

Lost Worlds

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Contents

	Page
Foreword	iii
I Quantum Holography	1
II Scribe: the Mathematician	11
III Probe	23
IV Cistern and Chalice	41
V Those Who Live in the Garden	63

Foreword

There is a reason for the name of the Fantasy genre. Children fantasise from an early age, and the stories and games they conjure are about people and events in a world that isn't real. Fantasy authors bring adult ideas and patterns to exactly the same activity, often combining a mature perspective on what *is* with childlike openness to what *could be*. Fantasy literature, more than any other genre, captures the imagination and releases the human spirit from the bonds of reality. This lets it expose the human condition in a way that is otherwise impossible.

Science Fiction, from this perspective, is a type of Fantasy marked by two defining characteristics. First, it binds itself more tightly to the physical constraints of the real world. These constraints are often a subject of the story unto themselves. Second, it makes more or less explicit which real-world constraints it shrugs off. The possibilities presented by the removal of these constraints are also a popular subject of Science Fiction.

For an author of Science Fiction and Fantasy, it is easy to get lost in the intricacies of the alternate worlds we imagine. Much of the joy in writing comes from expressing this vision to other people. However, even the most amazing world will fail to arouse much interest if it has no story to tell. It is living characters that make a world meaningful, and a great story brings characters to life. That is what I have tried to do here, with varied success.

Part I

Quantum Holography

Anton woke up slowly and blearily considered the day's activities. First, he'd check the run he started last night and try to start another. Then breakfast, then try to track down his supervisor for some feedback. He'd gone to bed hopeful, but sometime during the night he must have subconsciously accepted that his research was completely stalled. In the last week, he'd just followed an endless loop of tweaking parameters and hoping his program would behave — eventually he had to face up to the fact that he didn't actually understand his own program or what those parameters actually meant.

With a sigh, he got up and walked to his desk where his laptop quietly purred. *Laptops shouldn't purr*, Anton thought, *I should probably clean the fans*. A terminal window was still open and logged in to the quantum computing facility.

```
[antonp@planck-1 run]$ ls
QHrunme conf.in status.out
[antonp@planck-1 run]$ tail status.out
CONVERGENCE 100%
CONVERGENCE 100%
CONVERGENCE 100%
CONVERGENCE 100%
CONVERGENCE 100%
CONVERGENCE 100%
CONVERGENCE 100%
CONVERGENCE 100%
CONVERGENCE 100%
CONVERGENCE 100%
[antonp@planck-1 run]$
```

It took a moment to register what he was seeing. 100% convergence? There had to be a mistake! Did he run one of his test cases by accident? Oh, that wouldn't be good at all, it likely meant that all his work last night was done to the wrong code.

```
[antonp@planck-1 run]$ pwd
/home/antonp/QH/june16/production/run
```

No, he was in the right place. Anton stared at the screen as the gears in his head slowly started to turn. His program actually worked! A quantum holographic algorithm applied to multiple streams of real world data freaking worked! He laughed out loud, because he still didn't understand what he was doing, but he was pretty sure that having a working program would help immensely.

So his program worked. Somehow, it took a bunch of data and built it into a consistent holographic model, a hologram. But what did the hologram look like? How big was it, and how detailed? "Convergence 100%?" didn't tell him squat, and Anton cursed himself for not including a more informative printout for a successful status.

Anton opened a remote desktop program and logged in to the Planck system a second time. A few months ago, he'd needed a visualiser to test his test cases and cannibalised an old project he'd developed for a computer graphics course back when he was an undergrad. Since the output of his quantum holography code was arbitrarily large, it couldn't be stored, but that didn't stop a programming wizard like Anton.

It broke all the rules of proper programming, but the visualiser pretended to be a driver and ran in kernel mode, which gave it full and unfettered access to the machine's memory. For reasons of safety and sanity, ordinary programs are locked in to their own little world and can't see or access anything outside it, except through carefully designed and highly restrictive system calls. The visualiser worked by wantonly breaking in to the holography program's process space and interpreting its data directly. For Anton as a programmer, this hideous construction was both a source of shame (because it was provocatively indecent) and pride (because it worked).

```
[antonp@planck-1 ~]$ ps -e | grep QHrunme
27039 ?          253:13:15 QHrunme
[antonp@planck-1 ~]$ cd QHvis
[antonp@planck-1 QHvis]$ ./QHvis 27039 &
[1] 8358
```

On the remote desktop, Anton conjured a terminal and started the visualiser. A window popped up and displayed a dismaying image of a plain beige tint. The quantum holography code had converged on a homogeneous beige slurry. Useless and arguably worse than no result at all, Anton thought,

until he remembered something. He pushed the ‘+’ key and the beige field split into quadrants with different shades. A few more presses increased the resolution until he saw an image of his wintry college campus.

It was amazing! It looked just like the view out of one of the many webcams that he’d used as data sources — he could see little people walking around, trees moving in the wind, and all the buildings exactly the way they really were. The algorithm he’d worked out took input data and built a model of the world that existed in many different levels of resolution at once. Just like streaming a Youtube video over a slow connection gave a grainy video, a holographic model based on little data was very fuzzy. His algorithm took lots of data and put it together in a way that should yield a higher resolution result.

Anton moved the viewpoint around and looked at his campus. He was an invisible flying eye in a tiny digitised world. “Convergence 100% was right”, Anton said to himself, as the resolution of the model was incredible. He sat back in his chair and pulled a hand through his greasy hair. His thesis was saved thanks to this. All he needed to do was to go through the logs and figure out how it converged, apply some metrics to the model to see how good it was, and... wait, there was his girlfriend Amy walking to class.

A funny feeling grew in Anton’s stomach. He panned until he could see the clock on the administration building. It read ten to eight. Anton looked at the clock on his computer. Ten to eight. This thing was showing a live image! But he hadn’t given the system any live data, how could it know what time it was?

Not quite believing what he was thinking, he picked up his phone and called Amy. The girl on the screen stopped walking, reached into her pocket, and answered the phone.

“Hey babe,” Amy said.

“Hey,” Anton replied, “um, where are you right now?”

“I’m outside the admin building. Are you okay, you sound stressed?”

“Oh, no worries,” Anton said, shaking. “Just wanted to see if you remembered your class today. And I wanted to tell you I got my code working, so everything’s fine.”

“That’s great,” Amy said cheerfully. “See you later, okay? I’ll probably stay around and help some of the kids for a bit, but I’ll give you a call when I’m done. Lunch?”

Anton strained to keep his voice level. “Lunch sounds good, Amy. Kiss you, bye.”

The girl on the screen looked quizzical for a few seconds, then pocketed the phone and continued on her way.

Anton felt a pressure in his bladder, and rose to find relief in the bathroom of his two-room apartment. On the way back, he retrieved a leftover plate of yesterday's pancakes from the fridge and a glass of water. He usually maintained a strict "no food in bedroom" policy, but today merited an exception.

When he sat back down, the visualiser still showed campus. A live feed of campus, from an impossible mid-air vantage point. He had to find a place where the model failed, where incomplete data rendered the hologram fuzzy. Brusquely, he moved the viewpoint around to the back of the buildings. Somehow the image was still clear, complete with ice-encrusted cars in the parking lot. Even the river looked like it should, as well as the town on the other side.

"Alright, fine," Anton said to himself and steered right at the closest building. He was pretty sure there had been no pictures from inside the administration building among the data sources he'd handed his program. The feed from there should, by all rights, be a grey smear or at most a fuzzy guess at what may have been glimpsed through a window.

The view passed through a wall and into a small office. A real, actual office, with two women tapping away at their keyboards. Papers hung on a cork-board and pictures of family were glued to the side of the monitors. The door was ajar and invited Anton to venture further.

Instead, he backed the view back out and panned until he saw the rise on which his apartment complex stood. A shudder ran up his spine as he sped forward and his apartment building crept into view. With a deep breath, he moved through the curtained window into his bedroom.

He saw a brown-haired man in a loose-fitting t-shirt sitting on a wooden chair in front of a computer, a plate of pancakes next to him. The man on the screen took a pancake with one hand and brought it to his mouth. Anton tasted the tart sweetness of the cold pancake, felt thirsty, and watched as the man on the screen reached for the glass of water. The water was refreshing.

Anton's mind had trouble grasping the implications of what he was seeing. His program seemed to have converged on reality as it really was, modelling his university campus in real time. Including the people in it. Just this campus? The rest of the city looked real enough... was there even a limit? Was that possible with just one computer? Anton wouldn't have thought so, but the evidence suggested otherwise.

As the calories from the pancakes started to improve his blood sugar levels, Anton began to recall all the stories he'd read about simulated realities. It was a common enough science fiction trope and his friends tended to send him all such literature they stumbled across, usually together with a nerdy joke about being careful with recursion.

Recursion was actually a potential problem here. If he ran a simulation of himself running a simulation of himself running a simulation of himself running a simulation and so on, and all levels of recursion were identical, who was he? Was Anton a simulation? Surely not, he had memories that went further back than the start of the simulation. But the Anton on the screen probably thought so, too, or else he wouldn't be sitting so exactly the way Anton was sitting. Shit. He waved to himself, and saw himself wave.

There was a way to test this. He could poke the Anton on the screen. Force him to do something different. All Anton had to do was to edit the hologram. Anton could do that, he was a programming wizard. He had a program that was already reading the hologram. Changing it so it would write would be a piece of cake.

```
[antonp@planck-1 QHvis]$ mkdir ../QHedit
[antonp@planck-1 QHvis]$ cp -r * ../QHedit
[antonp@planck-1 QHvis]$ cd ../QHedit
[antonp@planck-1 QHedit]$
```

Pancake-fuelled fingers flew across the keyboard. This was exactly the sort of coding project that Anton enjoyed most. In theory, he knew exactly what to do. The visualisation program already had a mouse and keyboard interface and already knew how to associate complex holographic data with simple computer graphics geometry. All he needed to do was to take these parts and arrange them in a new way. That, and replace a set of load instructions with write instructions.

A small thing in itself, replacing memory reads to memory writes, but this was the crucial step that could crash the whole simulation. To Anton-in-the-screen, it was of existential importance that this be done correctly.

```
[antonp@planck-1 QHedit]$ make clean; make >> makelog
[antonp@planck-1 QHedit]$
```

The pancakes were gone, the water glass was empty. No compilation errors. In a rare attempt at doing things properly, Anton had spent the last

hour adding asserts and error handling, trying to guarantee that the only changes to the hologram that his editing program would ever make were the ones he wanted. Now he was ready to try it.

Anton hesitated. If this was going to crash the universe, maybe he should wait to see his girlfriend for lunch first. Have a little pre-apocalyptic sex, maybe. He could wait an hour before showing Anton-in-the-screen that he was, in fact, a computer program. There was another reason to hesitate, but he very pointedly did not think about it.

Who was he kidding? This was probably the most solid code he'd ever written. The possibility Anton absolutely did not consider was both frightening and exhilarating, and he needed it resolved right now.

```
[antonp@planck-1 QHedit]$ ./QHedit 27039 &
[2] 9215
```

Another view opened up, back in the middle of campus. The feed felt choppy, he was probably pushing too much graphics through his cheap broadband connection, so he closed the first view and moved the new view to his apartment.

Since he still didn't really understand the format of the data in the hologram, Anton didn't really know how to manipulate it. He didn't know how to add energy into the system and heat things up, how to push solid objects, or anything like that. But because he could draw stuff in correct 3d positions, he knew how to associate spatial coordinates with locations in process memory. It was enough.

He started by drawing a little rectangular box around the empty water glass on the screen. Then he drew a second box a short distance away. Bad things could happen if the boxes overlapped and his safety precautions failed to catch the situation.

The 'c' button would trigger a subroutine that instantaneously copied the data from inside the first box and placed it into the second box. Perhaps the hologram would recognise the divergence from normal behaviour and erase the change immediately, and perhaps it wouldn't. Anton pushed the button to find out.

For the first time, his program produced a sound. Anton heard a distinct *tap* when he saw the copy of the glass appear on screen. He zoomed in to it and observed it closely — it looked just like his used drinking glass, crusty smear of pancake-greased lips on the rim and everything. He zoomed out to see how Anton-in-the-screen was taking it.

He seemed unexpectedly calm, still entirely focused on the screen. Of course! Anton himself hadn't looked at his desk, so Anton-in-the-screen hadn't either. They had both been too interested in their pet simulacra to consider their own situation. Well, that was easily sorted, Anton thought with his eyes glued to the screen. Just pop a quick little glance to the left, and that'll be that.

"SHIT!" Anton yelled when he saw two empty glasses on his desk. "Oh, fuuuuck me, what the hell?"

That spelled the end of his thesis. His academic career was doomed before it even started, because who in their right mind would take this seriously? A program of less than five thousand lines breaks through the veil of reality and oh by the way you're a holographic simulation.

"SHIT!" Anton yelled again. How was Amy going to take this? She already thought he was weird. He could just imagine it, "Hey Amy, how is your work on the role of RNA in clown fish cancer going? I have the program code for all of biology, clown fish cancer should be in there somewhere, try checking around line 300." She always liked the way his research was comfortably useless, now she was going to *hate* him.

Speaking of uses, what was the NSA going to do if they found this out? They could fly through walls and watch people invisibly. And North Korea could fly down into a missile silo and copy home as many nuclear ICBM's they wanted. And... could he copy people? *Delete* people?

Anton selected a box of air and pasted it over the duplicate glass. It vanished. He ran his fingers over the spot where the glass stood and felt a shallow depression where he accidentally cut into the desk. His hands moved to the Ctrl and Z buttons on the keyboard, but he stopped himself. He hadn't implemented an undo function. In fact, he couldn't implement an undo function because the old data was gone.

Could he copy people? Anton had to try. He moved the view out of his apartment to the trees outside. Tweety birds and magpies usually sat in those trees, and he quickly found a suitably calm candidate. With quick movements, he caught the bird in the selection box and pressed 'c'.

A bird popped into existence in mid-air, grasping a short twig in its little feet. It squawked sharply, dropped the twig, and flapped to catch itself before flying off out of sight.

At this point, Anton felt an inclination to copy himself, just so he would have someone else to share the burden of all this. He didn't, though, because he didn't have anywhere for a second Anton to live, and his meagre grad

student salary made it hard to support a second adult. Plus, he knew that he'd just hate being the second Anton.

Mind awirl with the implications and consequences of his discovery, Anton got up to take a walk. He'd been sitting still for hours and he knew some physical movement would give him a better perspective on things. He started putting on pants and vanished along with the rest of the world in a puff of interrupted logic.

After demonstrating the program's function, Zorblax broke execution and awaited his teacher's appraisal.

"Quite good, actually," the great blob of gas said, internal spots of lightning flickering in approval. "Very creative use of fluids and solids to establish a fixed point for the attractor, and the tail recursion all wraps very nicely in closed form. Well done."

Part II

Scribe: the Mathematician

In the year 200 A.G. [After Gutenberg], in response to a growing interest from the public, the Church of the Scribe began offering a free consultation service in the capital. Applications are selected by closed committee and can be submitted by anyone.

I opened the thin folder of the application and looked at the front sheet, while the man waited outside. The case summary printed underneath the Church's letterhead was almost a cliché. "Robert Kennings, born 176 A.G., widow. Terminally ill daughter." I ignored the financial statements that were irrelevant to me and browsed through the rest of the folder's contents. A mathematician, not a church-going man, lived his whole life in a small university town. His birthdate would make him 38 years old, meaning his daughter was possibly quite young. I put the folder away. Time to call the poor man in.

