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Also by Stephen Baxter in Gollancz

Mammoth
Long Tusk
Icebones
Deep Future

STEPHEN BAXTER

Reality Dust

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An explosion of light: the moment of her birth.

She cried out.

A sense of self flooded through her body. She had arms, legs; her limbs were flailing. She was *falling*, and glaring light wheeled about her.

But she remembered another place: a black sky, a world - no, a *moon* - a face before her, smiling gently. *This won't hurt. Close your eyes.*

A name. *Callisto.*

But the memories were dissipating.

'No!'

She landed hard, face down, and she was suffused by sudden pain. Her face was pressed into dust, rough, gritty particles, each as big as a moon to her staring eyes.

The flitter rose from liberated Earth like a stone thrown from a blue bowl. The little cylindrical craft tumbled slowly as it climbed, sparkling, and Hama Druz marvelled at the beauty of the mist-laden, subtly curved landscape below him, drenched as it was in clear bright sunlight. But the scars of the Occupation were still visible. Away

from the great Conurbations, much of the land still glistened silver-grey where starbreaker beams and Qax nanoreplicators had chewed up the surface of the Earth, life and rocks and all, turning it into a featureless silicate dust.

'But already,' he pointed out eagerly, 'life's green is returning. Look, Nomi, there, and there His companion, Nomi Ferrer, grunted sceptically. 'But that greenery has nothing to do with edicts from your Interim Coalition of Governance, or all your philosophies. That's the worms, Hama, turning Qax dust back into soil. Just the worms, that's all.'

Hama would not be put off. Nomi, once a ragamuffin, was an officer in the Green Army, the most

significant military force yet assembled in the wake of the departing Qax. She was forty years old, her body a solid slab of muscle, with burn marks disfiguring one cheek. And, in Hama's judgement, she was much too sunk in cynicism.

He slapped her on the shoulder. 'Quite right. And that's how *we* must be, Nomi: like humble worms, content to toil in the darkness, to turn a few scraps of our land back the way they should be. That should be enough for any life.'

Nomi just snorted.

The two-seat flitter began to descend towards a Conurbation. Still known by its Qax registration of 11729, the Conurbation was a broad, glistening sprawl of bubble-dwellings blown from the bedrock, and linked by the green-blue of umbilical canals. Hama saw that many of the dome-shaped buildings had been scarred by fire, some even cracked open. But the blue-green tetrahedral sigil of free Earth had been daubed on every surface.

A shadow passed over the Conurbation's glistening rooftops. Hama shielded his eyes and squinted upwards. A fleshy cloud briefly eclipsed the sun. It was a Spline ship: a living starship kilometres across, its hardened epidermis pocked with monitor and weapon emplacements. He suppressed a shudder. For generations the Spline had been the symbol of Qax dominance. But now the Qax had gone, and this last abandoned Spline was in the hands of human engineers, who sought to comprehend its strange biological workings.

On the outskirts of the Conurbation there was a broad pit scooped out of the ground, its crudely scraped walls denoting its origin as post-Occupation: human, not Qax. In this pit rested a number of silvery, insectile forms, and as the flitter fell further through the sunlit air, Hama could see people moving around the gleaming shapes, talking, working. The pit was a shipyard, operated by and for humans, who were slowly rediscovering yet another lost art; for no human engineer had built a spacecraft on Earth for three hundred years.

Hama pressed his face to the window - like a child, he knew, reinforcing Nomi's preconception of him - but to Lethe with self-consciousness. 'One of those ships is going to take us to Callisto. Imagine it, Nomi - a moon of Jupiter!'

But Nomi scowled. 'Just remember *why* we're going there: to hunt out jasofts - criminals and collaborators. It will be a grim business, Hama, no matter how pretty the scenery.'

The flitter slid easily through the final phases of its descent, and the domes of the Conurbation loomed around them.

There was a voice, talking fast, almost babbling.

'There is no time. There is no space. We live in a universe of static shapes. Do you see? Imagine a grain of dust that represents all the particles in *our* universe, frozen in time. Imagine a stupendous number of dust grains, representing all the possible shapes the particles can take. This is reality dust, a dust of the Nows. And the dust fills a realm of instants.' A snapping of fingers. There. There. There. Each moment, each juggling of the particles, a new grain. The reality dust contains all the arrangements of matter there could ever be. Reality dust is an image of eternity . . .'

She lay there, face pressed into the dirt, wishing none of this was happening.

Hands grabbed her, by shoulder and hip. She was dragged, flipped over on her back. The sky above was dazzling bright.

She cried out again.

A face loomed, silhouetted. She saw a hairless scalp, no eyebrows or lashes. The face itself was rounded, smoothed over, as if unformed. But she had a strong impression of great age.

'This won't hurt,' she whispered, terrified. 'Close your eyes.'

The face loomed closer. 'Nothing here is real.' The voice was harsh, without inflection. A man? 'Not even the dust.'

'Reality dust,' she murmured.

'Yes. Yes! It is reality dust. If you live, remember that.'

The face receded, turning away.

She tried to sit up. She pressed her hands into the loose dust, crushing low, crumbling structures, like the tunnels of worms. She glimpsed a flat horizon, a black, oily sea, forest-covered hills. She was on a beach, a beach of silvery, dusty sand. The sky was a glowing dome. The air was full of mist; she

couldn't see very far, in any direction, as if she were trapped in a glowing bubble. Her companion was mid-sized, his body shapeless and sexless. He was dressed in a coverall of a nondescript colour. He cast no shadow in the bright diffuse light. She glanced down at herself. She was wearing a similar coverall. She fingered its smooth fabric, baffled.

He was walking slowly, limping, as though exhausted. Walking away, leaving her alone.

'Please,' she said.

Without stopping, he called back, 'If you stay there you'll die.'

'What's your name?'

'Pharaoh. That is all the name I have left, at any rate.'

She thought hard. Those sharp birth memories had fled, but still . . . '*Callisto*. My name is Callisto.'

Pharaoh laughed. 'Of course it is.'

Without warning, pain swamped her right hand.

She snatched it to her chest. The skin felt as if it had been drenched in acid.

The sea had risen, she saw, and the black, lapping fluid had covered her hand. Where the fluid had touched, the flesh was flaking away, turning to chaotic dust, exposing sketchy bones that crumbled and fell in thin slivers.

She screamed. She had only been here a moment, and already such a terrible thing had happened.

Pharaoh limped back to her. 'Think beyond the pain.'

'I can't -'

'*Think*. There is no pain.'

And, as he said it, she realised it was true. Her hand was *gone*, her arm terminating in a smooth, rounded stump. But it didn't hurt. How could that be?

'What do you feel?'

'. . . Diminished,' she said.

'Good,' he said. 'You're learning. There is no pain here. Only forgetting.'

The black, sticky fluid was lapping near her legs. She scrambled away. But when she tried to use her missing right hand she stumbled, falling flat.

Pharaoh locked his hand under her arm and hauled her to her feet. The brief exertion seemed to exhaust him; his face smoothed further, as if blurring. 'Go,' he said.

'Where?'

'Away from the sea.' And he pushed her, feebly, away from the ocean.

She looked that way doubtfully. The beach sloped upward sharply; it would be a difficult climb. Above the beach there was what looked like a forest, tall shapes like trees, a carpet of something like grass. She saw people moving in the darkness between the trees. But the forest was dense, a place of colourless, flat shadows, made grey by the mist.

She looked back. Pharaoh was standing where she had left him, a pale, smoothed-over figure just a few paces from the lapping, encroaching sea, already dimmed by the thick white mist.

She called, 'Aren't you coming?'

'Go.'

'I'm afraid.'

'Asgard. Help her.'

Callisto turned. There was a woman, not far away, crawling over the beach. She seemed to be plucking stray grass blades from the dust, cramming them into her mouth. Her face was a mask of wrinkles, complex, textured - a stark contrast to Pharaoh's smoothed-over countenance. Her voice querulous, she snapped, 'Why should I?'

