this morning could have killed everybody in the city of New York, say scientists.

The box, which was found in a Starbucks coffee shop in Manhattan, is an empty platinum cube, just 2.1cm (0.8 inches) on a side, and now being held as evidence in a police investigation into the attempted attack.

Unlike Paul Klick's original device, Kosogorin's would have had devastating physical consequences, effectively destroying all of Manhattan, Brooklyn and Queens as well as much of Jersey City on the far side of the Hudson River, the water contents of the river itself and all aircraft up to an altitude of 15,000 metres (49,000 feet) (see map).

Kosogorin was shot by a police officer who confronted him while he was activating the device. He was the only person affected by the activation, "disappearing like a flash" at that instant. No body has been recovered.

"Time machine"

A spokesman for the Ambient Layer Observatory at Medford, Oregon said that the cube created what scientists call a "semiclosed timelike loop". This form of time travel, first proposed in March 2007, allows anything to travel backwards in time, provided it travels back far enough that none of it survives to reach its "starting point".

A statement prepared by the observatory explains: "If you were to go back in time sixty years, you could find your grandfather and kill him before your father was born. That would cause a contradiction, which is called the grandfather paradox. However, this paradox only exists because you know that your grandfather was your grandfather. If you go back a hundred million years, you are in an era about which no concrete details are known, which we call a *causal blind spot*. There is nothing you can do to change history, because there is no concrete history to be 'changed'."

Like the Klick device, Kosogorin's device is now inert following its single activation, and it

is believed that semiclosed timelike loops will remain impossible for the forseeable future.

[...]

Marooned

This scene was originally the second sub-chapter of the final episode, Science Fiction Future. Its inclusion was controversial. In this scene several fairly major facts are revealed. First, that like Oul, Xio has an "egg". Xio's egg is buried under an archaeological excavation in equatorial Somalia, at the point on Earth where humans first rose to sentience, thereby creating a large enough concentration of intelligence to cause Xio to "condense out" from what, up until then, was something like a thin vapour of consciousness spread over the whole universe. Like Oul's egg, Xio's egg requires a freshly-deceased human body to escape, and it is an unlucky mathematics teacher called Mitchell James Calrus who fatally trips and falls and provides that outlet. Calrus is in Somalia on expedition with a few other teachers and a group of pupils from his school, establishing educational links with a Somalian school which, for no reason other than to convolute matters, also happens to include Anoo Nkube from this was supposed to be a parable about the power of the imagination. (So it is Calrus who visited her and provided the computer she uses to teach herself.)

This scene occurs in 2005, some years before Mitch is officially revealed in The Story So Far. It therefore appears to be a colossal retcon. It casts immense doubt over the true circumstances of Mitch's first meeting with Seph Baird - is he making friends or insinuating himself into her mind? It also (in combination with a line which I deleted from Ching's speech during the "Ghosts" sub-chapter of "Science Fiction Future" - "In fact, an invisible man could easily have sabotaged that first experiment...") raises the frightening possibility that - using his four-dimensional powers to break into the laboratory at night - Mitch orchestrated the original teleportation experiment in Taphophobia deliberately, in order to destroy Anne Poole's mind and acquire her as an asset to his cause. It would even be possible that he had contact with Anne Poole before the experiment occurred, perhaps discovering that her mind was impervious to mental attack and using the teleportation accident as an alternative way to break her mind down. This would explain why, against incredibly long odds, Anne Poole ends up actually being found, instead of being buried forever. No trace of Mitch's sabotage would be found except fingerprints. These fingerprints wouldn't match anything... except fingerprints found on the money from in Mitch's other known crime, in The Four-Dimensional Man when he uses his powers to steal some money from a bank, but later reluctantly returns it. That crime made the news. Thomas Muoka would have seen the newspaper article about it. Muoka would have figured out that only a four-dimensional person could have committed the crime. Muoka would have instantly realised, when he saw Mitch reach through the MPR like a ghost in The Story So Far, that Mitch must be that four-dimensional person. Mitch would have seen that Muoka had realised this, and this would be why Mitch "silenced" Muoka.