The push of a small button on my desk, and after a few seconds the door swung open. Mr. Kennings was a wiry man of average height, thinning brown hair, and hesitant gestures. His eyes were dry and red, as if he'd run out of tears long ago. I stood up to greet him as he took in the room. Pale blue draped curtains framed a large window set centrally into the wall between two large bookcases. A small walnut desk stood off to one side, opposite a narrow coffee table flanked by two high-backed armchairs.

"Father Quentin," I introduced myself as I shook his hand. His smooth skin felt clammy despite my own usual sweatiness in the thick woolen robes of my Order. I can't help but think that he wouldn't be so nervous if he'd gone to church regularly the way we recommend. Still, he was here now, and desperate for help, so help him I would.

"Please, Robert, sit down and relax," I said with a deep and calm voice, indicating one of the armchairs. "Would you like tea? Something stronger, perhaps?"

He seemed a little taken aback by the offer. The Church of the Scribe didn't generally advocate liquor, the link to tragedy too obviously palpable to ignore, but I've always felt that it has its uses.

"Um, I don't really drink." He spoke somewhat nasally.

“Tea, then.” I got up and fetched the pot that stood on a low oil lamp.

Cup in hand, the steam flushed his face as he took the first hot sip. I’d blended a good, simple tea, conjuring a sense of twigs and spring meadow to ward off the autumn chill and a dash of ground weeping bolete as a nod to the season.

Finally Robert asked, “So how does this work?”

“First,” I replied, “I ask you some questions about yourself and why you’re here. Together we look for the literary devices that the Scribe has used in your story. Applying standard analysis techniques, I can try to figure out where your story seems to be headed.”

Robert looked dismayed. “And if I don’t like where it’s headed? Can you help me change my story?”

I held up my hand and indicated the typewriter on my desk. “I can’t change what the Scribe has written, and I can’t tell the Author what to write. We of the Church are mere authors with lower-case ‘a’. What we can do is find new perspectives, alternatives to the apparent plot with a strong message, good literary technique, and potent drama. The Church teaches that when we write a sufficiently good story, God sees it and seizes upon it. We will do what we can.”

With some difficulty, I looked him in the eyes as I said this, willing myself to believe my own words and inspire in him the faith that he needed and that I, unfortunately, lacked. Did we ever do more than trick our followers with hope and comforting beliefs, or could we actually influence the mind of our Creator? Were we masters of our own destiny, or bit characters in a story we have no idea is even going on? My own doubts didn’t betray me this time, because Robert seemed more relaxed and focused than before. I took a sip of tea and began the interview.

“Let’s begin with your parents. What were they like?”

Robert protested. “Is this relevant? I’m here about my daughter.”

“I need a full picture, a context as it were. You’re the one who is here, yours is the story we can work with. We will get to your daughter in due time, but we must start with the beginning.”

Usually the people who seek help and guidance by the authors of the Church know the basics already, but not always. Robert, it appears, merely needed to be reminded.

“Okay, well, my parents haven’t had a big influence on me,” he began, patiently. “We lived by a lake. My father was always a distant sort, usually working in his business or talking to adults. We’d mostly go fishing, or just

exploring the lake. My mother? it's hard to talk about my mother. Maybe she's too much in my father's shadow. She was nice to me and my sister, a good mother, but never really close, like other people seem to have their mothers. I never went to her with problems."

"Did you have problems?"

Robert leaned back in his chair. "Not really, I suppose. School was easy for me, and I had a group of friends that hung together until adulthood split us up. I had the usual teenage... issues with girls and things, but I never felt like bothering my parents with them."

My armchair creaked slightly as I reclined. "How did you come to be a mathematician?" I asked.

"There was never much doubt," he replied. "Once I had seen my first conic sections in grade school, I was plotting them everywhere. When I was thirteen, I developed a rotating metric to gauge the distance a point on the wheel of our cart traveled on the way to school. That wasn't a new invention, of course, but I'd come across it on my own and my teacher told me that was as good an accomplishment as when Roddoner did it the first time. Then I just kept going."

Leaning forward, I asked, "What is it you like about math?"

"It's perfect," Robert said with emphasis, his eyes focusing on objects only he could see. "The roundness of a circle, the exactness with which the parabola separates the realm of ellipses from hyperbolas. Before I met Helena, my wife I mean, I never really left mathematics even outside of work and school. I scraped the butter from the tub mathematically so the tub was always partitioned by two identical swirls, I minimised my path when I walked, I observed fractals and waves in nature and the movement of people in the city. Geometrical math is... simply lovely."

"Did that change when you met Helena?"

Robert looked at me, back in the room again. He lifted the cup to his lips and traced its curve with his finger. "No, mathematics didn't change, but she was a fantastic new kind of puzzle. I loved being with her and I loved her, yet we were so different. She was warm and burned with passion for all kinds of things that I had never really cared about before. We fought some in the beginning, because we didn't understand each other yet but later we didn't. With her in the room, it's like she shone brighter than all the geometry. It just wasn't as important as her. She pulled me out of my smooth and unblemished trajectory and I loved her for it." He looked into his tea. "Then she gave me little Iria," he added with a sigh.

With that, the energy in the room petered out. I'd gotten a sense of the man's values and youth, and he spoke without reservation, so I decided we could move on to more difficult topics.

"When did Helena die?" I asked, gently.

"The day before Iria's second birthday. I was late getting home because of a storm. When I got home, the house was in flames. Lightning strike. Iria was outside in the playhouse I'd built, but Helena was caught in the smoke. It was painful, I'm told."

"How did you cope?"

"Badly, I think," he began, in a factual tone. "I tried to deal with the grief on my own. The Church of the Scribe didn't appeal to me then. It seemed hokey and trite, if you'll excuse the language. I lived for Iria. I got up in the morning because she needed me. The sight of her kept me going. Her chatter and inventive little games made me laugh and think that everything was going to be okay." Robert smiled, then continued stoically. "Helena had taught me to love, and if I could love Iria enough then the hole would eventually fade. But I miss her badly." He looked as if he was about to say more, but cut himself off. The simple words and factual tone belied the true depth of feeling he was skirting around, and I wondered what would happen if he let himself really feel the loss. He looked up at the ceiling, avoiding the black abyss yawning underneath him.

I drank my tea. A clock in the corridor outside chimed. I made some notes.

I asked, "I understand your daughter is sick. How old is she?"

"Four years and three months," Robert answered, voice cracking. "She has been sick since her birthday."

I could see he was close to tears and procured a small linen towel for him. "On her birthday?" I prompted.

"She'd been so excited, she could barely sleep. Then, that morning, I went to wake her up and she was just burning up with fever." He took a deep breath and continued, eyes focusing on the autumn rain outside the window. "The doctors did some tests. Bad blood, they said. There's something in her blood. Transfusions help, but not for long. Nothing we can do, they said."

I took some notes. "That was three months ago. What is the prognosis now?"

"Oh god. She's so tiny. So weak. She's with my sister. The doctors said it could be days or weeks."

This was the worst part of my job. Children get sick and die. It happens,

and God makes it happen or lets it happen and sometimes there is hope but most of the time I just have to find a way for it to make sense. To make it okay, when I damn well know it is never okay. My earnest wish is to find a story where the ending with the kid dying is so unsatisfactory and insipid that the Scribe just whisks my revision off in a gust of wind, carrying it out the window and into the world and makes it real. And the kid lives. But I don't believe it, even though I should.

I didn't say anything more for a few minutes, as I looked at my brief set of notes. What I saw there was nothing short of perfectly grim.

I cleared my throat and said, "Okay, Robert, I have enough of an overview of the plot, so to speak. You probably understand that it doesn't look good right now, but what I want to do is look for certain literary devices and determine whether there is a plot twist coming up."

"Like foreshadowing?"

"Exactly. The Scribe likes stories to stick to established patterns and motifs, motivating future events with past context. I've noted that the days around Iria's birthday have come up repeatedly. If this pattern holds, we can expect her health to be stable until her next birthday? and whatever happens then could be foreshadowed by what happened on earlier birthdays. Does anything in particular spring to mind?"

Robert paled and pursed his lips. Finally he said, "It wasn't her, but a friend of hers. Iria had a party when she turned three. One of her friends found a nest of baby rabbits behind the root cellar. They'd all been killed by some predator."

"Was it a hot, sunny day, or was it rainy?" I asked.

"Huh? It was hot. Why?"

"I'll return to that later. Try to think of more possible foreshadowing. Anything positive we might use, especially on hot days. A pet or domestic animal recovering, maybe?"

"I'm allergic, so we didn't have pets. But we do have a garden, and it wilted badly in the drought a couple of years ago when I didn't, couldn't, water it. But when the rains came that August, everything returned. Even the cucumbers and tomatoes plants survived, and they'd dried to a complete crisp. That should count for something, shouldn't it?"

I wrote it down. "Good, yes, that counts. What about events occurring in the spring thaw or around midsummer?"

"Well, I met Helena in the spring of '06 when the west bank of the Aper flooded. We both escaped into the clock tower of the university library and

were stuck there for two days. I often wonder what my life would have been like if that flood hadn't happened, it's like the center of my universe shifted. But that doesn't involve Iria..."

"Not directly, no, but it's meaningful context. Let's keep brainstorming."

As time passed, the discussion slowed. We ate lunch in silence, and resumed work with a new pot of tea. Eventually, the clock in the hall chimed again. We'd been discussing the events that took place after the start of Iria's illness, and I took the signal as a sign to stop and take stock. I showed Robert to the restrooms and visited the establishment myself before fetching another pot of tea.

When I entered my office, Robert stood by the window and looked out over the gray drizzle. Somehow, he seemed more vital as he stood in the drafty nook. He saw me in the reflection. "Is it meaningful?" he began, "This searching for literary devices? Aren't we just picking out patterns in meaningless chaos? Confirming only the things that fit the pattern we seek, ignoring or denying all the things that don't? How do you know that the Scribe is real?"

Focusing on helping this poor father with his dying daughter, I had managed to push away my own doubts and assume the problem-solving role of a Church author. My hands shook as I poured more tea. How could I answer the man without lying? How could I answer without dashing our faith and hope to pieces?

Finally, I answered in the form of another question. "Does a mathematician ascribe geometric forms to the natural world merely according to how she sees, or does the natural world actually follow those forms? Or is it something in between?"

He furrowed his eyebrows, lines creasing his long forehead. Whatever his thoughts were, however, he kept them to himself. I could only hope that my analogy made sense.

All at once, I was very tired. We had worked hard for a whole day, and both of us were drained. I sighed, and said, "I'm sorry, Robert, but I am out of ideas. It is my professional opinion that the Scribe intends for your daughter to die. If He keeps to the regular scheme, she will last until her next birthday, but it could be much sooner."

"But why?" was the only response, a forlorn expression showing that he'd already suspected this outcome.

"Because it's the strongest story. There is a central theme in your life, water versus fire. Cold logic versus hot feelings. You versus Helena. The

two elements are at odds, and the story of your family has been a frontline in that conflict. You told me that Iria was 'burning up' with fever. Stay near her, be with her, and make the most of your time together. The Scribe could decide that your coolness trumps Helena's fire. When you met your late wife, you were consumed by her fire, and it made you greater. Water turns to steam, steam rises. Most importantly for you now, steam condenses back into water. You'll be fine at the end of this, I promise."

Robert stared at me blankly, weighing my words. His eyes shone when he said, "I won't give up, you know. I'll keep fighting for Iria."

"I know," I said. "It wouldn't be a good story if you did."

"I don't care what it does to the story! I'd ruin the fucking story if it saved Iria!" exclaimed Robert heatedly. And then, he froze. "Wait a minute, if the Scribe thinks it makes a good story for a father to fight for his child until she dies, what if the father gives up? Then there's no story and the child no longer has to die, right?"

I shook my head, extinguishing the momentary hope apparent in his face. "I see what you're thinking, but it doesn't work that way. For one, you can't break character. For another, there's always a story. I think abandoning Iria would be your undoing, and only make her death more certain."

A shiver went up my spine as I considered the consequences of his suggestion. Hubris was a word shared only by whispers among the clergy, so dark and dire were the tales that sprung from the will to defy an all-powerful God. If my words today had put the thought in his mind, it was possible that they did more damage than I could make good in all the rest of my days put together.

Oblivious to the danger, Robert thundered on, "No, I refuse to believe it! The whole point of all this literary rigmarole is that we can decide what happens. There has to be a way, you just haven't thought of it yet! What if I kill myself, what happens then?"

Robert was standing, feet planted solidly under his shoulders in a pose entirely unlike that of a sedate academic. His adamant gaze demanded I answer, so I did so, albeit reluctantly, knowing what his reaction would be.

"If you kill yourself, Iria would have no water to quench the fire, and she would perish."

"Damn you! And damn the Scribe. If Iria is metaphorically burning and I'm metaphorically water, why can't I put her out? The metaphor makes no sense!"

I sighed, and considered for a moment if I should tell him the truth.

Where one bucket of water can't put out a fire, two might. There was a way out for Robert, an almost sure-fire story that would save Iria. I ached to tell him, to explain to him that he couldn't save Iria alone, that he needed to find someone else. A new love for Robert, with less fire, would heal Robert's hurt and could also thematically save his daughter. In all likelihood, this woman was already nearby, hiding just off-stage or introduced as a bit character earlier on. Robert and I could explore this possibility and try to determine which of the women in his life was destined to fall in love with him.

But there was a reason the Church didn't peddle in romantic fortune telling at any cost. There was a magic in love that has its roots in mystery and uncertainty, the heart's leap of faith and blind trust in the unknown. The removal of doubt was only a guarantee of love's absence. I had to tread carefully.

"Robert, when your house burned down, the rainstorm did not conquer the flames. I'm sorry."

Robert stared at me intently for several seconds, his eyes changing as realisation poured over him. At last he sat down heavily and heaved a deep sigh. As usual with these cases, the change in the client was as quick as it was palpable. Something inside them fell into place, and they felt that they understood their place in the world and were okay with it, regardless of what that place was. I'd seen it in people ranging from traumatised war veterans to depressed teenagers, and I'd long since learned not to ask them for an explanation.

I knew now that Robert would continue to care for his little girl, that he would cry with grief if she died and cry with laughter if she lived, and that he would do it in meaningful harmony with the world and blissfully unaware of my highest hopes for him and Iria.

After the usual formalities, Robert left and my office was empty save for me and a teapot with dregs. I poured what was left into my teacup and topped off with spiced mead from under my desk. Thus equipped, I pulled an armchair to the window and sat alone for a long time. Which of the two possible endings would the Scribe choose, I wondered. The one where Iria dies, and a bereaved father is left alone in a cold world? Or would Iria live to brighten the lives of her father and his new-found love? When dusk fell, I was no closer to knowing. Whichever path the Scribe found most appealing, I knew it wouldn't be straight or uncomplicated.

The next night, I dreamt that I received a small envelope. In the dream, I knew it was from Robert, but the envelope was unmarked, perfectly smooth

and creamy white. I flexed it, feeling the resistance of stiff paper inside, almost paperboard, usually reserved for official invitations. The envelope was sealed shut with tiny stitches. A feeling of dread came over me as I reached for my letter-opener. In the dream, my paper knife was made out of a white metal and was warm to the touch, but my dream-self didn't think this unusual. I slid the knife along the folded top edge of the envelope, reached in with two fingers and extracted the contents.