'Because I once helped you.'

The woman got to her feet, growling.

Callisto quailed. But Asgard took her good hand and began to haul her up the beach.

Callisto looked back once more. The oil-black sea lapped thickly over a flat, empty beach. Pharaoh had gone.

As they made their way to Hama's assigned office, Nomi drew closer to Hama's side, keeping her weapons obvious.

The narrow corridors of Conurbation 11729 were grievously damaged by fire and weaponry - and they were scars inflicted not by Qax, but by humans. In some places there was even a smell of burning. The Conurbation itself faced endless problems day to day. The Conurbations had been deliberately designed by the Qax as temporary cities. It was all part of the grand strategy of the latter Occupation; the Qax's human subjects were not to be allowed ties of family, of home, of loyalty to anybody or anything - except perhaps the Occupation itself.

The practical result was that the hastily-constructed Conurbation was quickly running down. Hama read gloomily through report after report of silting-up canals and failing heating or lighting and crumbling dwelling-places. There were people sickening of diseases long thought vanished from the planet - even hunger had returned.

And then there were the wars.

The aftermath of the Qax's withdrawal - the overnight removal of the government of Earth after three centuries - had been extremely difficult. In less than a month humans had begun fighting humans once more. It had taken a chaotic half-year before the Interim Coalition had coalesced, and even now, around the planet, brushfire battles still raged against warlords armed with Qax weaponry.

And it had been the jasofts, of course, who had been the focus of the worst conflicts. In many places jasofts, including pharaohs, had been summarily executed. Elsewhere the jasofts had gone into hiding, or fled off-world, or had even fought back.

The Interim Coalition had quelled the bloodshed by promising that the collaborators would be brought to

justice before the new Commission for Historical Truth. But Hama - alone in his office, poring over his data slates - knew that justice was easier promised than delivered. How were short-lived humans - dismissively called *mayflies* by the pharaohs - to try crimes whose commission might date back centuries? There were no witnesses save the pharaohs themselves; no formal records save those maintained under the Occupation; no testimony save a handful of legends preserved through the endless dissolutions of the Conurbations; not even any physical evidence since the Qax's great Extirpation had wiped the Earth clean of its past.

What made it even more difficult, Hama was slowly discovering, was that the jasofts were *useful*.

It was a matter of compromise, of practical politics. The jasofts knew how the world worked, on the mundane level of keeping people alive, for they had administered the planet for centuries. So some jasofts - offered amnesties for cooperating - were discreetly running parts of Earth's new, slowly-coalescing administration, just as they had under the Qax.

And meanwhile, children were going hungry.

Hama had, subtly, protested against his new assignment.

He felt his strength lay in philosophy, in abstraction. He longed to rejoin the debates going on in great constitutional conventions all over the planet, as the human race, newly liberated from the Qax, sought a new way to govern itself.

But his appeal against reassignment had been turned

down. There was simply too much to do *now*, too great a mess to clear up, and too few able and trustworthy people available to do it.

It was so bad, in fact, that some people were openly calling for the return of the Qax. *At least we were kept warm and fed under the Qax. At least there were no bandits trying to rob or kill us. And there were none of these disgusting ragamuffins cluttering up the public places . . .*

As he witnessed the clamour of the crowds around the failing food dispensers, Hama felt a deep horror - and a determination that this should not recur. And yet, to his shame, he looked forward to escaping from all this complexity to the cool open spaces of the Jovian system.

It was while he was in this uncertain mood that the pharaoh sought him out.

Asgard led her to the fringe of the forest. There, ignoring Callisto, she hunkered down and began to pull at strands of grass, ripping them from the ground and pushing them into her mouth.

Callisto watched doubtfully. 'What should I do?'

Asgard shrugged. 'Eat.'

Reluctantly, Callisto got to her knees. Favouring her truncated arm, it was difficult to keep her balance. With her left hand she pulled a few blades of the grass stuff from the dust. She crammed the grass into her mouth and chewed. It was moist, tasteless, slippery.

She found that the grass blades weren't connected to roots. Rather they seemed to blend back into the dust, to the tube-like structures there. Deeper into the forest's gathering darkness the grass grew longer, plaiting itself into ropy vine-like plants. And deeper still she saw things like trees looming tall.

People moved among the trees, digging at the roots with their bare hands, pushing fragments of food into their faces.

'My name,' she said, 'is Callisto.' Asgard grunted. 'Your dream-name.' 'I remembered it.' 'No, you *dreamed*.' 'What is this place?' 'It isn't a place.' 'What's it called?'

'It has no name.' Asgard held up a blade of grass. 'What colour is this?'

'Green,' Callisto said immediately . . . but that wasn't true. It wasn't green. What colour, then? She realised she couldn't say.

Asgard laughed, and shoved the blade in her mouth. Callisto looked down the beach. 'What happened to Pharaoh?'

Asgard shrugged. 'He might be dead by now. Washed away by the sea.'

'Why doesn't he come up here, where it's safe?' 'Because he's weak. Weak and mad.' 'He saved me from the sea.' 'He helps all the newborns.' 'Why?'

'How should I know? But it's futile. The ocean rises and falls. Every time it comes a little closer, higher up

the beach. Soon it will lap right up here, to the forest itself.'

'We'll have to go into the forest.'

Try that and Night will kill you.'

Night? Callisto looked into the forest's darkness, and shuddered.

Asgard eyed Callisto with curiosity, no sympathy. 'You really are a newborn, aren't you?' She dug her hand into the dust, shook it until a few grains were left on her palm. 'You know what the first thing Pharaoh said to *me* was? "Nothing is real."'

'Yes -'

' "Not even the dust. *Because every grain is a whole world.* "' She looked up at Callisto, calculating.

Callisto gazed at the sparkling grains, wondering, baffled, frightened.

Too much strangeness.

I want to go home, she thought desperately. But where, and what, is home?

Two women walked into Hama's office: one short, squat, her face a hard mask, and the other apparently younger, taller, willowy. They both wore bland, rather scuffed Occupation-era robes - as he did - and their heads were shaven bare.

The older woman met his gaze steadily. 'My name is Gemo Cana. This is my daughter. She is called Sarfi.'

Hama eyed them with brief curiosity.

This was a routine appointment. Gemo Cana was, supposedly, a representative of a citizens' group concerned

about details of the testimony being heard by the preliminary hearings of the Truth Commission. The archaic words of family - *daughter, mother* - were still strange to Hama, but they were becoming increasingly more common, as the era of the Qax cadres faded from memory.

The daughter, Sarfi, averted her eyes. She looked very young, and her face was thin, her skin sallow.

He welcomed them with his standard opening remarks. 'My name is Hama Druz. I am an advisor to the Interim Coalition and specifically to the Commission for Historical Truth. I will listen to whatever you wish to tell me and will help you any way I can; but you must understand that my role here is not formal, and -'

'You're tired,' Gemo Cana said.

'What?'

She stepped forward and studied him, her gaze direct, disconcerting. 'It's harder than you thought, isn't it? Running an office, a city - a world. Especially as you must work by persuasion, consent.' She walked around the room, ran a finger over the data slates fixed on the walls, and paused before the window, gazing out at the glistening rooftops of the Conurbation, the muddy blue-green of the canals. Hama could see the Spline ship rolling in the sky, a wrinkled moon. She said, 'It was difficult enough in the era of the Qax, whose authority, backed by Spline gunships, was unquestionable.'

'And,' asked Hama, 'how exactly do you know that?'

'This used to be my office.'

Hama reached immediately for his desktop.

'Please.' The girl, Sarfi, reached out towards him, then seemed to think better of it. 'Don't call your guards. Hear us out.'

He stood. 'You're a jasoft, Gemo Cana.'