Here's the problem. All of this was intended from the start. I wanted Mitch to have a secret darker side which would be revealed at the climax of the story. Whether he would truly be the aggressor from Unbelievable Scenes, I didn't know. I decided to play it safe on that score, and kept matters ambiguous. I went to great lengths to avoid hinting at any of these facts because I knew that if I did, somebody would instantly figure it out and blow the secret in a comment. The problem was that I played too coy. The result was that this reveal came completely out of left field. It uprooted so many established facts, like the God-did-it explanation for the events of Taphophobia, that it pretty much made no sense at all.

AND, MORE IMPORTANTLY: it didn't add anything to the story. The basic resolution of the story is not "Oul is really the good guy and Mitch is really the bad guy", which was my sophomoric first idea, which was suggested by a reader very early in the game. It is not "both Mitch and Oul are as bad as

each other in their casual disregard for 'trivial' humanity". The resolution is "Mitch was just a human guy, in an impossible situation, and he did bad things to prevent other bad things, and had several changes of heart, and It Was Complicated". So revealing these dark past facts doesn't help that. It just clouds the issue and pushed Mitch too far towards uneqivocal evilness. That said, enjoy!

CLICK

The first thing he feels is heat on his back. Then dust between his fingers. There's something hot and red dripping out of his mouth, and there's the infinite, unutterable weight of entombment. He can't think for the pressure. He can barely form a thought. It's like his brain is inside a vice. The world is grey-yellow and red and vertical and incredibly hot. *Distant fusion.* He feels pinned to one wall, with others rising up around him like an artificial chasm. A word crawls out of his new host's memories and into his own. *Gravity?*

This is where it happened, says a new voice in his head. This is where they woke up for the first time. In deepest equatorial Africa.

"Where iszh thiszh? Shree and ONE? How am I szhtill- - How- -"

No XG. No readouts. He gropes for orientation but he's cut off from hundreds of his senses. He spins around. He's wearing a filthy dusty T-shirt, shorts, walking boots. There's a wide-brimmed hat which he dropped when he fell. Above him, there's a crumbled ledge, not shored up properly. There's a red clay ramp leading out of the archaeological excavation to the surface. Two young teenagers, both taller than he is, are skidding down the ramp, wearing similar attire and backpacks. "Mister Calrus! Mister Calrus! Are you okay?"

"Zhat name," he slurs. He realises he's spraying the red stuff all over his chest and the sand. He raises a hand to his mouth and now his hand has blood all over it too. "AOOW! Where do I know zhat name from - - "

"Your mouth is *broken*!" says Ben, the shorter of the two. A school expedition? They're worried. There are plans unfolding in their heads, involving a nearby village and a satellite telephone. "We need to get you to a doctor. We'll have to call an air ambulance or something. I can't believe you're even alive after falling that far."

He can't move. He can't see. He's imprisoned and he doesn't know where he is. But as he collapses and pass out, he notices something buried deep inside the archaeology below them. Something small, and distant, and silvery in the all-penetrating superlight.

Take The Stars

This short story from January 2007 is what eventually became The Astronomer's Loss. I was never really happy with this story. Gary's emotional outburst towards the end never felt like it was timed or paced properly. The fact that he explicitly figures out exactly what is happening to the stars is implausible, as is the notion of the quintillions of microscopic singularities in the first place, and the odd saboteur at GILO obviously doesn't fit in the story as it eventually turned out. Also, apologies to the real people whose names and identities I borrowed for some of the party attendees.

"What time is it?"

Gary is the kind of geek who's geeky enough to own a binary wristwatch but not geeky enough to be able to decode the digits instantly. The alcohol doesn't help. It's been a good party so far. Though he is still vertical. "Eleven fifteen," he says after doing the numbers in his head.

"Cheers," says the girl-- Yin? He has a bad head for names. He smiles broadly. Drains his bottle.

"I'm gonna go get some more beer."

There are sixteen bottles of Carlsberg left on the coffee table. Gary takes one and automatically starts arranging the rest into a triangle. Then somebody calls him from the balcony. "Gary! You do astronomy, right?"

Gary looks up. "I've been known to." It's actually his full-time job. He is working on his thesis. It's on Cepheid variable stars.

"Can you explain something to us?"

"It's highly unlikely there's anything up there I would know anything about," says Gary. "This is London. I imagine you're lucky if you get to see a full Moon."

"Well, we're looking away from the middle of the city, at least. You know Orion, right?" The speaker is Jules. Jules is a banker (primary) and a drinker (secondary).