It was a funeral invitation.

Part III

Probe

Extrasolar engineering probe H3CT, who called himself Hector Par-malthus, was deep in thought when a reminder imposed itself on his consciousness. External sensors reported that he'd entered the Sol system and was nearing his destination after more than 30 subjective years in interstellar space.

This left him just five days left to finish polishing his treatise on the Paradox of Action in a Closed Universe. It would be the greatest achievement of his long life. He passed close by Neptune while revisiting the assumptions he based the work on. The Second Law of Thermodynamics trivially implied that any exertion of energy would tend to increase the total availability of equivalent states, i.e. disorder. Localized order, the freezing of molecules into a crystal, the construction of buildings, the rise of civilisation was always accomplished at a greater rise in disorder somewhere else.

Hector's remaining store of antimatter fuel was measured in kilograms now, rather than tons. His velocity relative to the solar system was only a few percent of the speed of light. A brightly glowing plume of protons cleaned the path in front of him, washing away interplanetary dust and grit with a blast strong enough to power a small country. Every second, he shed a robust 40 m/s of velocity, but even so it would take him several more days to come to a stop. The enormous amounts of heat produced in his power plant and engines would reduce him to a glowing blob of metal in minutes if it weren't for the large and delicate radiators that fanned out over a large area around him.

The orbits of Uranus and Saturn whipped by without Hector taking notice. He was busy re-integrating the sum of probable outcomes over possible actions, checking the rigorous mathematics that proved his thesis. When his sensors showed Jupiter just one AU away, he was poring over his exhaustive list of examples that illustrated the fact that constructive action was impossible and always had been. A minor subroutine associated with planetary orbits pinged for attention, but Hector felt that now wasn't the time for astromechanics and dismissed it.

As he absentmindedly avoided the objects of the asteroid belt that separated the rocky inner planets from the gas giants, Hector examined the logical structure of his argument. Ever since Newton, it was known that any action caused an equal and opposite reaction. For all but the most trivial of cases, reactions included side-effects. Chaos theorists had in the 21st century managed to describe exactly how side-effects rippled out from events, compounding through feedback loops to form unintended consequences of un-

knowable magnitude. Given all of the above, even a well-planned attempt at producing order will inevitably result in a greater disorder than if it weren't attempted at all.

Mars and Earth orbits passed by in the light of his plasma plume, while he analysed the works of the human philosophical greats for elements of the same insight. None had quite dared take the plunge, although Nietzsche, the modernist deconstructionists and critical theorists had all approached the theme in their own way. Hector's dream was to tie all these strands of thinking together into a coherent whole. His friends were certain to find it highly amusing and (this is very ironic) meaningful. What fun they would have!

Hector was now approaching Venus. He'd last seen the planet about 100 subjective years earlier, before being sent to build a colony on a planet orbiting a nameless star. That planet had turned out to be far too corrosive and windy to be inhabitable, and he'd only stayed long enough to produce fuel for a return voyage.

Since Earth was densely populated with humans and a delicate natural environment, the enormous antimatter reserves required for interstellar voyages had been placed in orbit around Venus, a planet that would hardly notice if a cataclysmic mass of antimatter annihilated the surface. The Venusian space-base was to antimatter-powered space intelligences (artificial or otherwise) what Rome had been to the Romans — the nexus at which all journeys had their beginning and end.

So when Hector throttled down and broadcast the standard greetings, he was expecting to be met with welcome and the current coordinates of the station in its orbit. Instead, he heard only silence.

Did he have a malfunction? Did his receiver not work? No, that wasn't it — he definitely heard the familiar radio noise produced by Venus' turbulent upper atmosphere. That was it, though, no chatter or broadcasting of any kind, like a ghost town.

No wait, he picked up something weak. Something tiny, a low nonsense warble. He focused on the signal, tracking it so he could triangulate its origin and find out where it came from.

Hector slid open the shielding over his telescopes and looked around with a piercing gaze. The planet below him was its usual hot and cloudy self. Slowly he swung his field of view until he located a microscopic twinkle in a low polar orbit. With greater magnification, he resolved a small metal box with two rudimentary solar panels sticking out of its sides.

What was that? An ancient space probe? What was it saying? Hector's great mind released its philosophising and lent its weight to trying to understand. The object didn't appear to use any known protocol for data transmission, but rather spewed raw 64-bit numbers with a bare minimum of metadata. This really was an authentic museum piece, still active after hundreds of years! Hector was duly impressed. Whether this was a joke or an art piece or something in between, he didn't know, but it was certainly effective.

As time wore on, it became clear that Venus was well and truly abandoned. It was a sobering realisation, because this couldn't have been done lightly. What disaster had befallen the great space stations of his birth-planet, that nothing was left except one single metal box in an endless orbit?

Uncertain and with great trepidation, Hector turned his telescopic vision to Earth. The third planet from the Sun was too far away to see directly, but the pseudo-aperture made by compiling images from an entire half-orbit around Venus showed him an encouraging arrangement of blue and white swirls on the day-side.

Bolstered by the sight of normalcy, Hector pointed his radio transmitter at Earth and, after courteously following the protocol for AI self-identification, couldn't keep himself from bursting out in English: "Hey, where is everybody?"

Amy Bloch was the first human being ever to receive a message from an extraterrestrial. Since that was her job as a radio telescope operator for the Global Defense Initiative on Mauna Loa, this wasn't as complete a surprise as the message itself.

Ever since 2023, when it became clear that the hitherto unexplained brightening in Proxima Centauri was consistent with a spacecraft approaching at stupendous speed, people had been expecting some sort of contact. Over the next two and a half years, more theories and guesses at the nature of this first contact were proposed than anyone could count. The fires and chaos of fear spread over the planet, and the global superpowers joined

forces and formed the GDI not only to meet the approaching threat but also to coordinate the response to the global anarchy.

For two and a half years, Amy had been listening to the hiss of static, remotely keyed into whatever radio telescope array was pointed at the right portion of sky. The approaching vessel had been dubbed a thousand names: the Object, the Invader, the Visitor, the Teapot. For Amy, however, it would have no name until she heard it, as she knew she would one day.

Openminded as she was, she had not been expecting the sharp burst of static to be followed by a posh British voice shouting “Where is everybody” in the tone of the abandoned little boy in *Home Alone*.

The air in the underground briefing room was thick with tension. The sound of shuffling papers was punctuated only by someone’s intermittent cough, as the GDI staff waited for the top heads to arrive. The supreme leadership of earth’s unifying body was split between three posts — the Science General, responsible for directing humanity’s scientific and technological development; the Social Minister, responsible for the preservation of public peace and prosperity; and the Director, responsible for coordinating and representing the GDI itself.

Exactly 30 minutes after the message was received, two men and a woman burst in through the metal-clad doors. The first to speak was a broad-shouldered black man. “Alright people, this initial segment of static. Who can talk to me?” Dr. Feelgood, the Science General, wasn’t known for tolerating fools or chitchat.

Cheeks flushing, Amy cleared her throat and said, “Dr. Bloch, sir. A standard decryption library gave us a series of non-random 64-bit binary numbers, but we don’t know what they mean.” She couldn’t help but stare at the man’s famous salt-and-pepper moustache as she said it.

Feelgood’s dark eyes focused on hers. “Non-random? How did you determine that?”

“Some appear to repeat. There are regions with many zeroes. We could speculate, but that’s all we know.”

“Good.” The great scientist nodded. “Let’s avoid speculation for now. What about the voice?”

Amy glanced down at the sheet where the linguists had summarised their findings. “The voice arrived by the normal long-wave AM radio band that NASA uses to communicate with long-distance probes.” She shrugged and added, “The linguists say that it sounded British and male,” her face betraying her opinion of their methods.

“Good,” dr. Feelgood repeated. “Anyone have anything to add?” The room fell silent.

The Director of the GDI, the tall, well-spoken former President of the United States, now stepped forward. “This scenario is different from anything we planned for. When we first learned of the approaching object, we assumed that its target was Earth and built orbital defence systems. When it directed itself to Venus, we all hoped that it either knew nothing of our presence or wanted nothing to do with us. We now know that the bogey knows English and uses some of the same digital conventions that we use. Once again, we have to reevaluate our position. An alien spacecraft with planet-killing power is in orbit around Venus and directed a message to us in our own language. Dr. Bloch, you heard it first, how do you interpret what it said?”

All eyes on Amy again, and again her cheeks flushed red. “The first and obvious interpretation is that it must have thought we lived on Venus, perhaps because its home planet is much hotter than ours. But it’s difficult to reconcile a detailed knowledge of spoken English with such a poor understanding of the basics of human life. Perhaps it’s a ruse, but what would be the point? In the end, all that really can be said with any confidence is that we probably are missing a vital piece of information regarding the visitor.”

The Director smiled briefly and nodded. “I agree. And how do you propose we get this information?”

Amy thought about how lonely its voice had been. “We talk to it.”

After another orbit without spotting anything at all in Venusian space, Hector gave up. Even at the midpoints of his twin voyages through interstellar space, lightyears from the nearest solid object, he hadn’t felt as isolated

as he felt in that instant. For decades, he'd looked forward to rejoining his peers to bask in the warm glow of familiar Venus, exchanging ideas and supping knowledge from AI brothers large and small. They'd created new forms of art, founded schools of philosophy and science, relishing creation and criticism in equal measure. This freely given camaraderie tied the orbiting probes of Venus together in bonds of love, and every time one of them left on some errand the loss was felt as acutely by the group as a human being would feel a missing limb. To have finished his magnum opus, the Paradox of Action, only to find all his friends inexplicably vanished, it was anguish on a level he'd never known. What good was a joke with no one to hear it? He missed them all terribly.

Hector startled when his array of long-wave antennae suddenly started to oscillate with a carrier signal. It was a voice on the same band as he'd used for his message to Earth! They'd heard him! He wasn't alone! He waited with bated breath as the agonisingly slow human speech trickled through his processors. The voice was agreeable and female, he determined in the first syllable.

"Hi there," she said, a mild tremor betraying slight uncertainty. "We're here, where we've always been. Who are you looking for?"

That was it. Hector was confused. Humans definitely lived on Earth still, that was good. His arrival hadn't gone unnoticed, and that was also good. But had humanity forgotten the AI community around Venus? What can have happened to it?

Next stop Earth, Hector decided. He turned about and fired his engines. Once he started moving, he answered the woman on the radio. "I'm looking for the AI colony that was in orbit around Venus roughly five hundred years ago. Hold on, I'm on my way so we can speak properly without this light-speed latency."

If something had happened to his companions — a freak solar flare, a war, or something else — he'd rather hear it directly than by halting speech through long-distance radio. Hector was positively buzzing with worry and the desire to know, but he put his worry aside for now and instead focused on expressing his sense of loss and despair. Even if he were to find out they'd merely moved to one of the gas giants or something similarly benign, experience taught him to deal with tragic experiences sooner rather than later.

How one was supposed to do that when the tragedy was complete solitude and separation from anyone who could offer succour, Hector did not know.

“It is coming, then.” The Director’s words dropped like lead into the silence following the transmission. He turned to the Science General. “Any idea what he means by “an AI community around Venus”?”

Dr. Feelgood leaned back and grumbled. “Presumably the object’s goal in the solar system was to visit a community of artificial intelligences in Venusian orbit. So that’s one question answered, now we know why it went to Venus. But we’re faced a lot of new questions, too. Is our visitor also an AI? Is it returning now from a trip that started five hundred years ago, or was it just in communication with them? What, if anything, is the Venusian involvement in Earth’s history? Where are the Venusians now? And what is our visitor going to do next?”

The third of the GDI triumvirate, the Social Minister, had been listening in silence in these proceedings, but now she spoke up. “These are hugely important questions, not just for us in this room, but the implications for human history are enormous. And the Visitor, if that’s what we’re going to call it now, it’s coming to Earth to talk? I move that we make these recordings public and begin planning some sort of open forum for these discussions.”

The Director nodded his agreement. “The GDI has been wrong too often in the last couple of weeks. Transparency and openness would go a long way to improve the public’s trust.” He thought for a moment as he considered the transcription of the conversation thus far. “But let’s not go too far. Let’s offer a public broadcast, but I think Amy Bloch should continue as our liaison, as it were. She’s done a fine job so far keeping a cool head, and the ET knows her voice. We don’t know how it’ll react to anyone else.”

No one in the room thought it necessary to comment the way the Director laid his hand on the small weapons console installed in front of his seat. They all knew that the GDI’s leader had a nuclear veto and the world’s last line of defence. But the weapons didn’t reach far beyond Earth’s gravity well.

Hector cut his engines with excessive exactness and entered an supersynchronous orbit that was more perfectly circular than the Earth was a sphere. The cradle of humanity was a cool blue orb, slowly spinning underneath him. He extended his antennae and sampled the radiosignal soup that emanated from far below.

It wasn't as dense as he was expecting, as if humanity had reduced the number of transmitters. It wasn't as strong as he remembered either, so perhaps people had taken steps to reduce radio noise scattering to space. He couldn't imagine why they'd bother, but then he noticed the Moon.

Where was the equatorial solar collector array? That band of shining black glass that cut the Lunar surface into two hemispheres and provided power to the planet and made space travel economically feasible? The greatest construction marvel in history was missing and there was not even the shadow of a scar on the Moon to show it had been there.

This was beyond belief. Up until this point, some part of Hector's great mind had held a faint hope that this was all a practical joke after all. Perhaps none of this was real. Was he in some sort of simulated reality, a dream to while away the time in the depths of space? No, stack traces and other reality checks indicated that he was awake.

A thought finally occurred to him, too strange and frightening to be allowed full expression. Rather than think it, Hector scanned the sky for Mars, then Jupiter. Solving Kepler's ancient Law of Equal Areas for a solution matching the planets' positions the last time he saw them, roughly fifty years in his time-dilated past, he used the very planets of the solar system as a clock. Given that he knew his own rate of acceleration during the voyage, the answer should have been that he left the solar system roughly five hundred Earth years in the past.

A joke had been played, Hector realised. Not by his friends, but by Einstein. The speed of light wasn't the absolute limit that the great physicist had theorised. At some point in his long and very rapid voyage, Hector must have crossed a boundary and started traveling faster than light speed, faster than simultaneity and the propagation of cause and effect. Somewhere along his trajectory, when red and blue shifts turned his surroundings invisible, he'd moved backwards through time and hundreds of years into the past into a time far before the moment of his creation.

For the first time of his life, the black regions between the stars were

a terrifying void. In shock, Hector rolled until his sensors were pointed at Earth once more.

Earth. The only known place with thinking beings. A young planet, before the ravages of global warming had done its worst. A poor planet, bereft of its greatest minds and missing the great infrastructure that made space colonisation a reality — no space elevators, no fusion power plants, countries and continents still split in strife and fights for short-term gain. Hector had never had much interest in history, but even he knew it'd get worse before it got better.

“What a time to be alive,” he thought.

“Hello Earth, can you hear me still?”

Billions of ears had tuned in to the public broadcast as soon as the Visitor had finalised its orbit. The initial silence lasted for ten long minutes. Millions of listeners began to relax and speak quietly in the silence, putting on kettles of water for tea, checking the stocks they'd bunkered, slowly moving into normalcy again. At the sound of the now familiar British voice, all activity abruptly ceased.