'Oh, worse than that,' Gemo murmured. 'I'm a *pharaoh* . . . You know, I have missed this view. The Qax knew what they were doing when they gave us jasofts the sunlight.'

She was the first pharaoh Hama had encountered face to face. Hama quailed before her easy authority, her sense of dusty age; he felt young, foolish, his precious philosophies half-formed. And he found himself staring at the girl; he hadn't even known pharaohs could have children.

Deliberately he looked away, seeking a way to regain control of the situation. 'You've been in hiding.'

Gemo inclined her head. 'I spent a long time in this office, Hama Druz. Longer than you can imagine. I always knew the day would come when the Qax would leave us exposed.'

'So you prepared.'

'Wouldn't you? I was doing my duty. I didn't want to die for it.'

'Your duty to Qax occupiers?'

'No,' she said, a note of weariness in her voice. 'You seem more intelligent than the rest; I had hoped you might understand that much. It was a duty to mankind, of course. It always was.'

He tapped a data slate on his desk. '*Gemo Cana*. I should have recognised the name. You are one of the most hunted jasofts. Your testimony before the Commission -'

She snapped, 'I'm not here to surrender, Hama Druz, but to ask for your help.'

'I don't understand.'

'I know about your mission to Callisto. To the enclave there. Reth has been running a science station since before the Occupation. Now *you* are going out there to close him down.'

He said grimly, 'These last few years have not been a time for science.'

She nodded. 'So you believe science is a luxury, a plaything for easier times. But science is a thread in the tapestry of our humanity - a thread Reth has maintained. Do you even know what he is doing out there?'

'Something to do with life forms in the ice -'

'Oh, much more than that. Reth has been exploring the nature of reality - *seeking a way to abolish time itself*.' She smiled coolly. 'I don't expect you to understand. But it has been a fitting goal, in an era when the Qax have sought to obliterate human history - to abolish the passage of time from the human consciousness . . .'

He frowned. *Abolishing time?* Such notions were strange to him, meaningless. He said, 'We have evidence that the science performed on Callisto was only a cover - that many pharaohs fled there during the chaotic period following the Qax withdrawal.'

'Only a handful. There only ever was a handful of us, you know. And now that some have achieved a more fundamental escape, into death, there are fewer than ever.'

'What do you *want*?'

'I want you to take us there.' 'To Callisto?'

'We will remain in your custody, you and your guards. You may restrain us as you like. We will not try anything - *heroic*. All we want is sanctuary. They will kill us, you see.'

'The Commission is not a mob.'

She ignored that. 'I am not concerned for myself, but for my daughter. Sarfi has nothing to do with this; she is no jasoft.'

Then she will not be harmed.' Gemo just laughed. 'You are evading justice, Gemo Cana.' She leaned forward, resting her hands on the desk nonchalantly; this really had been her office, he realised.

'*There is no justice here*,' she hissed. 'How can there be? I am asking you to spare my daughter's life. Later, I will gladly return to face whatever inquisition you choose to set up.'

'Why would this *Reth* help you?' 'His name is Reth Cana,' she said. 'He is my brother. Do you understand? Not my cadre sibling. My *brother*.' Gemo Cana; Reth Cana.

In the Qax world, families had been a thing for ragamuffins and refugees, and human names had become arbitrary labels; the coincidence of names had meant nothing to Hama. But to these ancient

survivors, a shared name was a badge of kinship. He glanced at Gemo and Sarfi, uneasy in the presence of these close primitive ties, of mother and brother and daughter.

Abruptly the door opened; Nomi Ferrer walked in, reading from a data slate. 'Hama, your ship is ready to go. But I think we have to . . .' She looked up, took in the scene at a glance. In an instant she was at Gemo's side, with a laser pistol pressed against the pharaoh's throat. 'Gemo Cana,' she hissed. 'How did you get in here?'

Sarfi stepped towards Nomi, hands fluttering like birds.

Hama held up his hand. 'Nomi, wait.'

Nomi was angered. 'Wait for what? Standing orders, Hama. This is a Category One jasoft who hasn't presented herself to the Commission. I should already have killed her.'

Gemo smiled thinly. 'It isn't so easy, is it, Hama Druz? You can theorise all you want about justice and retribution. But here in this office, you must confront the reality of a mother and her child.'

Sarfi said to Hama, 'If your guard kills my mother, she kills me too.'

'No,' said Hama. 'We aren't barbarians. You have nothing to fear -'

Sarfi reached out and swept her arm down at the desk -no, Hama saw, startled; her arm passed *through* the desk, briefly breaking up into a cloud of pixels, boxes of glowing colour.

'You're a Virtual,' he whispered.

'Yes. And do you want to know where I live?' She stepped up to her mother and pushed her hand into Gemo's skull.

Gemo observed his lack of comprehension. 'You don't know much about us, do you, even though you presume to judge us? . . . Hama, pharaohs do not breed true.'

'Your daughter was mortal?'

'The Qax's gift was ambiguous. We watched our children grow old and die. *That* was our reward for serving the Qax; perhaps your Commission will accept *that* historical truth. And when she died -'

'When she died, you downloaded her into your *head*?'

'Nowhere else was safe,' Gemo said. 'And I was glad to, umm, make room for her. I have lived a long time; there were memories I was happy to shed . . .'

Nomi said harshly, 'But she isn't your daughter. She's a copy.'

Gemo closed her eyes. 'But she's all I have left.'

Sarfi looked away, as if ashamed.

Hama felt moved, and repelled, by this act of obsessive love.

There was a low concussion. The floor shuddered.

Nomi Ferrer understood immediately. 'Lethe. That was an explosion.'

Hama could hear running footsteps, cries. The light dropped, as if some immense shadow were passing over the sky. Hama ran to the window.

All around the Conurbation, ships were lifting, hauled into the sky by silent Qax technology, an eerie rising of ballooning metal flanks. But they entered a sky that was already crowded, darkened by the rolling, meaty bulk of a Spline craft.

Hama quailed from the brute physical reality of the erupting conflict. And he knew who to blame. 'It's the jasofts,' he said. The ones taken to orbit to help with the salvaging of the Spline. They took it over. And now they've come here, to rescue their colleagues

Gemo smiled, squinting up at the sky. 'Sadly, stupidity is not the sole prerogative of mayflies. This counter-coup cannot succeed. And then, when this Spline no longer darkens the sky, your vengeance will not be moderated by show trials and bleats about justice and truth . . .'

Sarfi pressed her hands to her face.

Hama stared at Gemo. '*You knew*. You knew this was about to happen. You timed your visit to force me to act.'

'It's all very complicated, Hama Druz,' Gemo said softly, manipulating. 'Don't you think so? Get us out of here - all of us - and sort it out later.'

Nomi pulled back the pharaoh's head. 'You know what I think? I think you're a monster, pharaoh. I think you killed your daughter, long ago, and stuck her in your head. An insurance against a day like today.'

Gemo, her face twisted by Nomi's strong fingers, forced a smile. 'Even if that were true, what difference would it make?' And she gazed at Hama, waiting for his decision. Obeying Nomi's stern voice commands, the ship rose sharply. Hama felt nothing as shadows slipped over his lap.

This small craft, commissioned to take Hama to Jupiter's moons, was little more than a translucent hemisphere. In fact it would serve as a lifedome, part of a greater structure waiting in Earth orbit to propel him across the Solar System. The three of them, plus Sarfi, were jammed into a cabin made for two. The Virtual girl was forced to share the space already occupied by Hama and Gemo. Where her projection intersected their bodies it dimmed and broke up, and she averted her face; Hama was embarrassed by this brutal indignity.

The ship emerged from its pit and rushed beneath the looming belly of the Spline; there was a brief, ugly moment of fleeing, crumpled flesh, oozing scars metres long, glistening weapon emplacements dug in like stab wounds.