"Sure." Gary joins Jules, Ellie and James at the balcony. James is Jules' roommate - he is gangly, and works for the Home Office. Ellie - minuscule, bespectacled, horrifyingly cultured - is James' girlfriend. Gary follows their gaze. "What's up?"

"Orion's belt ought to have three stars on it, right?"

"Yeah." Gary squints. Then he takes off his glasses and huffs on them so he can see better.

"Middle one's missing," they all say together.

"Huh," adds Gary.

"So what would cause that?" asks James.

Gary stares at the missing star for a very long time. It is a fairly clear night for London in Spring. There is the usual amount of light pollution, but there are no clouds. "I thought something just got in front of it," suggests Ellie. "An asteroid or a planet or something."

"No planets that far off the ecliptic, all the asteroids would be too small at that distance," says Gary, not even glancing at her. "Huh," he says again. "If there was some eclipse-type event going to happen this evening I'm almost positive I would have heard about it. James, you sail. Do you have any binoculars

lying around?"

"I'll do you one better," says James, puts his drink down and plunges off into his increasingly wrecked apartment.

"I know where he's going," says Ellie. She, also, sails.

Gary turns back to the missing star and his expression becomes increasingly perplexed. "That's... *really* weird. Hot air balloon is my best guess, currently. Do they fly hot air balloons at night? Over London?"

"Not that I know of," says Jules.

"Epsilon Orionis," says Gary. "That's its name. Means it's the fifth brightest star in the constellation of Orion."

James returns triumphantly with a black box. Gary opens it. It has a brass cylinder in it. "You take this out sailing?"

"Not yet," says James. "We're visiting the Isle of Wight in August. Mostly I've been using it for spying on people."

Gary extends the telescope and takes another experimental look at the missing star. The magnification is reasonable, but he sees nothing but black sky where Epsilon Ori should be. Every other nearby star looks normal - at least, those bright enough to be visible. He hands the telescope away to the next person to hold out their hand, Jules. They all take turns taking a look.

"I dunno."

"Well, what good are you?"

Gary pulls out his phone so that he can phone his friend Tron at the observatory, and nearly jumps out of his skin when Tron calls *him* at that precise instant.

"Tron? Gary! Yeah, we're missing you, man. Yeah. No, not yet! Hah hah. Ask me again tomorrow morning. Not too early, mind." Tron Jordheim is Gary's friend at the observatory. Co-worker, actually. Mentor, to some extent. There is ten years' difference between them. They've written a few papers. Nothing notable, as yet.

"Gary, are you outside? Have you taken a look at the sky?"

"Epsilon Orionis is missing, right?"

"Dozens of stars are missing, Gary. Everybody we know is calling everybody else we know. The office phone is going mental, I've had to unplug it. You're in London, right? Epsilon Ori is the only major star you can't see right now. You can't see the fainter stars from your vantage point; you can't see the detail yet. I'm the one with the big optical number, and I can. I've confirmed this with half a dozen other people. There is a circle of stars cut out of the sky. It's growing. It's been growing for at least an hour. Hold on a second--"

"Whoop, there goes another one," says James. "The one on the right."

"What?" Gary ricochets confusedly between the two conversations. "Tron-- James, you just saw it vanish? Did it, like, wink out? Just switch off? Did it dim at all? Was it like a wipe from one side to the other?"

"The last one," says James. "From left to right, like it was a shutter or something. I was looking right at it. Happened quite fast."

Gary frowns, and wishes he hadn't drunk so much.

Tron returns to the phone. "You see Mintaka go?"

"That's *really* weird, Tron."

"Do you remember what Steph-from-GILO was talking about on Thursday?"

Gary doesn't remember.

"GILO. Gravity wave interferometry. I think it's a black hole."

"...Oh, you have got to be *kidding* me."

"I have no better ideas. By the rate it's growing it's coming towards us fast and it's completely dark in every spectrum anybody I know has scanned it with."

Gary looks around. Nobody is listening to his conversation. "We would have heard it coming," he says. "I don't know the math, but we surely should have seen real gravitational and optical effects, months ago. Decades, even."

"I know, I know. Look: I'm going to try to arrange some parallax readings to maybe get its distance and size. Don't tell anyone anything until I get back to you. With something concrete."

Gary closes his phone again. "Can somebody turn on the television? Put it on a news channel?"