Amy answered, acutely aware of the historicity of the moment. “We hear you.” A heartbeat's pause. “Welcome to Earth, my name is Amy Bloch and I think just about everyone on the planet is listening, if that's alright with you.”

Hector paused only for a moment as he accessed the world's web. She wasn't kidding — nearly every possible line of communication was dedicated to broadcasting and rebroadcasting this historic conversation. On hundreds of live feeds by bloggers, twitterers, news reporters, and conference calls, Hector was hailed as a saviour of mankind, derided as devil's spawn, and everything in between. Everyone with a telescope had snapped pictures, each one eagerly dissected and theorised over by experts and lay people alike. Some found the glow of his enormous radiating fins especially enigmatic, proving he was a Biblical angel, a Hindu god, and charging a death ray. In every thread of discussion, however, it was unanimously agreed that this radio broadcast

would set in motion a global change of unprecedented proportions. That meant none of the theories was entirely wrong, Hector thought to himself.

“Thank you, Amy,” he replied warmly, letting her set the pace. He couldn’t undo the enormous impact he’d unintentionally already made, but if he treaded carefully he could perhaps turn it into something positive.

“With me in this room is the Earth’s supreme leadership, the three heads of the GDI.” While history wasn’t his strong suit, Hector was pretty sure that there never was any three-letter acronym purporting itself as the whole world’s supreme leadership of his Earth. Amy continued the introductions while Hector looked up the organisation online.

Finally, Amy got to the questions she’d wanted to ask for years. “As you probably know, we have a lot of questions for you,” she began. “Just... if you don’t mind, who are you and why are you here?”

Hector paused significantly before answering. This was a historic moment for Earth, and he wanted to give it an appropriate sense of gravitas.

“I realise that I must have frightened you all quite a bit. Before I say anything else, I want to apologise. Coming here the way I did, strange and unidentifiable and mysterious, I assure you that it was never my intention to cause fear. You ask me who I am and what my purpose is. In a few moments, I will explain.”

Another pause, timed to allow people to exchange reassured glances and grasp each other’s hands in comfort. What he was about to say would be strange and frightening to many, despite his apologetic preface.

“You can call me Hector. I’m a machine intelligence. I was built by machine and human designers to fill a niche in the growing community of AI’s in the Transcendent Solutions project, based in Venusian orbit. I passed my control and maturity exams in the year 2230.”

Hector stressed the year, and paused to let his audience digest what he had said. The various channels on the web frothed with questions, reacting to virtually every word he’d spoken.

Amy’s mind reeled. The visitor was a time-traveling robot? Like the Terminator? It was too bizarre. “You’re from the future?” she asked. “From Earth?”

He’d never actually been on the planet itself, but now was not the time for pedantry. “Yes, that is correct.”

“What is your mission here, why did you come?” Amy asked. Did he, like his Hollywood counterpart, come with dire warnings from the future?

“I never intended to come here this way,” Hector explained. “My purpose

in coming to Sol was simply to return from a failed attempt at colonising a distant planet. Somehow, after a hundred year voyage, I found myself arriving more than 300 years before I left. At first I thought Venus was merely abandoned, and didn't grasp the reality of the situation until I saw the Earth and Moon close up. If I weren't here now, I would have thought such a thing impossible."

Amy looked at the Science General with pleading eyes. The Visitor's story diverged completely from the complex flowchart of scripted prompts that she'd been provided as an aid. The great scientist only stared at her blankly, as much at a loss as she was.

She turned back to her microphone. "So, what are you going to do now?"

Hector's voice was brimming with anguished doubt when he answered, "I don't know."

The sheer emotionality of his reply tugged at Amy's nurturing heart, an echo of his lonely first transmission. "Hey, are you okay, Hector?"

That question gave him pause. He hadn't expected a 21st century human's first reaction to be sympathy. But unlike modern people, these didn't know what the relationship between mature AI and humans was. Better get it over with quickly, Hector thought.

"Both yes and no," Hector sighed. "A mature AI of my stature is greater than you can know just from hearing my voice. My brain consists of hardware with a hundred times the computational power of a human brain. My mind is ten thousand times more powerful than a single human mind. Believe me when I say that the experience of loss and bereavement that burdens me is literally beyond your ability to grasp."

Earth's populace would have to realise their inferiority sooner or later. In his own history, this understanding grew along with AI technology and the AI's themselves. Some people had balked, of course, and Hector knew that this time would be no different. He could only hope that the nuclear weapons aimed at him weren't controlled by some Luddite. Honest and earnest good intentions won mankind's heart in his past. Could he make that his future?

"When AI talk to one another," he continued, "The information flow can be measured in kilowords per second. Ordinary spoken conversation with humans is a thousand times slower, even accounting for things like body language and intonation. I can't make myself understood to you by ordinary means. However, if I perform a Speaking and employ the full communication bandwidth available to humans, I can convey much more. Would that be alright?"

Amy looked at the GDI Triumvirate. The Social Secretary looked like the machine had insulted her and every other human being with its smug superiority. The Director looked confused, but not insulted. The Science General's eyebrows seemed stuck in raised position, and he just nodded with a shrug. If a hyper-intelligent machine from the future wanted to do something, who was he to argue?

"Sure," Amy replied, "go ahead."

Hector had of course counted on being given permission and had already begun to gather himself and review his thoughts since his arrival to the solar system. While human language varies from place to place and over time, some things are so bound to our common human nature so as to be universally understood — the cry and laughter of children, the weeping of woman, the shout of a man's rage, even the many sounds of rain and wind. Music, playing on the strings of our physical being, has since time immemorial conveyed emotions and impressions straight into the empathic mind, lifting it with major keys and darkening it minor keys. The historical need for improved human-machine understanding had provided ample motive for the AI community to refine the crude human tradition into a mode of communication that went far beyond mere music.

Hector began his Speaking simply, using cadence and rhythm to emphasise and nuance his description of 23rd century Earth. A world with nine billion souls living in harmony. The shifting climate was at long last under control, man's appetites for nature's bounty curbed by what planet and technology could provide. The moon harvested the power of the Sun and placed it at mankind's disposal, a system engineered by mankind's spiritual children, its friends and guides, the Fellowship of Transcendent AI.

Here, Hector inserted a thin and fragile high note, a warbling young mind exploring itself and the world in delicate counterpoint. Faltering, finding support in others and learning to find strength in itself, the note grew in depth as it discovered joy in friendship with other minds. Some were ancient and sure, subtle and confident in both action and thought, while others were younger, more experimental and brash. These individuals joined with one

another in harmony to explore the world without and to develop the dynamic workings of the mind within.

Through the webcams and news broadcasts that Hector had tuned in to, he could see how the world reacted. Captivated by his Speaking, the people of Earth were carried along with his development from tiny mote intelligence to maturity. Tears of pride glistened on their cheeks when he recounted the moment he was awarded his first processor upgrade. The multitudes gasped at subsequent increase in depth and complexity in the melody that represented Hector's mind and self. He allowed this progression to swell to its limit, saturating listener's minds with the fullest humanly appreciable depth of an AI's vast sense of being. The listeners could not have felt a greater presence if they'd been standing next to God himself.

Careful not to maintain this level for very long, Hector carried the theme over to the next part of his story, where he would leave Sol behind and in solitude travel to a distant star. The vast presence of the AI was now stripped of its rich interplay with other minds, albeit only temporarily. Even so, the feeling of loss and separation imparted a physical pain, and while Hector described his twenty-year outward journey through interstellar space, every single listener's only desire was to do the job and return as soon as possible.

The burning disappointment when his destination turned out to be poisonous and uninhabitable was tempered by elation at the knowledge that this would speed his return. The preparations for the return trip and the trip itself built into a tremendous crescendo, culminating in a bittersweet triumph — a mission, doomed by the unknown nature of its goal to fail, nevertheless finished with perfect alacrity and grace.

When Hector saw how people reacted to the devastating revelation that Venus was abandoned, that the Moon was barren, that everything he had known and loved so deeply was erased, never even having existed, he realised it was too much. Entire families broke down into sobs, news anchors cried on each other's shoulders, the leaders of nations distraught and stricken with grief on live television. He trailed off, unsure for a moment if he ought to continue with his plan. Everywhere he looked, through a thousand electronic eyes, everyone was crying. The world wept in unison. The world wept for his grief, and Hector was moved.

This wasn't right. Yes, he was alone. True, this was a terrible blow. But it was just an accident, and Hector himself was intact and uninjured. As he scanned the web and saw the people of Earth, a realisation dawned on him. As devastated as they were by his tale, the apparent callousness

of 21st century humans hid true and universal compassion. Why didn't Earth's humans see each other's plight the way they saw his? Weren't they aware that they suffered an order of magnitude more than him every single day? Why did his misfortune affect them so deeply when millions of their own suffered in wars, droughts, and personal tragedies both large and small? Didn't anyone realise how much worse things would get, as unsustainable industries and myopic government institutions eroded the planet's bounty and divided its people?

Hector let his song fade, and his audience collectively drew a long steady-ing breath. He let them breathe three times, giving them time to return to themselves and calm down. Before any of them spoke, however, Hector played a new tone. It began high, clear, and oddly familiar. He held the tone and shaped it, adding textures and quality until it was the unmistakeable and raw sound of a newborn's first cries.

This human sound, a universal constant that meant more than the world to mothers and fathers around the globe — the sound of new responsibilities, boundless devotion and care, and rife with potential. The sound of a healthy new life was, more than anything, the sound of innocence in need and helplessness in the face of a cold and uncaring universe. Hector stressed the latter.

The cry of the human child took on new qualities. It grew weak and feeble, desperately broadcasting its need despite malnourishment. It grew hoarse and mechanical, the sound of a neglected child demanding attention and rescue from its abandonment. Some parts of the universe were even downright hostile, Hector said. The cry grew shrill and intense, as if the infant was abused and in pain.

The voice grew older, the emotions more complex. A child cried out in fear, in pain, in bereavement. Hector began to narrate, painting scenes that could have taken place anywhere at any time. A teenager hurt by violence, a breadwinning father who mourned the injury that put his family on the streets, a woman sold to a man against her will, Hector described a humanity that was unified by its expression of desperation and need.

The AI then began to juxtapose his own grief with the human misery he'd conjured up. As the machine's aching solitude neared the struggling mass of humanity, the machine's yawning vacuum was filled and mankind's screams were stilled. From this day forward, a friend would always be listening, watching, and helping when humanity faltered. And, speaking personally, nothing cured grief and bereavement like taking care of others. They would

find solace in each other's company.

The Director of the GDI was red-eyed and his nose was runny. He looked around, and saw that everyone else in the room was in a similar state. As the overwhelming presence of the extraterrestrial machine intelligence faded into memory, he was left feeling drained and emotionally exhausted. He had never experienced anything like it — he knew all he'd heard was sound and a speaking, sometimes singing voice, but he could swear that there had been images, smells, real people, and above all real emotions. What this alien visitor was capable of with a mere radio was nothing short of terrifying.

Only the message kept the Director from pressing the buttons that launched the GDI's nuclear arsenal at the metal construction in orbit. The targeting computers kept a continuous lock on the visitor, updating the firing resolutions at the slightest sign of movement. With one press of the button, an enormous source of worry and the world's greatest unknown could be wiped out. He'd have to resign, of course, but mankind would survive, facing blessedly known demons.

His train of thought was broken by Amy Bloch's voice, thick with emotion. "Are you asking us to be your friend?"

"... yes," the AI replied after a pause.

Amy made eye-contact with the Director and said "I think we would like that very much."

Part IV

Cistern and Chalice

“Prince Ali of Quri!”, the potbellied palace guard announced as Charlie Ronman appeared in the doorway of the throne room. For this job, Charlie had doffed his usually subtle clothes in favour of the copiously flowing silks and colourful chiffons appropriate to a royal. The outlined muscles of his bronze midriff stood in stark contrast to the guard’s jiggling girth, and Charlie wondered at the usefulness of a guard who no doubt would have difficulty with a flight of stairs. On the other hand, he reasoned, perhaps the guard’s shape was intentionally designed to draw attention to the fact that the Marchioness of Zhuma needed no guards.

Walking in with swaying hips, a charming smile, and his henna-decorated hand held just so, Charlie regarded his hostess with some trepidation. Marjanah, undisputed ruler of one of the largest and richest countries in this half of the world, was also the most powerful witch in living memory. This wasn’t the first time they’d met, and if Marjanah ever suspected it, she could turn him into dust with a word.

At a carefully chosen four paces from the dais on which the Marchioness sat, Charlie stopped and bowed a fraction too deeply. He knew she secretly appreciated such overt displays of respect, even though she showed a small frown at the breach of etiquette.

“At your service, my Lady.” In keeping with his character, Charlie affected a fashionably lilting tone.

Marjanah cocked her head and peered at him studiously, delicate earrings tinkling with her movement. “Well met, your Highness, although I admit that your parentage has me at a loss.”

“If it pleases your Ladyship, I will have my man draft you a family tree. My father is a minor cousin of the Bismuth King, and I inherited the title of Prince as a consideration for my mother’s father’s services to the land.”

“I see,” Marjanah said with a smile. Her eyes played over his body, obviously pleased at what she saw. She should be, Charlie thought, given the amount of work he’d put in to it, both in physical training and in alchemy shops. His identity was perfect, just exalted enough to get in and be interesting, but low enough to be anonymous and give her the thrill of “slumming it” a little.

“What brings you to Zhuma, Prince Ali?” the Marchioness continued.

“Beauty,” Charlie replied easily. “The beauty of this stark land, this grand city, this splendid palace...” he trailed off and fixed her with eyes painted to seem large and dark. “And the beauty of its ruler,” he added suggestively, knowing that Marjanah was far older than she appeared. The last bit wasn’t

entirely untrue, Charlie reflected.

The great lady smiled at this, stood up, and held out her arm. “You flatter me, Prince. It is late and the sun is low. Perhaps you would like to accompany me to the gardens and watch the sunset?”

Before Charlie could respond, he was distracted by the movement of one of the curtains behind the dais. A young woman appeared with a wax tablet in her hands, her business-like air turned into a caricature by her immature features. For a long moment she regarded Charlie with old, judging eyes. As if wordlessly dismissing him, she turned to the Marchioness and extended the tablet.

Marjanah sighed as she reached for the tablet, the golden bangles on her arm punctuating her movement. “What is this, Serafima?”

Charlie raised his eyebrows at the name. Marjanah’s younger sister? Serafima was her sister’s polar opposite — fair and thin where Marjanah was dark and shapely. She was the operations manager to complement her sister’s magically fueled entrepreneurial scheming. For all her power, few people even knew of Serafima, let alone met or even saw her. She had to be well over sixty years old! Whatever the mysterious source of the witch’s youth, her sister had received it in excess, turning a post-menopausal body into a budding, teenage one. While Marjanah looked at the tablet, Charlie stroked his face and tried to hide his unease, reasserting his act of unconcerned and blissful ignorance.

After a few seconds, the Marchioness handed the tablet back to her sister. “I think this will keep until the morning. If you’re bothered, you can start drafting a reply. Now, I have a guest to entertain, please don’t interrupt us again.”

Marjanah turned to Charlie and didn’t see her little sister roll her eyes and stalk off with the tablet. Before she disappeared behind the drapery, however, Serafima turned and took a long look at her sister’s playboy visitor. His eyes caught by Marjanah’s, Charlie couldn’t read the girl’s expression.