The air was crowded. Ships of all sizes cruised above Conurbation 11729, seeking to engage the Spline. Hama saw, with a sinking heart, that one of the ancient, half-salvaged ships had crashed back to Earth. It had made a broad crater, a wound in the ground circled by burning blown-silicate buildings. Already people had died today, irreplaceable lives lost forever.

The ship reached clear sky and soared upward. Earth folded over into a glowing blue abstraction, pointlessly beautiful, hiding the gruesome scenes below; the air thinned, the sky dimming through violet, to black.

The lifedome began to seek out the orbiting angular structure that would carry it to the outer planets. Hama began to relax, for the first time since Gemo had revealed herself. Despite everything that had happened he was relieved to leave behind the complication of the Conurbation; perhaps in the thin light of Jupiter the dilemmas he would have to face would be simpler.

Sarfi gasped.

A vast winged shape sailed over the blue hide of Earth, silent, like a predator.

Hama's heart sank at the sight of this new, unexpected intruder. What now?

Nomi said softly, 'Those wings must be hundreds of kilometres across.'

'Ah,' said Gemo. 'Just like the old stories. The ship *is* like a sycamore seed . . . But none of you remembers *sycamore trees*, do you? Perhaps you need us, and our memories, after all.'

Nomi said, anger erupting, 'People are dying down there because of your kind, Gemo -'

Hama placed a hand on her arm. 'Tell us, pharaoh. Is it Qax?'

'Not Qax,' she said. '*Xeelee*.' It was the first time Hama had heard the name. 'That is a Xeelee nightfighter,' said Gemo. 'The question is - what does it want here?'

There was a soft warning chime.

The ship shot away from Earth. The planet dwindled, closing on itself, becoming a sparkling blue bauble, a bauble over which a black-winged insect crawled.

Callisto joined the community of foragers.

Dwelling where the forest met the beach, the people ate the grass, and sometimes leaves from the lower branches, even loose flaps of bark. The people were wary, solitary. She didn't learn their names - if they had any - nor gained a clear impression of their faces, their sexes. She wasn't even sure how many of them there were here.

Not many, she thought.

Callisto found herself eating incessantly. With every mouthful she took she felt herself grow, subtly, in some invisible direction - the opposite to the diminution she had suffered when she lost her hand to the burning power of the sea. There was nothing to drink - no fluid save the oily black ink of the ocean, and she wasn't tempted to try that. But it didn't seem to matter.

Callisto was not without curiosity.

The beach curved away, in either direction. Perhaps this was an island, poking out of the looming black ocean.

There was no bedrock, not as far as she could dig. Only the drifting, uniform dust.

There were structures in the dust: crude tubes and trails, like the markings of worms or crabs. The grass *emerged*, somehow, coalescing from looser dust formations. The grass grew sparsely on the open beach, but at the fringe of the forest it gathered in dense clumps. In some tufts the long blades

wove together until they merged, forming more substantial, ropy plants.

Tiring of Asgard's cold company, she plucked up her courage and walked away from the beach, deeper into the forest.

Away from the lapping of the sea and the wordless rustle of the foraging people, it grew dark, quiet. Grass ropes wrapped around her legs, tugging, yielding with reluctance as she passed. This was a drab, still, lifeless place, she thought. In bush like this there ought to be texture: movement, noise, scent. So, anyhow, her flawed memories dimly protested.

She found a thick, solid mass, like a tree root. It was a tangle of grassy ropes, melding into a more substantial whole. She followed it. The root soon twined around another, and then another, the whole soon merging into a snaking cylinder broad enough to walk on. And from all around her more such giant roots were converging, as if she were approaching some great confluence of life.

At last the roots left the ground before her and rose up in a thick, twisted tangle, impossible to penetrate.

She peered up. The root stems coalesced into a thick unified trunk. It was a 'tree' that rose above the surrounding vegetative mass and into the light of the sky. But a low mist lay heavily, obscuring her view of the tree's upper branches.

She felt curiosity spark.

She placed her hand on the knotted-up lower trunk, then one foot, and then the other. The stuff of the tree was hard and cold.

At first the climbing was easy, the components of the 'trunk' loosely separated. She found a way to lodge her bad arm in gaps in the trunk so she could release her left hand briefly, and grab for a new handhold before she fell back. But as she climbed higher the ropy sub-trunks grew ever more tangled. High above her the trunk soared upwards, daunting, disappearing into the mist. But she thought she made out branches arching through the mist, high above the surrounding vegetation. When she looked down, she saw how the 'roots' of this great structure dispersed over the forest floor, branching into narrower trees and vine-thin

creepers and at last clumps of grass, dispersing into the underlying dust. She felt unexpectedly exhilarated by this small adventure -

There was a snarl, of greed and anger. It came from just above her head.

She quailed, slipped. She finished up dangling by her one hand.

It was human. Or, it might once have been human. It must have been four, five times her size. It was naked, and it clung to the tree above her, upside down, so that a broad face leered, predator's eyes fixed on her. Its limbs were cylinders of muscle, its chest and bulging belly massive, weighty. And it was male: an erection poked crudely between its legs.

It thrust its mouth at her, hissing. She could smell blood on its breath.

She screamed and lost her grip.

She fell, sliding down the trunk. She scabbled for purchase with her feet and her one good hand. She slammed repeatedly against the trunk, and the wind was knocked out of her.

Above her, the beast receded, still staring into her eyes.

When she reached the ground, ignoring the aches of battered body and torn feet, she blundered away, running until she reached the openness of the beach.

For an unmeasured time she lay on the beach, drawing comfort from the graininess of the dust.

The craft was called a GUTship.

As finally assembled, it looked something like a parasol of iron and ice. The canopy of the parasol was the habitable lifedome, and the 'handle' was the GUTdrive unit itself, embedded in a block of asteroid ice which served as reaction mass. The shaft of the parasol, separating the lifedome from the drive unit, was a kilometre-long spine of metal bristling with antennae and sensors.

The design was centuries old.

The ship itself had been built long before the Occupation, and lovingly maintained by a colony of refugees who had seen out the Qax era huddled in the asteroid belt. In a hundred subtle ways the ship showed its age. Every surface in the lifedome was scuffed and polished from use, the soft coverings of chairs and bunks were extensively patched, and many of the major systems bore the scars of rebuilding.

GUT, it seemed, was an acronym for Grand Unified Theory. Once, Gemo whispered, unified-theory energy had fuelled the expansion of the universe itself. In the heart of each GUTdrive asteroid ice was compressed to conditions resembling the initial singularity - the Big Bang. There, the fundamental forces governing the structure of matter merged into a single superforce. When the matter was allowed to expand again, the phase energy of the decomposing superforce, released like heat from condensing steam, was used to expel asteroid matter as a vapour rocket . . .

Remarkable, exotic, strange; this might be a primitive ship compared to a mighty Spline vessel, but Hama had never dreamed that mere humans had once mastered such technologies.

But when they were underway, with the lifedome opaqued over and all the strangeness shut out, none of that mattered. To Hama it was like being back in the Conurbations, in the enclosed, claustrophobic days before the Occupation was lifted. A deep part of his mind seemed to believe that what lay beyond these walls - occupied Earth, or endless universe - did not matter so long as *he* was safe and warm. He felt comfortable in his mobile prison - and was guilty to feel that way.

But everything changed when they reached Callisto.

They entered a wide, slow orbit around the ice moon.

The sun was shrunk to the tiniest of discs by Jupiter's remoteness, five times as far as Earth from the central light. When Hama held up his hand it cast sharp, straight shadows, the shadows of infinity, and he felt no warmth.

And through this rectilinear, reduced light, Callisto swam.

The satellite was like a dark, misty twin of Earth's Moon. Its surface was crowded with craters - even more so than the Moon's, for there were none of the giant lava-flood seas that smoothed over much lunar terrain. The largest craters were complex structures, plains of pale ice surrounded by multiple arcs of folded and cracked land, like ripples frozen into shattered ice and rock. Some of these features were the size of continents, large enough to stretch around this lonely moon's curved horizon, evidently the results of immense, terrifying impacts.