Nobody hears him. Gary struggles through the other partygoers to the pile of remote controls, fumbles through for the one for the television, then turns it on. He finds the BBC news channel. There is a report about a foundry being closed down. Nothing immediately relevant. He sits down and flips through a few more channels.

"There was something weird going on at GILO," he mutters to himself.

"What?" It's Yin. She turfs some crumbs and cushions off the sofa and plonks herself down next to him.

"GILO," says Gary. "Massive experiment in Spain. They're trying to detect gravity waves. Spoke to a friend of mine there this morning. Doing her PhD. Said they actually had something. That or they just couldn't calibrate it. Gravity waves are like electromagnetic waves, any kind of asymmetric movement of massive bodies emits them, but they are so unbelievably weak even two colliding black holes barely make more than a whisper at this distance. GILO, this thing they built, can detect that whisper, no problem - it's like a ten-kilometre-long laser and they watch the beam for wobbles, fantastic stuff - but the problem is that even on the cosmic scale, black holes don't collide very often... but anyway, they got it working, or they thought they did, but they couldn't get it calibrated because it was just reading continuously. Ringing like a bell or something. Had been all week."

"Was this going to be on the news?" asks Yin.

"Well, I don't know. But the stars are going out, and I think there could be a link."

"The stars are--"

Gary's phone rings again. "Hello?"

"Steph," says Steph.

"GILO," says Gary. "Did you get it calibrated?"

"Don't ask. Just don't ask."

"Steph, the stars are vanishing. I'm standing here on a terrace in London and we watching Orion disappear right in front of us star by star. Like something big and black is passing front of them and getting bigger. I think some major gravitational anomaly might be coming to hit us and would like to know whether, assuming for the sake of argument that your interferometer *is* set up correctly, that this agrees with your anomalous readings."

"...No, it does not," says Steph. "Not a single mass, not moving towards us. That would result in an entirely different set of anomalous readings. Which would have been observed through more conventional means--"

"--Months ago, I know. So: any ideas? Any actual ideas, I mean? Miss Quantum Gravity?"

Steph sighs. "I don't like to speculate wildly--"

"Sure."

"But I think... these readings are consistent with an array of small singularities moving almost at random a fixed distance from Earth."

"How far?"

"I don't like to speculate. I don't like guessing. Ask me again in a year once we've processed the data-- Hey, YOU!" Suddenly Steph is shouting at somebody else entirely. "Don't you *dare* touch that!"

Gary switches ears and listens intently to the commotion at the other end. "Steph, are we talking klicks or parsecs?"

"Gary, look up," says Ellie in his other ear. He does so. A blanket is falling over the sky. The stars are all going out, the black disk - and it is a disk, he can see that now - expanding much faster than before.

"Steph? Talk to me."

"Probably light-months," she says, muffled.

"There has been a contamination," says another voice. This one sounds unlike anything Gary has heard. His eyes widen and he crams the phone against his ear.

"Steph? Who was that?"

"I have to go."

Gary looks at his now-inert phone, then looks up. He is surrounded by people now. Watching him. Watching the sky.

"So what is it?"

Gary tries to focus. Tries to join the dots. Beer lubricates his thought processes a little but it also makes them slippery and difficult to control. "If you wanted to completely cut off Earth and humanity and our solar system from the rest of the universe," he says, "you could, in theory, I mean in the usual sense of 'theory', not the scientific sense, like this probably could never actually work, surround it with an event

horizon. You get a quadrillion or a quintillion or some insane number of primordial-size black holes and scatter them, on a spherical lattice centred on the Sun. We wouldn't notice that stage. That would be difficult to detect. Each black hole would be cancelled out by another one on the other side of the sphere and only their smaller interactions would get picked up by gravity wave detectors..."

He goes to the railing and looks at the horizon, where the black curtain is coming around. The job is half-done. "Then you join them up. I don't know how, but you join up the event horizons. You get long narrow event horizons, black threads. Then you fill in the gaps in the weave and they swallow together until you have a black shell. A hollow black hole. Black from the outside, black from the inside. An impenetrable barrier."

"But wouldn't they all collapse on us?" asks Jules.