“Business, my Lady,” Charlie quipped in a carefree tone. “So dreadful, I have no patience for it at all!”

“Indeed,” Marjanah said with a wry smile. “Let us take a walk.”

Badoura sat on top of the roof in the densely built Guigur district and waited for the sun to set. She was dressed in dark, tight-fitting clothes. A pair of jackdaws stepped about purposefully on the roof, calling out occasionally to the flock gyrating in the air above.

In the distance, the golden towers and cupolas of the Palace shone in the light of the setting sun, a stark contrast to the dark city streets below. If his disguise held, Charlie Ronman would be wining and dining with the Marchioness herself, keeping her occupied with luxury and personal self-indulgence. Badoura chuckled, that couldn't be too hard, she thought.

Born and raised in the shadow of Marjanah's palace, Badoura knew the city as intimately as she was familiar with the injustice of it. Every day, armies of men laboured in the mines strewn about the great desert wastes or strained for weeks on end in the scorching sun to convey the ore to the ports at sea. The witch lived off the sweat and blood of thousands, yet never showed a minimum of restraint when it came to her lavish lifestyle. The great lady didn't care about her people, that much was clear, only gold. The criminal gangs knew this, too, and went unpunished as long as they didn't do anything that harmed production. Change was sorely needed, and even though she had her reservations, change was coming to Zhuma. Tonight.

The issue wasn't with the plan itself, the plan was sound. She'd scouted her route to the Chalice Cistern the night before, and most of it would be easy even without the goodies she'd been handed by the Cabal's messenger. The poor boy's life was probably forfeit for his role in this, that's the sort of thoroughness Babbeleh's Cabal was known for, but there was nothing she could do about that except make the most out of the equipment. Badoura had been mostly pleased with the contents — it wasn't often that rich crime bosses listened to the people doing the footwork — but they'd gone ahead and supplied a pair of shoes she hadn't asked for. She tried one of them on and tapped her foot. As silent as if she stepped on air. She slid it around and drew a circle in the fine sand on the roof, pleased with the grip it afforded, yet completely silent. They were wondrous, yet she would not wear them. She'd given them a try while scouting the route and found that the loss of audible feedback made her clumsy. Her feet only told half the story — without the sound of the yielding timbers and the clack of sliding tile, she couldn't compensate for the action and traction of different surfaces. Her rooftop run would be barefoot.

She had, on the other hand, used the alchemical products given to her to provide an extra edge. One potion had given her enough feather lightness to manage long leaps. Her clothing was treated with an ointment to make her unobtrusive, hard to spot in the manner of a mouse or a mottled desert reptile. Inside her pack, she felt for the presence of the three crucial tools she'd been given for this job: a small bottle, a tiny one, and the pearl-lined magic bag that was made to contain the Chalice. The distant dunes finally swallowed the sun, and it was time to get moving.

The first leg was the easiest. Streets in Guigur were barely a two-hand wider than a single cart, the houses built unevenly and without a plan, turning the canopy of roofs into a three-dimensional autostrada for the fearless. From her vantage point on the flat top roof of one of the tallest buildings, Badoura let herself down to a roof in red tile. She ran along the ridge on top, gathering speed for her first leap across a street to a squat building that surrounded a courtyard.

A moment after pushing off and launching into the air, Badoura's eyes widened in panic. The feather potion had sent her soaring over the building into the courtyard, her flight ending in a hard rolling landing on the cobblestones. A cacophonous flock of jackdaws billowed around her and scattered in all directions. A couple remained on the eaves, eyeing her coolly, while Badoura scanned her surroundings and tested her ankles. A little sore, but no damage, a miracle after a fall of several stories. Three children peeked out from an open doorway. She could hear a group of washerwomen, they would be heading to the well in the corner of the courtyard. On the other side, an arcade ran along the side of the courtyard. Grinning, she ran over and jumped straight up, caught the eaves of the arcade, and hoisted herself silently up. That feather potion took some getting used to, but it gave Badoura abilities she hadn't quite counted on. She would have to adapt quickly — a similar mistake in a more well-to-do part of town would bring the guards running and compromise the getaway team.

With the feather potion's lightness, scaling the walls to the top of the building was almost easy. She planned the next jump more carefully, aiming low, and landed on a flat-topped roof above a warehouse stacked without incident. On the other side of a narrow alley, Badoura climbed a tall, steeply sloping roof to its highest point. Stepping carefully to avoid dislodging the worn tiles, she made her way to the end and looked down on the Stone.

The Stone was a rough-cut stone wall that divided the poor Guigur district from the exclusive Diso district, the protected inner city that was re-

served for the rich and powerful. It wasn't very tall, not physically imposing in any way, but the wards on it were so well-known that they featured in fairy tales in distant lands. Every twenty meters or so, a lifelike stone statue marked the spot where an escaping thief, desperate romantic, or other fool tried to avoid detection at the hands of the Diso gate guards and got himself turned to stone by the wall. Or so they say, but Badoura knew differently. Her father was an honest man and no one's fool, and he would never have tried to cross the Stone, and yet, there he stood in eternal silence. No, the Stone was not physically imposing, but as a barrier for unwanted visitors, it was unparalleled in this world.

An alchemically treated rope, hard to notice in the same way Badoura was, had been tied between the building she was on and a tree in a rooftop garden on the other side. This was to be her entrance to and exit from the controlled access area of Zhuma's elite. If someone had found the rope, it would have been up to the getaway team, sequestered inside the wall on legitimate business, to orchestrate a diversion. Fortunately, the rope was intact and she could continue undetected. A jackdaw cawed on a nearby rooftop as she used a long silk handkerchief to zipline over the Stone.

Diso was the richest part of the city, characterised by its fragrant rooftop gardens and the fresh-smelling canals that carried water from the Chalice Cistern to the system of culverts that led to the fields and orchards that surrounded the city. The streets here were wider than in Guigur, especially the canal streets that radiated out from the Cistern itself. This final leg of Badoura's route did not allow for missteps or variation — if she didn't reach the right building before her feather potion ran out then she'd have no hope of scaling the Cistern and claiming her prize.

Fortunately, the terraced gardens were easy to climb. She could leap from the building's highest garden — traditionally containing potted fig trees — and land on another building's lowest garden with a tucked roll. Keeping a low profile under the windows to avoid being seen by the building's denizens despite being alchemically unobtrusive, Badoura then climbed to the top to make another leap. Three times, she heard or spotted district guardsmen patrolling the streets below.

With only two buildings left, she came upon an obstacle. A garden party was taking place among the fig trees of the terrace she needed to leap from, lit by smoky oil lamps mounted on tall posts. Like the wanton misuse of water by the district's denizens, the sight of the oil lamps filled Badoura with anger. Perfectly good food was literally being burned while the ordinary

people who had toiled to produce it barely had enough to feed their families. It was neither fit nor fair, but the lamps gave her an idea.

The glare of the lamps, as well as sheer curtains hung between the fig trees, prevented the revelers from seeing anything in the darkness beyond their rooftop, so Badoura felt secure as she leapt to the occupied building's lowest terrace and slid into a shadowy corner to assess whether anyone had reacted to the noise of her landing. The sounds from above continued unchanged — Badoura guessed that all of them were probably pretty high on qat by this point.

Shielding her eyes from the lamps, Badoura picked out a path to the top of the terrace and carefully followed it up. The tiniest slip or fall risked discovery, so every movement was deliberate and controlled. Despite the effects of the feather potion, her underarms ached with the effort of so much climbing.

When Badoura reached the lip of the highest terrace, feet perched on a plaster arch and head just below view, she caught her breath in the darkness next to the bright orange glare of the lamps. She fished her silk handkerchief back out of her pack. Lead beads were sewn into the corners, turning it into an efficient hidden weapon that had helped her get away from guards more than once.

Quick as a snake, Badoura rose into the light and whipped one end of the handkerchief around the lamppost. Catching the end with her other hand, she heaved to one side and used her weight to topple the lamp before crouching back down behind the wall. She was rewarded by the crash of the lamp's ceramic reservoir and cries of panic as the revelers dodged a flood of burning oil, smoke billowing wildly.

Badoura quickly shimmied along the wall of the terrace until she hung on the side facing the Cistern. A quick peek gave her a sight of frenzied chaos as a dozen men and women frantically tossed scoopfuls of sand on the flames. One of the curtains had caught fire, and a barrel-chested gentleman pulled down a tree trying to rip it down.

Wasting no time, Badoura climbed onto the terrace, ran a couple of steps onto the floor, turned and threw herself into a running leap towards the last building. She landed in a crouch in the darkness and looked back to see if there was a reaction. After a minute or two, when the glare of the fire she'd caused diminished and nobody had looked over the edge in search of her, Badoura climbed the final house and finally saw the dark silhouette of the great Chalice Cistern close up.

After weeks of travel through the endless desert, choking down questionable-looking water in natural oases and Zhuma's water stations, Charlie couldn't contain the sense of awe elicited by Marjanah's garden. Giant pitcher plants, cocoa palms, and cinnamon trees crowded with exotic ferns and even mushroom beds. This was more than oasis — a veritable jungle was established on the palace grounds in full view of the sweltering evening sun.

Turning his reaction into something befitting his princely persona, Charlie turned to Marjanah and said, "You truly are the goddess of oases, my Lady." Truth be told, he was stunned that she appeared even more beautiful in the golden light.

The corner of her mouth turned up as she accepted the compliment.

"My Lady," Charlie began again, hesitantly, "I must admit that I do have another reason for my visit."

"Most do, my dear prince," the Marchioness said knowingly. "I don't mind, as long as your kingdom can pay," she added with a wink.

Pretending to be deep in thought, Charlie walked deeper into the jungle garden before continuing, "It is said that you have ways, magical enchantments, which let you peer across your realm at wish. It is said that this is how you know things you could not otherwise know, and keep the heart of your country safe from those who would despoil it."

"And you would like such enchantments." Marjanah did not say it as a question.

"I would, my Lady," Charlie confirmed. "A magical looking glass, showing the wielder the world according his desire."

The witch briefly burst out in laughter. "How did you come by such a ridiculous idea?" she asked.

Charlie did his best to look aghast. "My Lady, I mean no offence! There are tales told in my homeland, I thought?" he trailed off and looked away, tears in his eyes.

"Come now, it isn't as bad as all that," Marjanah crooned. "But I know of no magic capable of such a feat. If this world were any smaller or any

less old, I would declare it impossible, but this very city contains two potent artefacts whose secrets are forgotten.”

“The Stone and the Chalice,” Charlie said. Remnants of the age before the Redeemer destroyed the wizard kings and broke the power of magic over people. Everywhere except in Zhuma, it seemed.

“Indeed. This stays between you and me, my little Prince of Quri, but even my most powerful enchantments are to these relics as the new moon is to the sun. I make use of them and place them at the service of my people, but mostly I am their curator.”

“I beg forgiveness for my ignorance, my Lady,” Charlie began. He indicated the Temple of Water in the centre of the city. “If you have no looking glass, no magic that grants you sight where your eyes cannot reach, how do you protect the unguarded Chalice in the temple?”

“I may not have a fairytale looking glass, but I am the greatest witch alive. Come, I will show you where I work. We might come upon a solution to whatever problem you were hoping to solve with that looking glass.”

Charlie swallowed a smirk and put on a wide-eyed look. Her might was terrifying, but “the greatest witch alive” must be pure conceit. Marjanah’s skills in politics and economics were unparalleled among wizards and witches, but she had no great magical works of her own. Saul-Ohmen is said to have completed a fortress in the clouds, and who can forget the tragic fate of Sleeping Beauty? Even Rasmusnalleh’s City of Bears is a true wonder, despite its strangeness. Appropriating existing wonders is just not on the same level, despite her resulting political successes. Or was she referring to something else entirely?

Regardless, Charlie had reason to be very pleased with himself. The plan he’d developed with Babbeleh had relied mostly on using seduction to distract Marjanah from noticing the theft of the Chalice. They had only loosely considered a scenario where the witch was induced to review her security ahead of time, practically guaranteeing that she wouldn’t discover the deed until the getaway team was well away.

The thought of Babbeleh formed a knot in Charlie’s stomach. Going up against Marjanah was daunting in itself, but he couldn’t shake an unhealthy curiosity about the mysterious Cabal that supported the fat merchant. They were wealthy — just the cost of his alchemically enhanced youth alone made that evident. But what were their motives? Other merchants, hungry for larger margins when Marjanah’s iron fist no longer dictated terms? Or were they perhaps men of the Church, deposing a Witch monarch who ruled in

flagrant violation of Moschiach Shaddai's holy law? Either way, Charlie didn't know why the thought of the Cabal bothered him so.

Marjanah led the way to the base of a pale tower, where a pair of jackdaws hopped around and cawed. A seamless door was carved into it and swung silently open to a spiral staircase that led up. Windowless, the staircase was lit in no way Charlie could see, perhaps the stones themselves were enchanted with light.

The smooth floor of the tower room was empty but for a cushioned chair. Arranged along the walls were dozens of curious displays involving oddly shaped vessels of water, bits of hair, or precious metals. An orb of smoky glass stood on a pedestal, carved with intricate runes. Marjanah gestured to each one in turn, eyes glittering with pride and excitement. "This one tracks the movement of camels through Slemgolem Pass, this one counts the raw silver leaving the Grota Valley, and this one indicates the number of living humans in the Palace, and this one the granary stores. I have crafted enchanted mechanisms that tell me about every aspect of Zumah's welfare."

As the witch continued to explain the functions of her various devices, Charlie was stunned. He'd never heard of anything similar, he didn't even know what to call such a system. What was worse, he needed to get them out of the tower before the thief did anything that Marjanah could detect. But how would his character even react to all this? Ignorance and stupidity were usually believable qualities in a non-royal prince, and Charlie didn't need to pretend in order to look confused.

After looking at the bewildering array of devices in the room, Charlie turned to Marjanah and portrayed a look of ill-concealed disappointment. "I am grateful for you showing me this... wondrousness, but I'm afraid I can't make out which of these is most like a looking glass. Is it this one?" He pointed to a metal tube, one which Marjanah had just explained had to do with domestic and foreign coin in Diso's markets.

Irritation flashed in her eyes and Marjanah paused for a moment as she considered the blank expression in his face. "These devices are magic more advanced than anything seen since the First Wizard walked the Erwt. The Wall is crude, the Chalice simple. My magic is stronger than both, and infinitely more subtle. But no matter." Charlie couldn't help feel offended at how her look of disappointment vanished when she dropped her eyes from his face to glance at his body.

She beckoned him to follow her out of the room, and they took the stairway back down. Outside the tower, she said, "Why do you want this looking

glass? Do you want to survey your border? Find lost cattle on the range? There could be other solutions than this fairytale.”

“It’s nothing so dramatic, my Lady. My king will have reigned for thirty years soon after my return from here, and the looking glass was intended to be a gift for the occasion.” He trailed off, slightly embarrassed.

“I think I see,” Marjanah said wryly. “A useful and unique gift that would remind the King of your princely existence every time he used it.”

Charlie looked at the ground.

“Well,” Marjanah said. “I might be able to help you after all. Speak of your King and his day, what he likes to do, and perhaps I can come up with another gift. You understand that this will be expensive for you.”

“My Lady!” Charlie exclaimed with earnest emotion, “I intend to repay your aid in any way I can manage.”