But these great geological sculptures were oddly smoothed out, the cracks and ripples reduced to shallow ridges. Unlike the rocky Moon, Callisto was made of rock and water ice. Over billions of years the ice had suffered viscous relaxation; it flowed and slumped. The most ancient craters had simply subsided, like great geological sighs, leaving these spectacular palimpsests.

'The largest impact structure is called Valhalla,' Gemo was saying. 'Once there were human settlements all along the northern faces of the circular ridges. All dark now, of course - save where Reth has made his base.'

Nomi grunted, uninterested in tourism. Then that's where we land.'

Hama gazed out at this silent sculpture of ice and time. 'Remarkable,' he said. 'I never imagined -'
Gemo said caustically, 'You are a drone of the Occupation. You never even saw the sunlight, you never imagined a universe beyond the walls of your Conurbation, you have never lived. You have no *memory*. And yet you presume to judge. Do you even know why Callisto is so-called? It is an ancient myth. Callisto was a nymph, beloved of Zeus and hated by jealous Hera, who metamorphosed her into a bear . . .' She seemed to sense Hama's bafflement. 'Ah, but you don't even remember the *Gree-chs*, do you?'

Nomi confronted her. '*You* administered the Extirpation, pharaoh. Your arrogance over the memories you took from us is -'

'Ill-mannered,' Hama said smoothly, and he touched Nomi's shoulder, seeking to calm the situation. 'A lack of grace that invalidates her assumption of superiority over us. Don't concern yourself, Nomi. She condemns herself and her kind every time she speaks.'

Gemo glared at him, full of contempt.

But now Jupiter rose.

The four of them crowded to see. They bobbed in the air like balloons, thrust into weightlessness now the drive was shut down.

The largest of planets was a dish of muddy light, of cloudy bands, pink and purple and brown. Where the bands met, Hama could see fine lines of turbulence, swoops and swirls like a lunatic water-colour. But a single vast storm disfigured those smooth bands, twisting and stirring them right across the southern hemisphere of the planet, as if the whole of Jupiter were being sucked into some vast central

maw.

As perhaps it was. There was a legend that, a century before, human rebels called the Friends of Wigner had climaxed their revolt by escaping *back through time*, across thousands of years, and had hurled a black hole into the heart of Jupiter. The knot of compressed spacetime was already distorting Jupiter's immense, dreamy structure, and in perhaps a million years would destroy the great world altogether. It was a fantastic story, probably no more than a tale spun for comfort during the darkest hours of Occupation.

Still, it was clear that *something* was wrong with Jupiter. Nobody knew the truth - except perhaps the pharaohs, and they would say nothing.

Hama saw how Sarfi, entranced, tried to rest her hand against the lifedome's smooth transparency. But her hand

sank into the surface, crumbling, and she snatched it away quickly. Such incidents seemed to cause Sarfi deep distress - as if she had been programmed with deep taboos about violating the physical laws governing 'real' humans. Perhaps it even hurt her when such breaches occurred.

Gemo Cana did not appear to notice her daughter's pain.

The lifedome neatly detached itself from the ship's drive section and swept smoothly down from orbit. Hama watched the moon's folded-over, crater-starred landscape flatten out, the great circular ramparts of Valhalla marching over the close horizon.

The lifedome settled to the ice with the gentlest of crunches.

A walkway extended from a darkened building block, and nuzzled hesitantly against the ship. A hatch sighed open.

Hama stood in the hatchway. The walkway was a transparent, shimmering tube before him, concealing little of the silver-black morphology of the collapsed landscape beyond. The main feature was the big Valhalla ridge, of course. Seen this close it was merely a rise in the land, a scarp that marched to either horizon: it would have been impossible to tell from the ground that this was in fact part of a great circular rampart surrounding a continent-sized impact scar, and Hama felt insignificant, dwarfed.

He forced himself to take the first step along the walkway.

The gravity here was about an eighth of Earth's, comparable to the Moon's, and to walk through Callisto's crystal stillness was enchanting; he floated between footsteps in great bounds.

Gemo mocked his pleasure. 'We are like *Armm-stron* and *All-dinn*.'

Nomi growled, 'More *Gree-chs*, pharaoh?'

Reth Cana was waiting to meet them at the end of the walkway.

He was short, squat, with a crisp scalp of white hair, and he wore a practical-looking coverall of some papery fabric. He was scowling at them, his face a round wrinkled mask.

Beyond him, Hama glimpsed extensive chambers, dug into the ice, dimly lit by a handful of floating globe lamps - extensive, but deserted.

But Hama's gaze was drawn back to Reth. *He looks like Gemo*.

Gemo stepped forward now, and they faced each other, brother and sister separated for centuries.

Stiffly, they embraced. They were like copies of each other, subtly morphed.

Sarfi hung back, watching, hands folded before her.

Hama felt excluded, almost envious of this piece of complex humanity. How must it be to be bound to another person by such strong ties - for life?

Reth stepped away from his sister and inspected Sarfi. Without warning he swept his clenched fist through the girl's belly. He made a trail of disrupted pixels, like a fleshy comet. Sarfi crumpled over, crying out.

The sudden brutality shocked Hama.

Reth laughed. 'A Virtual? I didn't suspect you were so sentimental, Gemo.'

Gemo stepped forward, her mouth working. 'But I remember your cruelty.'

Now Reth faced Hama. 'And this is the one sent by Earth's new junta of children.'

Hama shrank before Reth's arrogance and authority. His accent was exotic - antique, perhaps; there was a rustle of history about this man. Hama tried to keep his voice steady. 'I have a specific assignment here, sir -'

Reth snorted. 'My work, a project of centuries, deals with the essence of reality itself. It is an achievement of which you have *no* understanding. If you had a glimmer of sensitivity you would leave now. Just as, if you and your mayfly friends had any true notion of duty, you would abandon your petty attempts at governing.'

Nomi growled. 'You think we got rid of the Qax just to hand over our lives to the likes of you?'

Reth glared at her. 'Can you really believe that *we* would have administered the withdrawal of the Qax with more death and destruction than *you* have inflicted?'

Hama stood straight. 'I'm not here to discuss hypotheticals with you, Reth Cana. We are pragmatic. If your work is in the interest of the species -'

Reth laughed out loud; Hama saw how his teeth were discoloured, greenish. '*The interest of the species.*' He stalked about the echoing cavern, posturing. 'Gemo, I give you the future. If this young man has his way, science will be no more than a weapon! . . . And if I refuse to cooperate with his *pragmatism?*'

Nomi said smoothly, 'Those who follow us will be a lot tougher. Believe it, jasoft.'

Gemo listened, stony-faced.

Tomorrow,' Reth said to Hama. 'Twelve hours from now. I will demonstrate my work, my results. But I will not justify it to the likes of you; make of it what you will.' And he swept away into shadows beyond the fitful glow of the hovering globe lamps.

Nomi said quietly to Hama, 'Reth is a man who has spent too long alone.'

'We can deal with him,' Hama said with more confidence than he felt.

'Perhaps. But *why* is he alone? Hama, we know that at least a dozen pharaohs came to this settlement before the Occupation was ended, and probably more during the collapse. Where are *they?*'

Hama frowned. 'Find out.'

Nomi nodded briskly.

The oily sea lapped even closer now. The beach was reduced to a thin strip, trapped between forest and sea.

She walked far along the beach. There was nothing different, just the same dense forest, the oily sea. Here and there the sea had already covered the beach, en-croaching into the forest, and she had to push into the vegetation to make further progress. Everywhere she found the tangle of roots and vine-like growths. Where the rising liquid had touched, the grasses and vines and trees crumbled and died, leaving bare, scattered dust.

The beach curved around on itself.