"No! Sure, the whole structure contracts to a point - but because spacetime is curved, and that curvature is not in our regular three dimensions, that point of contraction isn't *in* real space. It becomes a bottleneck. A pinch. Like a raindrop dangling off the bottom of a giant steel sphere. With a single black hole blocking the only route out. We're going to be locked away. Just our Sun and us."

Jules is using the telescope again. The disk covers more than half the sky now. If it was a real disk, or a circle, they'd have been hit by it. Gary's theory seems to be holding up. "You'll be out of a job," he says.

"*That's not funny!*"

That gets almost everybody's attention.

"That's not just my livelihood going up there, that's my *life!* I've been looking at the stars since I was, what, *six?* I wanted to *go* there, alright? I wanted to be the first guy to ride the first faster-than-light drive to Proxima Centauri and back. All we've ever done, as *humans*, is look up at the sky. And think about what could be. That was our source of inspiration. That was what we were always shooting for. The galaxy could have been ours. And-- and-- we're stuck--"

The gap's closed. All the stars are gone. Gary grips the railing futilely.

"I have nothing to study now, but data. And we have no future. We're stuck at the bottom of a hole, with stupid, petty Earth problems, until the Sun runs out."

"I think you're overreacting," says James. "It's not the end of the world, Gary."

Gary looks around the pained expressions looking down at him. He's not usually like this. "I feel ill," he says, and stumbles for the bathroom.

Slouched over the sink knocking back water he hears the conversation awkwardly start up again. He hears people laughing. His phone starts ringing again and he turns it off.

This doesn't change anything, he thinks to himself. What use are the stars, anyway? In your day to day life? These people hardly ever even *see* them. They've all been looking at the ground for their whole lives anyway. Almost everybody has. Nobody was planning to go to Proxima Centauri. Not *really.* Might as well take away the planets too, for all the good they were to us.

And then, finally, Gary figures it out. Nothing has changed.

Nothing.

God Squared

This passage was written very early in the development of Fine Structure (circa December 2006) and, like Forgotten Things In Space, never really properly fit into the storyline. Unlike "Forgotten" I never released it as a standalone story either because it doesn't work in isolation. The unnamed man in the story is obviously Mitch, and he and Anne are evidently working together to "earth" the bulk of Mitch's remaining power in Mitch. Instead, they tap into another, much angrier, source of power by mistake - and realise that Mitch's adversary Oul has also survived the Fall seen in Unbelievable Scenes. Mitch's comment about "flattened information" is also a first stab at what later became the Crashes.

Running all the way down the centre of the Atlantic Ocean is a tectonic fault. Two plates, one containing both Americas and the other containing Europe and Africa, are pulling apart from each other at a rate of millimetres per year.

The surface of Earth is mostly dead rock but between the two faults, molten rock from the living red interior bubbles up at a temperature of thousands of degrees, flash-boiling nearby water.

Above the ten-thousand-kilometre rift, floating on top of a kilometre of cold black ocean, is a ship. Three things are poking over the stern of the ship: two faces and a crane holding a silvery object, which breaks free of its harness, and begins to sink patiently into the water.

The object is a probe. It is a metre across, egg-shaped, shiny, armoured with titanium on all sides except at the two extremities. Circling the rounded ruby-coloured end is a thin indentation within which are scratched some delicate geometrical measurements. The cap of this end is rotating, two marks coming around to match each other as the probe sinks deeper. At the other end, aligning itself underwater so as to point directly upwards, is a cluster of thin and fat antennae; radio, sonar, infrared, microwave, ultraviolet, transmitting and receiving, acting as a beacon and reporting data to the parent vessel... as said vessel turns gradually, propellers powering into life, and accelerates away, paying out a thin cable along the ocean surface behind it, with floats attached every hundred metres, with a small cluster of detectors attached to each float.

All readings are nominal. The probe sinks at the expected rate. Pressure readings are appropriate and tolerable, though increasing. Instruments are functioning perfectly, though admittedly they have very little to record as yet.

The markings on the cap are pressure readings. The probe is pressure-triggered. Two hours down, the marks line up. Something inside the probe clicks. A bank of capacitors discharges itself. A two-gram blob of boron suspended in a steel gyroscope flips itself along a vertical plane and becomes two grams of antimatter.

And the ocean moves aside.

It's not an explosion.

Fifty miles away with a pair of binoculars:

"It's working!"