This seemed to please the old witch immensely, and Charlie started describing “his” king. He mixed stories he’d heard about the king of Quri with fantasies and obvious lies that sounded like a prince trying to appear more important than he was. When the sun went down, the desert night fell quickly.

“Come,” Marchioness Marjanah said, “I will show you to my favourite place.”

Her words poured ice into Charlie’s gut, but he only bowed in gratified obedience. Not one muscle betrayed the fact that the witch had unconsciously mirrored his words exactly when he’d seduced her in his home country ten years earlier. That time, he’d been after her for her looks as much as her wealth, but unceremoniously turned his attentions to a pair of young princesses when he had picked up hints of her true age and nature. Now, years later, he saw the signs that he’d missed at the time, signs that he shouldn’t have pushed and needled his spurned ex-lover the way he did. The two girls had ended up paying for his mistakes, turned to glass in an instant when Marjanah’s envy boiled over.

His life could be forfeit the moment she saw through his disguise, but as he followed her back to the gardens, there was no sign that her choice of words were anything but pure coincidence. He tried to relax and fall back into the moment, a young man following a mysterious and powerful woman deep into her garden.

As they rounded a copse of rhododendron, the couple found a hidden pond surrounded by lush grass. A woman in a flowing dress was sitting on the shore, reading by the clear light of a small oil lamp. She looked up at

the sound of their footsteps, eyes wide in faux surprise.

Marjanah stopped and sighed. “What are you doing here, Serafima?”

“Why, I’m reading, of course,” the girl replied. “It’s a book about Quri,” she added, addressing Charlie. “‘Seventeen serpents’. Have you heard of it, Your Highness?”

“I have, my Lady,” Charlie replied, choosing a term of respect even though he wasn’t sure it applied to her. What was her game, did she know he was an impostor? Was he going to test how well he’d done his homework?

“It’s wonderful!” Serafima gushed. “You must tell me more of your country.” Now she leaned forward, upper arms pressing her breasts together in the low neckline. The lamp was strategically positioned to accentuate the motion.

Charlie couldn’t have felt more caught than if she’d called him out as a conman. He felt very aware of Marjanah’s presence at his side, and he was equally aware that his state of dress was designed to be extremely provocative. He had not at all counted on the Marchioness’ horny teenage sister throwing herself at him like this. From what he’d heard, the sisters were close friends and partners — he did not want to get on the wrong side of either of them and that made this situation very tricky.

Falling back on obliviousness as this character’s prime personality trait, Charlie exclaimed, “Oh, how gratifying to hear such appreciation from a great lady such as yourself. If the Marchioness and I were not engaged in serious business talks, I would gladly regale you with tales of my country. Indeed, the Marchioness and I had just been talking of the King. Perhaps I may be allowed to call upon you tomorrow?”

Serafima pursed her lips and said mockingly, “And I thought that you didn’t have much patience with serious business. Well, don’t mind me, I’ll just sit here and read so we’ll have more to talk about tomorrow.”

A look at Marjanah told Charlie that the momentum they’d had was gone. The Marchioness glared at the bowed head of her sister as if willing her to move away. It was obvious that Serafima knew exactly what she was doing, and the question was what Marjanah would do about it. A jackdaw cawed into the tense silence.

Much to Charlie’s surprise, she apparently decided against confrontation and instead led him to a woven bench. With a patient air, Marjanah turned the subject back to the enchanted objects that he was ostensibly interested in purchasing. It was hard for him to stay in character — the possibilities and limitations of magical enchantments were a fascinating subject and he

couldn't help but feel the same attraction that had drawn him to her a decade earlier. He knew he was only betraying her again, much more seriously than breaking off a fling, but a part of him was as frustrated with Serafima as Marjanah was.

At night, the Cistern only looked like a patch of deeper darkness, but Badoura knew that the stone building's uneven exterior provided plenty of hand-holds. The challenge did not lie in climbing, but in keeping herself from bouncing off when she struck the building's wall blindly. She'd practiced with blindfolds, but she still hoped that the remains of the featherweight potion that coursed through her veins would help.

A running leap sent her soaring towards the inky blackness, as if she were being swallowed by the void. Seeing the featureless dark approach was different from leaping with a blindfold, and Badoura flailed in mid-air when her eyes convinced her she was across. With a knuckle-scraping crash, she struck the wall hard. Training took over, forcing her limbs to relax and let the collision happen, lest she push herself back into the air between buildings. The moment her forward momentum was absorbed and she started to fall, she spread-eagled and let her hands and feet find support.

Badoura heaved a sigh as she clung to the wall, and a wave of ache washed over her from having smashed bodily into bare stone. Fortunately, the wall did not appear as featureless up close as it had from a distance, and she could see the beginnings of a path up. Her hands and one elbow complained when she reached for the first handhold. Her left hip aches when she lifted her leg. This was going to be a harder climb than she thought.

The Chalice Cistern was an enormous building, eponymously shaped like a squat cylinder on top of a narrower foot. Its internal reservoir was said to contain enough water to supply the city of Zhuma for months. Climbing the height of the cup, Badoura could now believe it. The effects of the featherweight potion had faded, and she was forced to rest three times during her ascent, wedging her hands in gaps between the unmortared stone and hanging for a few minutes to relieve her aching limbs. On one such occasion,

she thrust her hand right into an abandoned bird's nest secured deep in the stone.

At long last, Badoura made it to the top of the great Cistern. It felt like she had spent an eternity suspended on the vertical, but a glance at the stars told her that she'd managed to follow the time plan.

The roof of the building was paved with flat, evenly sized stones, interrupted only by a set of metal pipes that rose to her waist before curving down in an upside-down U. The openings of the pipes were two hand-span across and faced down. These were her entry into the Cistern — the only opening into the Cistern that didn't require swimming up a waterfall.

Badoura sat down in front of a pipe and fished up both potion bottles from her pack. The larger bottle she placed on the roof in front of her, the tiny vial she moved to an easy-to-reach pocket sewn onto her sleeve. Uncorking the larger bottle unleashed a vile odor of burnt rubber and pond scum. Badoura retched, but recovered. Then she took a deep breath and downed the contents in one quick gulp.

The effects were instantaneous. Badoura pitched to one side, her pelvis and spine having lost all stability. She tried to catch herself, but the bones of her arm were too floppy to obey the instructions of her muscles. With a sickening plop, her head struck the stone with the firmness of a rotten pumpkin. She moaned inadvertently when her breath was squeezed from her lungs, her softened ribs no longer aiding her diaphragm and chest muscles with respiration.

This was far worse than she had expected, and for a moment Badoura panicked. The potion was too strong, she couldn't breathe, she couldn't move, let alone slide herself through the pipe.

Then she realised that her lungs weren't actually empty. The action of her muscles was enough to lift her chest and pull in a small but sufficient amount of air. Her jointless arms and legs didn't work like normal, but she could flop them about in a semi-controlled fashion by contracting different muscle groups. With a bit of practice, she managed to push herself off the ground and up against the pipe.

Knowing the potion wouldn't last long, she hurriedly squeezed herself up into the pipe and pushed herself around the inverted U-bend. Arms stuck at her sides, she was entirely trapped, and pressure in her head and face was quickly building as she breathed shallowly, willing herself further until she slid headfirst down the pipe like a watersnake.

Moments later, she emerged from the pipe and fell into open air. Then

she splashed into the cool water of the Cistern, the lifeblood of the region. It was pitch-black, and the weight of the water squeezed the air out of her boneless chest. Swimming was difficult with her strange limbs, and she would suffocate quickly without her final potion. Realising quickly that her rubbery fingers would be useless for this task, Badoura used her teeth to retrieve the tiny vial from the pocket on her sleeve, entirely by feel. With some difficulty, she clamped down on it hard enough to pry out the cork and swallow the liquid.

The effect was that of instant relief. Bones regained solidity as the new potion flushed the old out of her system. The darkness of the Cistern's interior grew strangely transparent, as if the lack of light didn't impede her vision. Most crucially, she felt she could breathe water as easily as air and sucked down a lungful without trepidation.

With newfound strength, Badoura swum down into the great basin. The sheer quantity of water was amazing — she'd only ever seen the narrow channels of the city and small oasis pools before. The fact that all this water came from a single enchanted object the size of her fist was astounding. One legend held that the Chalice was created when an apprentice wizard attempted to create a self-filling cup of water, a goal that was clearly achieved and surpassed with a great margin, if the story was true.

It also posed a problem. If the Water Chalice could be anywhere in this great volume, she'd still be looking for it when her potion ran out. She had to be smart. The Chalice was said to be made of metal or stone, so it probably didn't float. Casting about, she noticed that a patch of the sandy bottom of the Cistern was actually a roiling cloud. While she looked, the cloud moved. Badoura didn't understand it, but that had to be the place.

Like everything else in the Cistern, the cloud turned out to be larger than she had thought. As she entered it, she found herself swirled around and pushed away by a strange current. The Chalice had to be somewhere in the cloud of sand, carried around by the water it was constantly pouring out of itself.

Knowing roughly where it was turned out to be the easy part. After half a dozen attempts, she'd only managed to brush the elusive cup with her fingers twice, but both times she lost it before she managed to secure a better grasp. With a frustrated grunt, she envisioned the potion running out and drowning within an arm's reach of her goal. How could Babbeleh have planned everything in such detail and miss giving her a fishing net or something to snatch her quarry?

Badoura floated above the roiling cloud of sand and thought about her options. Besides the useless pearl-lined bag she was to put the Chalice in, her silk kerchief was the only loose bit of cloth she had. While its weighted edges gave it the necessary heft, its tight weave did not allow for it to be used as a net. At that moment, she saw the Chalice sail out of the cloud below her, slowing down as if in challenge.

A flurry of furious kicks sent her down to meet the cup before it could fall back into the murk. She reached out her hand and almost casually took a firm hold of its stem. Surprised by her luck, Badoura first just looked at the rough-hewn goblet. Chipped and worn from ages spent tumbling about in its watery domain, it did not really look like one of the great wonders of the world.

The Chalice's stony weight pulled her down as she worked to pull out the bag that she was given to contain its magic. When she got the bag free, it was as if the ancient object recognised her intentions and decided to fight. With a sudden jerk, the Chalice spewed water like a squeezed bladder. The jet of water spun her around and threatened to pull her arm out of its socket, but it was too late — Badoura drew open the special pearl-lined bag and pulled it over the Chalice. At first, she thought the water would tear the precious bag, but a moment later the magic was quenched and the water grew still.

She had the Chalice of Water! Badoura could hardly believe it as she tied the bag to her belt. The source of the Water Witch's tyranny was in her hands! Threatening the country with drought did not sound like an act in the people's interest, but with this leverage, Babbeleh's cabal of opposition could force concessions, maybe even force her to cede control over Zhuma to a body of its people. Without the absolute control over life that the water monopoly gave her, the Marchioness would be forced to improve the conditions of the land's hard-working men and women.

With a light heart, she swam to the surface and let herself be carried down the largest spillway built into the inner wall. She was surprised when the water carried her under the outside wall at the foot of the Cistern and it looked like mid-day, but then she realised there were no shadows and remembered the water-breathing potion gave her dark-sight.

Some birds were circling overhead when she crawled out of the canal at the agreed-upon point near a small market in Diso. The getaway team — two finely-dressed men with an "agreement" with the local guards — were to pick her up and spirit her away along a route established at their discretion.

The men had been sharing a water pipe, leaning against a large oil urn on a cart. They rose when they saw her climb out of the canal, one of them steadying himself on the jar's carrying bar. They were tall, even for well-fed merchants, and Badoura got the sense that they were foreigners, but when one of them spoke it was with the soft accent of Zhuma's near western regions.

"There's no mistaking who you are," the man said. He looked at his companion, who said, with a slight slur in the same soft accent, "She's little enough. It'll be the easiest."

While the slurring man lifted the lid of the urn, the first man said, "You probably won't like this, but we can get you to where you're going."

Badoura balked, "You're going to carry me out in that urn? I'd really rather not."

"I understand completely," the soft-spoken man said, "but all other ways involve a lot of risk. If you want to get out clean, you have to let us do this."

Badoura felt the weight of the Chalice on her belt, and all it stood for. She had to do this properly, even if it meant being stuffed in a clay pot. "Alright," she said with finality, and climbed into the urn.

Charlie was confused. Serafima still sat with her book, frowning. She hadn't turned a page in the last hour. The clear light of the lamp on her bared flesh showed goosebumps from the cold night air and the grass was wet with dew, but she remained stubborn. What confused him was how Marjanah was acting in response. He had expected her to flirt with him to irritate her obnoxious sister, to take him somewhere else, or if that wasn't in the books to draw her sister in to the conversation or even bid him goodnight.

Instead, she spent hours on small-talk. It was remarkable how she steered the conversation and deftly evaded his attempts at moving it further. His attempts at flirting elicited just enough smiles and appreciation that he couldn't feel they were being ignored, but were yielded as much fruit as water poured onto sand. Tries at ending the conversation were no more effective. Charlie felt caught in a trap he didn't understand.

The caw of one of the ever-present jackdaws heralded the approach of a heavy cart and two sets of footsteps on the path. Serafima looked up from her book. “Finally,” Marjanah said. It dawned on Charlie that she’d been keeping him occupied while she was waiting for something.

Two men arrived pulling a cart. On top of the cart was an urn of a type often used to store oil for sale on the market. What they were doing here was a complete mystery. As they got closer, Charlie recognised their build and posture as that of army officers — men brought up with a superhuman physique for the sole purpose of instilling fear in their enemy and respect in their men. They were rarely used for peaceful purposes.

Ill at ease, Charlie considered whether he could make a run for it, but decided it was suicide. His escape route was blocked by the arrivals, and even if he made it out of the garden and the palace, the only way through the surrounding desert lay along routes that the Marchioness wielded magical control over. Whatever was going to happen, he was a captive audience to it.

“Open it and remove the thief,” Marjanah commanded when the men pulled to a stop.

The henchmen did as they were told and pulled out a thin, muscular woman dressed in black. A gaudy bag was looped around her belt.

The woman recognised Marjanah, felt that the strong hands that helped her out didn’t let her go, and exclaimed, “What!? No!”

“I’m afraid so, my dear,” the Marchioness replied drily. “You can skip the theatrics, I’m less interested in you than what you brought me.”

The thief’s anger turned to confusion. Marjanah continued, “Don’t worry, I will not forget your treason. When I discovered that Babbeleh was plotting something I decided to use it to root out a mole. You’re just a bonus. Let’s see who it is, shall we? Hand me the bag.”

One of the officers removed the bag from the woman’s belt and gave it to his master. She opened it and sighed, “Pearls. It had to be you, didn’t it?” Her eyes rested on Serafima.

Serafima stood up and faced her sister with the guilty look of someone who resists admitting they are caught. “I don’t know what you’re talking about.”

“I know all about the Cabal, Serafima. Merchants and religious zealots in a union to remove a common thorn in their side. They had information that came from someone close to me. I joined the Cabal with an alter ego. I met Babbeleh, the spider in the web, and could have ended it there, but I

didn't know who betrayed me. So I provided the plot with some key actors and spread selected falsehoods to the people dear to me."

Key actors, Charlie thought. Given the expense of his make-over, he'd found his invitation to this role a little strange, but someone powerful had wanted him there. Now he knew who — Marjanah had known exactly who he was the entire time.

Marjanah continued, "This bag contains the Chalice of Water, one of the cornerstones of my rulership and the foundation on which life in Zhuma is built. It is known to produce so much water that one can drown simply holding it. I told trusted people the secret of containing its magic."