She was on an island. At least she had learned that much. Eventually, she supposed, that dark sea would rise so high it would cover everything. And they would all die.

There was no night. When she was tired, she rested on the beach, eyes closed.

There was no time here - not in the way she seemed to remember, on some deep level of herself: no days, no nights, no change. There was only the beach, the forest, that black oily sea, lapping ever closer, all of it under a shadowless grey-white sky.

She looked inward, seeking herself. She found only fragments of memory: an ice moon, a black sky - a face, a girl's perhaps, delicate, troubled. She didn't like to think about the face. It made her feel - complex. Lonely. Guilty.

She asked Asgard about time.

Asgard, gnawing absently on a handful of bark chips, ran a casual finger through the reality dust, from grain to grain. There,' she said. Time passing. From one moment to the next. For we, you see, are above time.'

'I don't understand.'

'Of course you don't. A blade of grass is a shard of story. Where the grass knits itself into vines and trees, that story deepens. And if *I* eat a grass blade I absorb its tiny story, and it becomes mine. So Pharaoh said. And I don't know who told *him*. Do you see?'

'No,' said Callisto frankly.

Asgard just looked at her, apathetic, contemptuous.

There was a thin cry, from the ocean. Callisto shaded her eyes, looked that way.

It had been a newborn, thrust arbitrarily into the air, just as Callisto had been. But this newborn had fallen, not to the comparative safety of the dust, but direct into the sea. She - or he - made barely a

ripple on that placid black surface. Callisto saw a hand raised briefly above the sluggish meniscus, the flesh already dissolving, white bones curling.

And then it was gone, the newborn lost.

Callisto felt a deep horror.

Now, as she looked along the beach, she saw dark masses - a mound of flesh, the grisly articulation of fingers - fragments of the suddenly dead, washed up on I this desolate beach. This had happened before, she realised. Over and over.

Asgard sat apathetically, chewing on her bark.

Is this it? Callisto wondered. Must I sit here like Asgard, waiting for the rising ocean of death to claim me?

She said, 'We can't stay here.'

'No,' Asgard agreed reluctantly. 'No, we can't.'

Hama, with Reth and Gemo, rode a platform of metal deep into the rocky heart of Callisto.

The walls of the pressurised shaft, sliding slowly upwards, were lined with slick transparent sheets, barring them from the ice. Hama reached out with a fingertip. The wall surface was cold and slippery, lubricated by a thin sheet of condensation from the chill air. There were no signs of structure, of strata in the ice; here and there small bores had been dug away from the shaft, perhaps as samples.

Callisto was a ball of dirty water ice. Save for surface impacts, nothing had happened to this moon since it accreted from the greater cloud that had formed the Jupiter system. The inner moons - Io, Europa, Ganymede - were heated, to one degree or another, by tidal pumping from Jupiter. So Europa, under a crust of ice, had a liquid ocean; and Io was driven by that perennial squeezing to spectacular volcanism. But Callisto had been born too far from her huge parent for any of that gravitational succour. Here, the only heat was a relic of primordial radioactivity; here there had been no geology, no volcanism, no hidden ocean.

Nevertheless, it seemed, Reth Cana had found life here. And, as the platform descended, Reth's cold excitement seemed to mount.

Nomi Ferrer was pursuing her own researches, in the settlement and out on the surface. But she had insisted that Hama be escorted by a squat, heavily-armed drone robot. Both Reth and Gemo ignored this silent companion, as if it were somehow impolite of Hama to have brought it along.

Nor did either of them mention Sarfi, who hadn't accompanied them. To Hama it did not seem human to disregard one's daughter, Virtual or otherwise. But then, what was *human* about a near-immortal traitor to the race? What was human about Reth, this man who had buried himself alone in the ice of Callisto, obsessively Pursuing his obscure project, for decade after decade?

Even though the platform was small and cramped, Hama felt cold and alone; he suppressed a shiver.

The platform slowed, creaking, to a halt. He faced a chamber dug into the ice.

Reth said, 'You are a kilometre beneath the surface. Go ahead. Take a look.'

Hama saw that the seal between the lip of the circular platform and the roughly-cut ice was not perfect. He felt a renewed dread at his reliance on ancient, patched-up technology. But, suppressing hesitation, he stepped off the platform and into the ice chamber.

With a whirl of aged bearings, the drone robot followed him.

Hama stood in a rough cube perhaps twice his height. It had been cut out of the ice, its walls lined by some clear glassy substance; it was illuminated by two hovering light globes. There was a knot of instrumentation, none of it familiar to Hama, along with a heap of data slates, some emergency equipment, and scattered packets of food and water. This was a working place, impersonal.

Reth stepped past him briskly. 'Never mind the gadgetry; you wouldn't understand it anyhow . . .

Look.' And he snapped his fingers, summoning one of the floating globes. It came to hover at Hama's shoulder.

Hama leaned close to inspect the cut-away ice. He could see texture: the ice was a pale, dirty grey, polluted by what looked like fine dust grains - and, here and there, it was stained by colour, crimson and purple and brown.

Reth had become animated. 'I'd let you touch it,' he breathed. 'But the sheeting is there to protect *it* from *us* -not the other way around. The biota is much more ancient, unevolved, fragile than we are; the bugs on your breath might wipe it out in an instant. The prebiotic chemicals were probably delivered here by comet impacts during Callisto's formation. There

is carbon and hydrogen and nitrogen and oxygen. The biochemistry is a matter of carbon-carbon chains and water - *like* Earth's, but not precisely so. Nothing *exactly* like our DNA structures 'Spell it out,' Gemo said casually, prowling around the gadgetry. 'Remember, Reth, the education of these young is woefully inadequate.'

'This is life,' Hama said carefully. 'Native to Callisto.'

'Life - yes,' Reth said. 'The highest forms are about equivalent to Earth's bacteria. But - native? I believe the life forms here have a common ancestor, buried deep in time, with Earth life - and with the more extravagant biota of Europa's buried ocean, and probably the living things found elsewhere in the Solar System. Do you know the notion of panspermia? Life, you see, may have originated in one place, perhaps even outside the System, and then was spread through the worlds by the spraying of meteorite-impact debris. And everywhere it landed, life embarked on a different evolutionary path.'

'But here,' Hama said slowly, fumbling to grasp these unfamiliar concepts, 'it was unable to rise higher than the level of a bacterium?'

'There is no room,' said Reth. 'There is liquid water here: just traces of it, soaked into the pores between the grains of rock and ice, kept from freezing by the radiogenic heat. But energy flows thin, and replication is very slow -spanning thousands of years.' He shrugged. 'Nevertheless there is a complete ecosystem ... Do you understand? My Callisto bacteria are rather like the cryptoendoliths found in some inhospitable parts of the Earth. In Antarctica, for instance, you can crack open a rock and see layers of green life, leaching nutrients from the stone itself, sheltering from the wind and the desolating cold: communities of algae, cyanobacteria, fungi, yeasts -'

'Not any more,' Gemo murmured, running a finger over control panels. 'Reth, the Extirpation was *very* thorough, an effective extinction event; I doubt if any of your cryptoendoliths can still survive.'

'Ah,' said Reth. 'A pity.'

Hama straightened up, frowning. He had come far from the cramped caverns of the Conurbations; he was confronting life from another world, half a billion kilometres from Earth. He ought to feel wonder. But these pale shadows evoked only a kind of pity. Perhaps this thin, cold, purposeless existence was a suitable object for the obsessive study of a lonely, half-mad immortal.

Reth's eyes were on him, hard.

Hama said carefully, 'We know that before the Occupation the Solar System was extensively explored, by *Mykal Puhl* and those who followed him. The records of those times are lost - or hidden,' he said with a glance at the impassive Gemo. 'But we do know that everywhere the humans went, they found life. Life is commonplace. And in most places we reached, life has attained a much higher peak than *this*. Why not just catalogue these scrapings and abandon the station?'