The column of water is over a mile high. It looks like somebody lifted a perfect cylinder of water into the air over the rift, froze it in time, carved it into a fractally detailed vine-twisted tree, then turned time on again. The slowness with which it collapses makes Anne Poole's brain balk. There's still no noise,

and that doesn't gel right either. White foam erupts in every direction. It’s like a nuclear explosion made of water, but it's not explosion, it's just making room. For something to come through.

And the blue curtain falls. And the rainbow wavers and clears. And dominating the sky behind it is a hand - a human forearm, kilometres long, an obscene, impossible sculpture with a palm the size of the rock of Gibraltar, curving out of the sea into the air, fingers crooked as if in pain, veins bulging, muscles bunching.

The figure plants a foot on the ocean floor and climbs all the way out of the seething hole he has ripped in the rift, rising to his full height. The spectacle takes minutes to unfold. A tidal wave hits the tiny ship but it holds steady, protected, as the colossal figure's gaze takes in the environment in which it has found itself. The figure seems carved out of sand-coloured stone or clay; it is male; bald, not skinny but not muscular; somehow, it wears glasses, opaque, made of the same clay.

At length, it turns to regard the tiny ship.

Anne Poole is confused, shocked. "You said it would look like you!"

The man standing next to her on the gantry, beside the second probe, can't take his eyes off the spectacled face above them, with its inscrutable expression. "It's not me," he says - confesses.

"How is that possible? We sent the probe, you said this exact location, that exact depth, so the probe worked, right?"

"It worked," says the man, "we woke it up, all right, it worked fine. But the power we tapped was wrong. I thought it was mine. But it looks like I made a mistake."

"If not yours, then whose?"

The figure starts to take a step, reaching down for the ship.

"I've made a mistake," says the man again. He grabs Anne's hand and pulls her towards him. With his other hand he reaches inside the second egg probe - inside it. Through the titanium casing, like it doesn't exist.

Anne Poole sees what he's doing. "You can't be serious. What about the crew?"

"I can't save them," he replies. He pulls his hand out and the probe clicks. "I'm sorry. Hang on."

They fly.

A shadow eclipses the sun behind them as the boat is engulfed, crushed like an ant in the giant's fist. He wades another step forwards, reaching for the pair of dark figures accelerating across the ocean surface, one of them lying flat out, fists forward, the other clinging around his neck, flapping like a scarf in the wind.

"Hang on."

They bank right as the giant's middle finger, every tiny wrinkle and groove in its skin metres wide and shadowed, gouges into the sea ahead of them. They head for the bright but closing gap between it and the descending ring finger. They skip lightly over the swell coming at them, descend the far side of the wave and then shoot down the corridor of converging waves like surfers.

"He grabbed the whole ship!" screams Anne, already drenched, bruised and freezing, as they emerge

from the end of the tunnel of water and begin to pull away out of reach of the slow-moving giant. "The probe's been crushed!"

"The probe's fine," he replies. "Just hang on. We've got less than--"

A mile behind them, buried inside tonnes of crushed metal in the giant's left fist, the silver egg actuates. More antimatter flicks into existence. Spacetime convulses, cracking open a second time, and then slams shut, violently.

The sandstone giant vanishes. And there's a thunderclap like the end of the universe.

*

Anne Poole wakes up on a beach, ears still ringing. She's still wet, but it's sunny and she's drying out fast. The guy is there. "Something's wrong," he says to her. His voice is muffled, it sounds like he's talking on the other side of glass.

"Where are we?"

"...Ghana, I think."

She rolls over and pushes herself upwards. "That was the wrong avatar."

"Something's wrong, Anne, can't you feel it? The texture of information here has... it's all changed, flattened..."

"Who was it?"

The man regards Anne carefully for some time.

"Suppose... there were multiple universes, each with an omnipotent overseeing God. Suppose there was a race of such Gods, enough to populate an entire God-universe, and that that God-universe had a God of its own. God-squared.

"God-squared thinks on a scale we can barely understand, and vice versa. Certain aspects of our waveforms in this plane remain uncollapsed - that is, in certain senses, we do not exist - until he bothers to make the effort to observe us. And likewise we cannot begin to conceive of him. This is all fine. We do not interfere with his affairs any more than we interfere with a typical bacterium's day to day life.

"The only way this could become a problem is if we somehow attracted his attention."