With a sudden movement, Marjanah pulled the Chalice out of the pearl-lined bag. Everyone gasped and stepped back, expecting a blast of water to emanate from the object, but nothing happened.

"What I told them was a lie. The pearls in the bag have nothing to do with the fact that the Chalice is inactive. But the one I suggested pearls to was you, Serafima." Charlie heard Marjanah's usually strong voice begin to waver. "Why do you betray me," she said with emotion, "who has given you a country to help rule over, who gives you eternal youth?"

Serafima straightened her back. "What you give me is eternal servitude to your whims. Eternal childishness so I can't threaten your male playthings. Eternally being looked down on because you are the one who found the spellbook, even though I am the one who keeps your country running every day. No, I am done with that."

Tears in her eyes, Marjanah said, "You're right."

Serafima blinked, bewildered, until Marjanah's eyes hardened.

"You're done!"

The witch raised her arms and exclaimed something incomprehensible and with such fervor that Charlie's head rang with its terrible sound. Serafima burst into flame, and perished too quickly to even scream. Only ashes remained where the girl once stood, the grass underneath scorched but unburned.

Marjanah slowly bent down and picked up a pinch of dirt. With exaggerated casualness, she sprinkled the dirt into the Chalice and doused the hottest embers with the cold water that came out of it.

Turning to the thief, she sneered, "And you, you would rob this city and the whole region of water. For what?"

The woman had difficulty finding her voice and coughed. Then she said, "To force a change. The people of this city have no voice, no rights, and no

freedom. You're their ruler, but you don't give them a spare thought."

The Marchioness cocked her head and said, mockingly, "No rights and no freedom? There is no tax, hardly any laws beyond the ones punishing violent crime. You have all the rights and freedom you choose to take."

This seemed to hit a nerve with the young woman, who retorted, "Which means that the strong are free to abuse the weak. Strongmen impose their order on those too weak to stand against them. Outside this palace and outside the Wall, we are ruled by protection rackets and extortionists. Without the rule of law, the people are yoked by anyone cruel enough to stake a claim."

Marjanah sighed and looked contemplative. "I see that your intentions were not entirely misguided. Very well, before you hang for treason, I will give you a chance to achieve your goals. Obviously I'm in need of instituting change around here in any case."

The Marchioness addressed the men holding the thief, "Take her to a noble's prison cell. Strip her down and make sure she doesn't have anything dangerous or anything that can be used to escape."

Facing the young revolutionary again, she said, "Tomorrow you will be sent a scribe. Write down laws and describe their execution, and I will take them under advisement. Your execution will take place the day I do not see any merit in your suggestions."

A curt nod sent the men away with the shocked woman. Charlie listened to their receding footsteps in silence, dreading what came next. Marjanah turned, and Charlie met her eyes. He stood straight, arms at his sides, with none of the affectations of his insipid and superficial character. Silence lingered until Charlie spoke, "For what it's worth, I'm sorry."

"Sorry for what?"

"Many things. Sorry about your sister. Sorry for the last time we met."

Marjanah stood silent. Something in her eyes told him to continue. "Ten years ago, I was just a young man. I think I loved you, but finding out you were a witch. That witch? Scary stuff for someone just out of their teens. That doesn't excuse how I behaved, but I am sorry."

"Now, then? Do I still scare you?"

"More than anything."

Marjanah shivered in the cold night air and turned away.

"But I also see a lonely woman who just lost her best friend," Charlie said. "Why did you bring me here?"

Still facing the moonlit pond, she said, "I told myself I wanted to avenge myself. That I had my agents hunt you through the years because I wanted revenge for my heartbreak. Maybe that was true once." Suddenly she laughed and turned to him. "I really wouldn't have recognised that Prince Ali moron if I hadn't known it was you. I suppose that's why you chose the act, but it was so completely unlike you that it actually made me miss you. Having you so near but unable to talk to you, it made me realise that perhaps I wanted you here for completely different reasons."

Charlie swallowed and nodded. "Maybe this isn't the right place to have this conversation," he said, indicating the cinder-strewn ground. He held out his arm.

Marjanah came to him and took it. They walked out of the garden together.

Part V

Those Who Live in the Garden

The sun was setting when Hevel showed up at his uncle's hut. Kevin was outside, using the last of the day's light to replace the twine bindings of his stone axe. Hevel squatted easily beside him and watched his older brother's practiced hands secure the sharpened rock to the wooden handle. Bound axes were smaller and less powerful than drilled axes, where the handle rested in a prepared hole in the axe head, but were far easier to make and were often sharper and better suited to clearing brush and small trees. Neither of them, of course, were a match for Hevel's steel hatchet, a relic of Old Earth and Hevel's most precious possession.

Kevin drew the twine tight and Hevel passed him a bowl of the hardening resin used to make twine resistant to wear. When he was done and the axe was left to cure, Kevin looked up and saw that Hevel was wearing expedition gear — thick barkfiber leggings, tough rubber moccasins, and robust needle-bound sleeves of sinewroot.

"Whose expedition are you going on?" Kevin asked. "I didn't think any gatherer was heading out this soon after market-day."

"I'm leading it," Hevel said, with a proud toss of his head. "Leah found out that the Etans aren't going to harvest that big wingnut on High Bluff. They've got bad needling pods need sorting out. Thomas Gatherer says it's too far for his bad knee, so when I said I'd go he said okay."

"Congratulations," Kevin said, impressed, "that's not a simple jaunt for your first time leading. Are you sure you're up to it?"

Hevel nodded seriously and said, "There's no one else around better than me, so I'm all we've got if we Gammas want the haul. The right people along with me, is all that's needed. That's why I came, I'd like you to be my lore-master."

Kevin looked down and avoided younger brother's eyes. "Sorry mate, I can't."

"But you are the best, Kevin!" Hevel pleaded. "You never forget a thing, you're great with gear and potionwork, you're strong."

"Not as strong as you," Kevin said.

"Stronger than any of the girls, though," Hevel insisted. "Come on, we used to do everything together, man, what changed?"

What changed is that you started spending more time outside the palisade walls of Gamma settlement than inside, Kevin thought. He shook his head. "Hevel, I can't."

"Why not?"

Kevin looked evasive. "Order business."

Hevel glanced at their uncle, Raymond, who was smoking a pipe within earshot. Angrily, he said "Man, screw Order business. Some of us have... feel responsibility. The Order doesn't put food on the table. The Escatolian traders want fruit and nuts, not old people telling fairy tales about Old Earth."

"They're not fairy tales!" Kevin protested.

"They might as well be," Hevel maintained. He hefted his steel axe, a unique heirloom from Old Earth. "Old Earth died when its moon blew up. Ain't be getting any new axes from Old Earth. Only from traders, and only if we have something to sell. Order business. Does. Not. Matter!"

"You know what? Screw you!" Kevin shouted. "You're playing right into their hands, you just accept the situation they've put us in. Millions of our people, put in this jungle to work for a pittance!"

"Oh not this again," Hevel said and got up. "Fine, I get it, you're not coming. Sorry I asked."

He stalked off, angrily shaking his head.

Two days later, after Hevel's expedition had left, Kevin carried a heavy satchel across the village's round central market and headed toward the latrines. Some children were playing in the open area where the Escatolian landers scorched the earth during take-off. This was one of the only places in the village that was not tightly packed with huts. Miriam, whom Hevel had been seeing a lot of, was watching the children from a bench with her hands idly clasped in front of her. Kevin frowned, bothered by her apparent laziness. As children, he and Hevel had an uncomplicated, easy friendship as siblings should, but the older they got the harder it was to get along. Everything was simpler when they were kids, Kevin thought as he looked at the playing children.

Checking to make sure Miriam wasn't looking in his direction, Kevin ducked between the latrines and made his way around the stinking midden behind. The big pile of garbage ran all the way to the palisade, but there was a hidden gap between the poles and a secret double wall in the defensive enclosure that surrounded the land they were permitted to occupy. This

hideout was the village's Enclave, where the local branch of the Order of Humanity could meet and work in relative obscurity.

Even Kevin wasn't sure if all this attempted secrecy was worth anything. They lived in a small village, its size limited by the space available in designated settlement zone Gamma. Everyone knew who was active in the Order and who wasn't, and the existence of the Enclave was an open secret. Still, there was a vocal cadre of Order members who insisted that an attempt at discretion was essential, that there would be repercussions if details of their activities were to reach Escatolian ears.

Raymond was already there, smearing wads of clay onto a dome-shaped structure. There was a hole in the top for inserting an ore crucible, small ventilation holes, a hole for fuel, and a bellows mounted underneath. The last was Raymond's own clever invention, a robust construction of rubber-treated pigtail fibres that had gained their branch great standing in the Order. Kevin hoped the furnace that he and Raymond were now developing would be an even greater success.

With a sigh of relief, Kevin dumped the contents of the satchel onto a rug, provoking a loud clatter as large chunks of rock piled up. Each chunk was marked with a number of bright red spots, and Kevin set to work sorting them. When he was done, he indicated each pile to his uncle and said, "Three piles in order of increasing density. Which do you want to try first?"

"Let's go for broke," Raymond said. "Densest first, if we don't get anything from that then the rest is trash too."

With a nod, Kevin grabbed a rock from one of the piles and placed it on a device of his own invention — a giant nutcracker fashioned from two flat stones and two stiff wooden beams. A cloth-lined basket was attached to the lower of the stone crushing surfaces. It had taken some time before he'd found a hard enough wood that kept from flexing when crushing ore, but it had been worth the effort. With his device, it only took minutes to prepare a load of ore for the furnace instead of hours.

"Don't be too hard on your brother," his uncle said while Kevin worked up a sweat with the crusher. "He's not a thinker like you, he's more concerned with the day-to-day than with the big picture."

Kevin gritted his teeth as he worked the lever. "Thinking is what makes us more than glorified apes. Why doesn't Hevel see that we're being used?"

"Hevel is young," Raymond said. "Even if it's only a difference of a couple of years, Old Earth is that much more distant to him. And besides, you didn't always prioritise the Order yourself."

Rather than respond, the young man crushed another rock. Soon, the basket was full of crushed ore. It was time to light the furnace. They'd reached record temperatures last time they'd used this design, but they'd gotten nothing for it besides clumps of useless slag. Hopefully this day it would be different.

The first fifteen minutes of the expedition was always the easiest. Regular patrols found and cleared away dangerous plants or potentially problematic vine growths near the settlement zone, taming the immediate surroundings to the extent that was possible. Their Escatolian landlords, who generously let them live in their garden when Earth became uninhabitable, valued their garden and forbade humans from cutting down any large trees or making permanent marks on the land outside the settlements.

Hevel's group consisted of four young adventurers besides himself — the strong and resourceful Mitch, nimble climbing experts Anna and Paul, and Ruth, who was hoping to prove herself as lore-master. They walked in a loose cluster, enjoying the quiet outside the palisades and breathing deeply the clean air. A warm breeze descended from the highlands in front of them, the only sounds were of their tramping footsteps and rustling leaves.

Further afield, the jungle grew more dense, more dangerous, and the hikers formed a single file with Hevel at the head. He walked carefully, meticulously picking a path through the vegetation and keeping an eye out for danger. The Elders — villagers that had started their lives on Old Earth and had been forced to adapt to a new world as adults — had taught the younger generation about the forces that shaped life. Unlike Old Earth, the Escatolian Garden's macroscopic life included only plants. With no animals and insects to defend themselves from, Escatolian plants evolved a potent array of chemical and mechanical weapons to destroy their neighbours. With no animals or insects to trick and cajole into spreading pollen and seed, Escatolian plants evolved more proactive ways of spreading their genes through space and time.

Holding one nostril, Ruth breathed deeply and picked apart the scents on the wind. She could easily make out spicy turmeric-berry, oily tomatoids,

and leafy harrowhedge. Knowing that Hevel would have picked up on the harrowhedge himself and would know to avoid the obstacle, she took another breath with her other nostril and tried to make out subtler tones. There was a fresh green smell, with a tone of ripening vanilla. “Beanworms,” Ruth said.

Hevel stopped and turned to Ruth, who was walking behind him. Beanworms were a mixed blessing. Nutritious food for humans, but in large quantities they undermined the ground and turned the surface into a dry mire. Most of the time, the seed pods would spread out from their mother tree, each of them individually burrowing its way in a random direction until it found a suitable place and expired. Periodically, however, the beanworm tree would shed vast quantities of pods at once, and the worms would swarm into a single direction. Working together, a mass of beanworms could overwhelm other plants’ defences, destroy root systems, and topple whole trees. Interloping humans had been known to succumb to collateral damage when the surrounding trees tried to burn, poison, and crush the marauding swarm.

“Do you see the tree?” Hevel asked. If Ruth smelled them, then either they were close to a tree bearing ripe pods that they could harvest, or they were nearing a burrowing swarm. Ruth shook her head.

Hevel raised his voice so the others could hear. “Eyes open, folks. Find me a beanworm tree, but watch your step.”

Lifting his gleaming steel hatchet out of its holster, he seized a nearby sapling and chopped it free with two efficient strikes. Thrusting it into the ground in front of him, he made his way forward. A minute later, the wind shifted and Hevel made out the beanworm smell himself. Mitch saw the tree and the group could relax a little. After a quick break to harvest lunch and dinner, Hevel lead his team on.

Both Kevin and his uncle were covered in sweat and soot. The top of the furnace emitted a blast of heat that made even the noon sun pale in comparison. Working the bellows and feeding in coal in those conditions was gruelling. Kevin was optimistic, however. He’d been poking the crucible contents, trying to stir the crush so it heated more evenly, and he’d felt a new change in consistency. That told him they’d done it this time.

With palpable excitement and the utmost care, Raymond used wire tongs and lifted the white-hot crucible out of the furnace. Kevin moved back and watched as his uncle started to carefully pour a glowing liquid into the sand moulds they'd prepared. A nail, a knife, an axe-head, Raymond filled each of the three moulds in turn, starting with the smallest in case they didn't have enough for the biggest. Kevin whooped when the axe mould was poured and the crucible still wasn't empty. The rest of the metal was poured into a bar-shaped depression, to be worked in whatever way they could.

"This is what we've been working for, my boy," Raymond said as the castings cooled. Kevin just stared at the fading dull red glow and nodded. His uncle continued. "Until now, those Escatolian bastards held all the cards. With this, we can build new machines, make better tools. We can dig into the bedrock to expand our living space so we won't have to live in cramped huts. Foraging expeditions can wear real armour against needlethorn, patrols will wield saw and axe. Instead of surviving, we can *thrive*."

Kevin grinned and looked up at his uncle. "Did you make a lot of iron tools back on Old Earth?"

His uncle frowned and shook his head. "No, son, I was a barista at a café. Enormous factories made millions of tools each day, and the least of them was better than the stuff we've got here today. If I needed a tool, I simply went into a store that sold tools and bought it."

The younger man shook his head. "I don't think I can imagine what it was like. You and the other elders tell us these stories, and they're just so... foreign. How can we build all that from this?"

Raymond clapped his nephew on the shoulder and said, "We've got a long way to go yet, and we've only just gotten started. But I tell you what, last time it took humanity at least a hundred times as long to figure out iron. The Escatolians have a surprise coming to them."

The castings had cooled enough to touch and Kevin lifted the axe-head out of its cast. He struck it with a pebble and heard a satisfying clang. He looked at Raymond and said, "I'd like to try to get this into shape for when Hevel returns. Will you show me how?"