Reth threw up his arms theatrically. 'I am wasting my time. Gemo, how can this mayfly mind possibly grasp the subtleties here?'

She said dryly, 'I think it would serve you to try to explain, brother.' She was studying a gadget that looked like a handgun mounted on a floating platform. This, for example.'

When Hama approached this device, his weapon-laden drone whirred warningly. 'What is it?'

Reth stalked forward. 'It is an experimental mechanism based on laser light, which ... It is a device for exploring the energy levels of an extended quantum structure.' He began to talk, rapidly, lacing his language with phrases like 'spectral lines' and 'electrostatic potential wells', none of which Hama understood.

At length Gemo interpreted for Hama.

'Imagine a very simple physical system - a hydrogen atom, for instance. I can raise its energy by bombarding it with laser light. But the atom is a quantum system; it can only assume energy levels at a series of specific steps. There are simple mathematical rules to describe the steps. This is called a "potential well".'

As he endured this lecture, irritation slowly built in Hama; it was clear there was much knowledge to be reclaimed from these patronising, arrogant pharaohs.

The potential well of a hydrogen atom is simple,' said Reth rapidly. 'The simplest quantum system of all. It follows an inverse-square rule. But I have found the potential wells of much more complex structures -'

'Ah,' said Gemo. 'Structures embedded in the Callisto bacteria.'

'Yes.' Reth's eyes gleamed. He snatched a data slate from a pile at his feet. A series of numbers

chattered over the slate, meaning little to Hama, a series of graphs that sloped sharply before dwindling to flatness: a portrait of the mysterious 'potential wells', perhaps.

Gemo seemed to understand immediately. 'Let me.' She took the slate, tapped its surface and quickly reconfigured the display. 'Now, look, Hama: the energies of the photons that are absorbed by the well are proportional to this series of numbers.'

1. 2. 3. 5. 7. 11. 13 ...

'Prime numbers,' Hama said.

'Exactly,' snapped Reth. 'Do you see?'

Gemo put down the slate and walked to the ice wall; she ran her hand over the translucent cover, as if longing to touch the mystery that was embedded there. 'So inside each of these bacteria,' she said carefully, 'there is a quantum potential well that encodes prime numbers.'

'And much more,' said Reth. 'The primes were just the key, the first hint of a continent of structure I have barely begun to explore.' He paced back and forth, restless, animated. 'Life is never content simply to subsist, to cling on. Life seeks room to spread. That is another commonplace, young man. But here, on Callisto, there was no room: not in the physical world; the energy and nutrients were simply too sparse for that. And so -'

'Yes?'

'And so they grew *sideways*,' he said. 'And they reached | orthogonal realms we never imagined existed.'

Hama stared at the thin purple scrapings and chattering

primes, here at the bottom of a pit with these two immortals, and feared he had descended into madness. . . . 41. 43. 47. 53. 59 ...

In a suit no more substantial than a thin layer of cloth, Nomi Ferrer walked over Callisto's raw surface, seeking evidence of crimes.

The sun was low on the horizon, evoking highlights from the curved ice plain all around her. From here, Jupiter was forever invisible, but Nomi saw two small discs, inner moons, following their endless dance of gravitational clockwork.

Gemo Cana had told her mayfly companions of how the Jovian system had once been. She told them of Io's mineral mines, nestling in the shadow of the huge volcano Babbar Patera. She told them of Ganymede: larger than Mercury, heavily cratered and geologically rich - the most stable and heavily populated of all the Jovian moons. And Europa's icy crust had sheltered an ocean hosting life, an ecosystem much more complex and rewarding than anybody had dreamed. They were *worlds*. Human worlds. All gone now, shut down by the Qax. But remember . . .'

Away from the sun's glare, lesser stars glittered, surrounding Nomi with immensity.

But it was a crowded sky, despite that immensity. Crowded and dangerous. For - she had been warned by the Coalition - the Xeelee craft that had glowered over Earth was now coming *here*, hotly pursued by a Spline ship retrieved from the hands of jasoft rebels and manned by Green Army officers. What would happen when that miniature armada got here, Nomi couldn't imagine.

The Xeelee were legends of a deep-buried, partly extirpated past. And perhaps they were monsters of the human future. The Xeelee were said to be godlike entities so aloof that humans might never understand their goals. Some scraps of Xeelee technology, like starbreaker beams, had fallen into the hands of 'lesser' species, like the Qax, and transformed their fortunes. The Xeelee seemed to care little for this - but, on occasion, they intervened.

To devastating effect.

Some believed that by such interventions the Xeelee were maintaining their monopoly on power, controlling an empire which, perhaps, held sway across the Galaxy. Others said that, like the vengeful gods of humanity's childhood, the Xeelee were protecting the 'junior races' from themselves.

Either way, Nomi thought, it's insulting. Claustrophobic. She felt an unexpected stab of resentment.

We only just got rid of the Qax, she thought. And now this.

Gemo Cana had argued that in such a dangerous universe, humanity needed the pharaohs. 'Everything humans know about the Xeelee today, every bit of intelligence we have, was preserved by the pharaohs. I refuse to plead with you for my life. But I am concerned that you should understand. We pharaohs were not dynastic tyrants. We fought, in our way, to survive the Qax Occupation, and the

Extirpation. For we are the wisdom and continuity of the race. Destroy us and you complete the work of the Qax for them, finish the Extirpation. Destroy us and you destroy your own past -which we preserved for you, at great cost to ourselves.'

Perhaps, Nomi thought. But in the end it was the bravery and ingenuity of one human - *a mayfly* - that had brought down the Qax, not the supine compromising of the jasofts and pharaohs.

She looked up towards the sun, towards invisible Earth. I just want a sky clear of alien ships, she thought. And to achieve that, perhaps we will have to sacrifice much.

Reth Cana began to describe where the Callisto bugs had 'gone'.

'There is no time,' he whispered. 'There is no space. This is the resolution of an ancient debate - do we live in a universe of perpetual change, or a universe where neither time nor motion exist? Now we understand. Now we know we live in a universe of static shapes. Nothing exists but the particles that make up the universe - that make up *us*. Do you see? And we can *measure* nothing but the separation between those particles.'

'Imagine a universe consisting of a single elementary particle, an electron perhaps. Then there could be no space. For space is only the separation between particles. Time is only the measurement of changes in that separation. So there could be no time.'

'Imagine now a universe consisting of *two* particles . . .'

Gemo nodded. 'Now you can have separation, and time.'

Reth bent and, with one finger, scattered a line of dark dust grains across the floor. 'Let each dust grain represent a distance - a configuration of my miniature two-particle cosmos. Each grain is labelled with a single number: the separation between the two particles.' He stabbed his finger into the line, picking out grains. '*Here* the particles are a metre apart; *here* a micron; *here* a light year. There is one special grain, of course: the one that represents zero separation, the particles overlaid. This diagram of dust shows all that is important about the underlying universe - the separation between its two components. And every possible configuration is shown at once, from this godlike perspective.' He let his finger wander back and forth along the line, tracing out a twisting path in the grains. 'And here is a history: the two particles close and separate, close and separate. If they were conscious, the particles would think they were embedded in time, that they are coming near and far. But *we* can see that their universe is no more than dust grains, the lined-up configurations jostling against each other. It feels like time, inside. But from outside, it is just - sequence, a scattering of instants, of reality dust.'

Gemo said, 'Yes. "It is utterly beyond our power to measure the change of things by time. Quite the contrary, time is an abstraction at which we arrive by means of the changes of things."' She eyed

Hama. 'An ancient philosopher. *Mach*, or *Mar-que*

'If the universe has three particles,' said Reth, 'you need *three* numbers. Three relative distances - the separa-

tion of the particles, one from the other - determine the cosmos's shape. And so the dust grains, mapping possible configurations, would fill up three-dimensional space -though there is still a unique grain, representing the special instant where all the particles are joined. And with four particles -'

'There would be six separation distances,' Hama said. 'And you would need a six-dimensional space to map the possible configurations.'