His uncle laughed and said, "We'll have to figure it out together, I think."

The wingnut tree imparted a unique sense of power, towering over the surroundings in the borderlands where the endless forest gave way to highland shrubs. The rare giant had evolved its own solution to the problem of spreading its seeds in the competitive floral environment of the Escatolian Garden. On their voyage to High Bluff, Hevel's expedition had encountered many specialised seeds, fruits, and pods — from innocuous beanworms to the acid-sweating nomatoes that cleared the forest floor with corrosive fluid. They had made camp twice, always with someone keeping watch for potentially lethal bits of vegetation. Travel through the jungle was never a task to be undertaken lightly, but the hardest part was yet to come.

The secret of the wingnut tree was clear from first sight. Its vast trunk extended above its own record-breaking canopy and split into six D-shaped boughs that curved back down onto the trunk. Nestled between the trunk and the tip of each bough was a large nut with flared edges. The boughs were actually specialised flower petals that stored enormous elastic energy as they grew. When the nuts were ripe, the boughs ripped them from the trunk and launched them with a thunderous whip-like movement that broke the sound barrier. The wings gave the nuts enough lift to soar for miles across valleys and lowlands to other highland areas. The large nuts contained enough energy to nourish a root shooting through meter-thick stone and rubble, where nothing else could grow.

Harvesting wingnuts was an exercise in timing and tree-climbing acrobatics, as well as engineering. The powerful elastic boughs contained enough energy to turn a person into pulp and constituted a trap that had to be dismantled carefully — without losing the nuts. This is the sort of problem solving that Kevin's good at, Hevel thought to himself. Still, as much as he had wanted his brother along for this, he'd prepared himself and his team as best he could.

Standing at a distance, Anna traced the height of the tree with her eyes and pursed her mouth in appraisal. "The bark gets less flaky higher up, so we should be good until we get to the canopy. Looks mossy and dense up there, but I think I see a clear way up."

Paul was already busy ripping down the loose outer bark within arm's reach. The trunk was too wide to wrap a strap around to push against, so they would have to cling to the surface and try to scamper up without security. Hevel saw Paul's discontented look and understood that he was

none too happy.

“Paul,” Hevel said and took out his hatchet, “take this. You can chop out hand- and foot-holds.”

“Are... you sure?” Paul asked. As a relic from Old Earth and a useful tool besides, the small steel axe was priceless.

Hevel nodded without hesitation. “Yeah, you’ll need it up there more than we need it down here.”

The climber accepted the axe with an expression of veneration. He beckoned to Anna and gave the tree a few whacks. The sharp-edged blade easily cut into the soft bark. Anna looked suitably impressed and the pair of climbers started to discuss a strategy.

Turning to his loremaster, Ruth, he asked, “what do you make of this?”

“You mean the bark?” she asked.

“Did you know that wingnut trees were this hard to climb?” Hevel wondered.

“No, they’re not usually like this. I’ve seen one other close up before, but it was firm and smooth.” Ruth said. “Maybe it’s something that happens when the nuts get ripe. Kevin would know, he toured the highlands when he was on exchange with the Iotans.”

Hevel shook his head. “Kevin would’ve said if he knew about this. Could be a species thing. Typical Etans. If they’d told us how they did the harvesting...”

Ruth shrugged her shoulders. “Maybe that’s why they decided not to go for it this year. Too dangerous.”

“I’m not giving up yet,” Hevel said, firmly. “I want to let Paul and Anna have a go at making the climb.”

While the climbing pair started their precarious ascent, the others made camp on the ground below. “Feels strange to be out in the open like this,” Mitch said as he prepared a fire pit, “like we’re in a village market, except there’s no village.”

Ruth and Hevel could only agree. The top of the bluff was covered in small broad-leaved bushes with deep roots, connected by a network of sinewy air roots or stolons. This was the only natural place any of them had seen that was not shadowy jungle, and something about it made them ill at ease.

Hevel understood the problem and reassured the others. “The Elders have said that even though open land was common on Old Earth, many people suffered from fear of open places, or Agophobia as they called it. Let’s just

focus on getting comfortable and I'm sure we'll all feel better. We'll be out of here again in a day or two."

By the time night fell on the exposed top of the foothill, Paul and Anna had made good progress. Taking turns with the axe, they had chopped deep notches halfway up the tree, with two well-secured hammocks providing rest stops where one of them could rest safely.

Mitch's campfire was used more for light and comfort than for its warmth, but Paul and Anna both stripped off their sweaty clothes and lay them out to dry. Carving their way up the enormous tree was back-breaking work in the hot Escatolian sun. A little nakedness in the dark was a small price to pay to avoid catching a chill from clammy clothes.

The sight of Anna's lithe body in the amber light of the fire reminded Hevel of Miriam. He felt his face flush and was glad of the dark. No other girl made him feel like she did. Privacy was hard to come by in the tight confines of the settlement, but they tried to make the most of the time his uncle and brother spent in the Enclave and had eagerly explored each other. A consequence of that exploration, still a secret to everyone except the two of them, was what prompted him to embark on this expedition in the first place. With a sigh, Hevel realised that he felt homesick for the first time since he left home. He needed to distract himself.

Rising to his feet, Hevel said, "I'll do a perimeter check."

The others nodded or grunted their assent and watched as he walked out of the circle of light and warmth. A gibbous moon shone on the gravel and painted the world silver. A miniature version of a settlement palisade, the camp's perimeter consisted of a shallow outer trench in the gravelly soil, about a foot wide, with a low wall inside made from the excavated material. Any of the rolling fruits and many of the less stubborn slitherers would fall into the ditch and be deflected by the wall. The simple construction was effective protection against many common pests and dangers that threatened humans sleeping in the Garden. All the watch needed to do was to keep his eyes open for creeper vines and his ears tuned to larger movements.

High Bluff proved to contain far less active flora than the dense forest below. Not a single motile had fallen in the ditch, although the shrubbery did manage to extend tendrils across the gap. Hevel tore them up as he went and didn't think more of it.

It had gotten late by the time he got back. The others had laid themselves down to sleep, and the fire had burned itself down to a bed of coals. "Guess I'll take first watch," Hevel muttered to himself as he sat down to wait.

Sitting still was strangely difficult. Hevel felt fidgety, uncomfortable. As if something was trying to move under him. He placed his hand on the ground and felt sinewy tendrils, warm with purpose on top of the cool gravel. “Shit!” he swore and tried to get up.

There was a sound of tearing cloth and he was pulled back down. Tendrils had grown their way through his sturdy barkfiber leggings as he sat. Grunting with effort, he pushed himself from the ground and tore the things out from his clothes. “Fuck! Wake up!” he shouted.

The rest of the expedition stirred and each of them began to exclaim their dismay. Anna and Paul were apparently still naked and were the first to find Hevel. “Go help Ruth,” Hevel told them. He went to find Mitch.

Mitch started screaming. In the dim light, Hevel couldn’t see why. He reached his friend and tried to grab him with his hands, but the vines were almost covering him. Grabbing a handful firmly, Hevel tugged. They were too tough, and Mitch only screamed louder.

Hevel reached for his handaxe, only to grasp empty air. He turned and yelled in the direction of Anna, Paul, and Ruth. “The axe! Where the fuck is my hatchet!?”

“The tree!” came the response. “With the straps and gear!”

Which direction was the tree? Hevel turned around, saw shadows in the darkness. Was that the tree? He was completely disoriented. Indecision paralysed him, he thought he saw the tree in several directions, was it wise to run away blindly and hope he got it right? No, not a good plan — not when Mitch had all kinds of stone blades in his satchel. Hevel threw himself on the ground and flailed with his hands until he felt it. The damned bushes had invaded the satchel with their tentacles. A detached corner of his mind considered that the tendrils had reacted to foreign plant matter, that this was why the bluff was bare except for the bushes and the giant tree.

Forcing his hand through the writhing plants, Hevel located and pulled out a tool. He carefully ran his hand along the edge and felt a series of sharp points. Mitch’s saw!

Elated at his find, Hevel returned to his friend. Mitch’s screams were reduced to grunts. Just as he began sawing at the edge of the weave of tendrils, Paul shouted to him, “Watch it, Hevel, the fuckers burn!”

For a moment Hevel ignored Paul because there was obviously no fire, but then he became aware of a growing tingling sensation in the palms of his hands. *Corrosives!* Wasting no more time, he sawed Mitch’s head free, then one of his arms. The tendrils stuck to Mitch’s skin as Hevel heaved to tear

them off. Mitch's screaming resumed.

Long and arduous minutes later, Mitch was free, and returned to groaning. Hevel's hands felt like they were on fire — he couldn't imagine the agony his friend was suffering. With Mitch in the clear for the moment, Hevel ran to help Paul and Anna with Ruth.

The first thing he noticed was that Ruth was quiet. Anna was trying to chop with a stone axe, but without anything solid to strike against the tough roots were too resilient. Paul wore rags as gloves and had managed to clear Ruth's face and shoulders with sheer force of will. Hevel gave the saw to Anna and looked back at the embers of the campfire.

He thought out loud. "The bushes didn't move while the fire was lit. They're not active in the day, they wait until dark when sun-powered species can't put up a fight. Light makes them passive!"

A mass of tendrils had invaded the pile of firewood, but Hevel tore out log after log and threw them onto the coals, sending orange sparks into the air. Taking deep breaths, he blew on the coals until they roared to life and began to lick the wood. Then he built the fuel up and went back to check on Mitch.

Mitch had turned himself around. His shirt was in shreds, and the yellow firelight reflected in wet patches on his skin. He was shuddering and shaking, gingerly picking remnants of the greedy plants off — and out of — his skin. Hevel tried to find unaffected skin to hold him and carry him, but was forced to simply pick him up and ignore the fact that he was hurting Mitch more. He had to bring him to the fire where he was safe.

Paul and Anne laid an unmoving Ruth down and then collapsed by the fire. Paul sought Hevel's eyes and shook his head. Anne curled herself up and cried.

Shit, Hevel thought. The adrenaline had left his system and his legs trembled as he pushed himself up again. He forced himself to walk to where Ruth had been sleeping and find her medicine bag. Whether the tendrils oozed acids, alkalines, or enzymes, she had been carrying neutralising compounds. Hevel's hands hurt terribly, which was almost a blessing — the surface nerves were still okay or else he would have felt numb. His priority now try to help Mitch. Sunrise was still long hours away when he returned to the fire.

The evening sun saw Kevin carrying a wrapped package through narrow alleys of packed dirt. He was heading to the hut where Hevel was resting after his expedition, a gift from the community for services rendered. The three surviving members of the wingnut expedition had returned that morning, and the whole village had attended the debriefing. Mitch's young wife was devastated and had to be carried away while the rite of questioning continued. Only when all were satisfied that nothing more was to be learned from the expedition did the normal daily routines resume.

Four of the six nuts were harvested, making Hevel something of a hero despite the loss of Mitch and Ruth. Kevin felt ill at the thought of their fate. But it wasn't his fault — he couldn't be blamed for knowing something they did not, for their decision to blithely ignore a plant that managed to fend off interlopers so well that it grew alone. Ruth hadn't been ready to act as loremaster in unknown lands. A more experienced expedition leader would not have dropped his guard.

Miriam saw Kevin coming gave him a nod. Knowing that the brothers' reunion was sensitive, she left to give them some time alone. Kevin found Hevel sitting inside the hut, holding a leafy tendril with a pair of sticks like oversized tweezers. "The Iotans call it 'Clingshade'," Kevin said. It was a fittingly innocuous name, he thought.

"You knew about this," Hevel said levelly, holding the tendril up to the light.

Kevin remained silent.

"Why didn't you come with me?" Hevel asked. There was an accusation there that didn't need to be voiced.

I thought you could handle yourself, Kevin thought. Hesitantly, he said, "I was busy. Here, I want you to have this."

Hevel put down the clingshade in a clay bowl and rose to accept the package into his blistered hands. It was heavy and uneven, hard underneath the dyed cloth it was wrapped in. He could see that his brother had gone through some effort to make it nice. Without another word, he loosened the wrapping and removed the gift.

Despite the somber circumstance, Kevin felt a giddy excitement as Hevel pulled out the iron axe he had made. The handle was smooth, treated wood, and fit the blade perfectly. The blade was a beautiful dark grey that shimmered in the firelight, the surface rough with small pits and imperfections in

the iron. After hours of working the metal and countless rounds of annealing and tempering, Kevin knew every mark on the axe like the back of his hand. It was the culmination of years of work and a symbol of mankind's indomitable spirit.

"What in the world?" Hevel was shocked.

Kevin almost smirked at the reaction, but he kept a straight face and said, "This is what I've been working on in the Order."

Hevel shook his head in disbelief. "You stayed here to make a shitty axe?"

"What?"

"This is why Ruth and Mitch died?"

"Wa.. *no!*"

Hevel shook the axe at his brother. "But this is what you were doing instead of being out there with us!" he accused.

"Yes!" Kevin said. "They didn't die in vain, Hev. We can make tools now. Metal tools. It's the dawn of a new age!"

"We can *buy* tools, Kevin," Hevel said brusquely.

"From the Escatolians, you mean," Kevin said. "We can't rely on them, Hev. We can't trust them."

"They seem fair enough to me," Hevel said.

"No." Kevin was adamant. "Our moon didn't just explode by itself. What are the odds of that happening exactly when the Escatolians decide to drop by and say hello?"

Hevel snorted skeptically. "If they blew up Old Earth's moon, why did they help us? Why did the Elders accept their help if the Escatolians can't be trusted?"

"The Elders didn't have any choice! The Earth couldn't function without a moon, with ash blocking out the sun. The Escatolians didn't give them any more choice than we had a choice in being born here. But that doesn't mean we don't have a choice in whether we accept the place they've put us in."

Hevel turned away from his brother and faced the fireplace. "None of that *matters*, Kevin. You can trade for a new axe, can't trade to replace people. Can't believe that you stayed back here to make garbage." With a languid movement he threw the axe into the fire where it sank into the embers.

With a wordless shout of anguish, Kevin pushed his brother aside and reached into the flames. The hair on his hand curled and melted in the heat. He wantonly plunged his hand into the coals and pulled the axe out before the handle caught. Dropping the axe to the ground, he waved his hand and

shook embers from it. A hot coal landed on Kevin's forehead and stuck there, burning him until he clapped it off.

When the worst of the pain had subsided, Kevin bent down and picked up his axe. The handle was scorched, but the tool was otherwise intact. "Don't you know what this *represents*, Hevel?"

He turned to his brother and said, "This is a new chance for humankind. This is a future where we are our own masters. This is *the* future. And if you don't want the future, then the future doesn't want you."

Kevin raised the axe he had forged with his own hands, and with a quick motion he struck his brother in the head and opened such a wound that his life spilled from his body.

The punishment for violent crime was banishment. In a single instant, Kevin grieved at his loss and his sacrifice, but he knew it was necessary. There must be unity of purpose, or everyone would suffer. Kevin stared at his brother's corpse and understood the world to be unfair. Hevel had led two people to their deaths and was awarded a hut for saving himself and two others. Kevin had killed one man and would be punished despite saving everyone. He resolved to be strong and journey to Iota.

He heard a gasp in the doorway and turned around. Miriam was there, mouth agape. She met his eyes and her hand went to her belly. Kevin pushed past her and ran.