Reth glared at him, eyes hard. 'You are beginning to understand. Now. Imagine a space of stupendously many dimensions.' He held up a dust grain. 'Each grain represents one configuration of all the particles in *our* universe, frozen in time. This is reality dust, a dust of the Nows. And the dust fills *configuration space*, the realm of instants. Some of the dust grains may represent slices of our own history.' He snapped his fingers, once, twice, three times. 'There. There. There. Each moment, each juggling of the particles, a new grain, a new coordinate on the map. There is one grain that represents the coalescing of all the universe's particles into a single point. There are many more grains representing chaos - darkness - a random, structureless shuffling of the atoms.'

'Configuration space contains all the arrangements of matter there could ever be. It is an image of eternity.' He waved a fingertip through the air. 'But if I trace out a path from point to point -'

'You are tracing out a history,' said Hama. 'A sequence of configurations, the universe evolving from point to Point.'

'Yes. But *we* know that time is an illusion. In configuration space, all the moments that comprise our history exist simultaneously. *And all the other configurations that are logically possible also exist,*

whether they lie along the track of that history or not.'

Hama frowned. 'And the Callisto bugs -' Reth smiled. 'I believe that, constrained in this space and time, the Callisto lifeforms have started to explore the wider realms of configuration space. Seeking a place to play.'

Nomi turned away from the half-buried human township. She began to toil up the gentle slope of the ridge that loomed above the settlement. This was one of the great ring walls of the Valhalla system, curving away from this place for thousands of kilometres, rising nearly a kilometre above the surrounding plains.

The land around her was silver and black, a midnight sculpture of ridges and craters. There were no mountains here, none at all; any created by primordial geology or the impacts since Callisto's birth had long since subsided, slumping into formlessness. There was a thin smearing of black dust over the dirty white of the underlying ice; the dust was loose and fine-grained, and she disturbed it as she passed, leaving bright footprints.

'Do you understand what you're looking at?'

The sudden voice startled her; she looked up.

It was Sarfi. She was dressed, as Nomi was, in a translucent protective suit, another nod to the laws of consistency that seemed to bind her Virtual existence. But she left no footprints, nor even cast a shadow.

Sarfi kicked at the black dust, not disturbing a single grain. The ice sublimates - did you know that? It shrivels away, a metre every ten million years - but it leaves the dust behind. That's why the human settlements were established on the north side of the Valhalla ridges. There it is just a shade colder, and some of the sublimed ice condenses out. So there is a layer of purer ice, right at the surface. The humans lived off ten-million-year frost . . . You're surprised I know so much. Nomi Ferrer, I was dead before you were born. Now I'm a ghost imprisoned in my mother's head. But I'm *conscious*. And I am still curious.'

Nothing in Nomi's life had prepared her for this conversation. 'Do you love your mother, Sarfi?'

Sarfi glared at her. 'She preserved me. She gave up part of herself for me. It was a great sacrifice.'

Nomi thought, You resent her. You resent this cloying, possessive love. And all this resentment bubbles inside you, seeking release. There was nothing else she could have done for you.'

'But I died anyway. I'm not *me*. I'm a download. I don't exist for me, but for *her*. I'm a walking, talking construct of her guilt.' She stalked away, climbing the slumped ice ridge.

Gemo started to argue detail with her brother. How was it Possible for isolated bacteria-like creatures to form any kind of sophisticated sensorium? - but Reth believed

in the present - the fossils and geology of Earth, so cruelly obliterated by the Qax, even the traces of chemicals and electricity in your own brain that comprise your memory, maintaining your illusion of past times . . . Gemo, may I -'

Gemo nodded, unsmiling.

Reth tapped a data slate. Sarfi froze, becoming a static, inanimate sculpture of light. Then, after perhaps ten seconds, she melted, began to move once more.

She saw Hama staring at her. 'What's wrong?'

Reth, ignoring her, said. The child contains a record of her own shallow past, embedded in her programs and data stores. She is unaware of intervals of time when she is frozen, or deactivated. If I could start and stop *you*, Hama Druz, you would wake protesting that your memories contained no gaps. But your memories themselves would have been frozen. I could even chop up your life and rearrange its instants in any way I chose; at each instant *you* would have an intact set of memories, a record of a past, and you would believe yourself to have lived through a continuous, consistent reality.

'And thus the maximal-reality dust grains contain *embedded within themselves* a record of the eras which "preceded" them. Each grain contains brains, like yours and mine, with "memories" embedded in them, frozen like sculptures. And history emerges in configuration space because those rich grains are then drawn, by a least-energy matching principle, to the grains which "precede" and "follow" them . . . You see?'

there were slow pathways of chemical and electrical communication, etched into the ice and rock, tracks for great slow thoughts that pulsed through the substance of Callisto. Very well, but what of quantum mechanics? The universe was *not* made up of neat little particles, but was a mesh of quantum

probability waves - ah, but Reth imagined quantum probability lying like a mist over his reality dust, constrained by two things: the geometry of configuration space, as acoustic echoes are determined by the geometry of a room; and something called a 'static universal wave function', a mist of probability that governed the likelihood of a given Now being experienced . . .

Hama closed his eyes, his mind whirling.

Blocky pixels flickered across his vision, *within* his closed eyes. Startled, he looked up.

Sarfi was kneeling before him; she had brushed her Virtual fingertips through his skull, his eyes. He hadn't even known she had come here.

'I know it's hard to accept,' she said. 'My mother spent a long time making me understand. You just have to open your mind.'

'I am no fool,' he said sharply. 'I can imagine a map of all the logical possibilities of a universe. But it would be just that - a map, a theoretical construct, a thing of data and logic. It would not be a *place*.

The universe doesn't *feel* like that. I *feel* time passing. I don't experience disconnected instants, Reth's dusty reality.'

'Of course not,' said Reth. 'But you must understand that everything we know of the past is a record embedded

Sarfi looked to Gemo. 'Mother? What does he mean?

Gemo watched her clinically. 'Sarfi has been reset many times, of course,' she said absently. 'I had no wish to see her grow old, accreted with worthless memory. It was rather like the Extirpation, you see. The Qax sought to reset humanity, to abolish the memory of the race. In the ultimate realisation, we would have become a race of children, waking every day to a fresh world, every day a new creation. It was cruel, of course. But, theoretically, intriguing. Don't you think?'

Sarfi was trembling.

Now Reth began telling Gemo, rapidly and with enthusiasm, of his plans to explore his continent of configurations. 'No human mind could apprehend that multidimensional domain unaided, of course. But it can be modelled, with metaphors - rivers, seas, mountains. It is possible to *explore* it . . .'

Hama said, 'But, if your meta-universe is static, timeless, how could it be experienced? For experience depends on duration.'

Reth shook his head impatiently. He tapped his data slate and beckoned to Sarfi. 'Here, child.'

Hesitantly, she stepped forward.

She trailed a worm-like tube of light, as if her image had been captured at each moment in some invisible emulsion.

She emerged, blinking, at the other end of the tube, and looked back at it, bewildered.

'Stop these games,' Hama said tightly.

'You see?' Reth said. 'Here is an evolution of Sarfi's structure, but mapped in space, not time. But it makes no difference to Sarfi. Her memory at each frozen instant contains a record of her walking across the floor towards me - doesn't it, dear? And thus, in static configuration space, sentient creatures could have experiences, afforded them by the evolution of information structures across space.'

Hama turned to Sarfi. 'Are you all right?'

'What do you think?'

'I think Reth may be insane,' he said.

She stiffened, pulling back. 'Don't ask me. I'm not even a mayfly, remember?'

'It is a comforting philosophy, Hama,' Gemo said. 'Nothing matters, you see: not even death, not even the Extirpation. For we persist, each moment exists forever, in a great universe . . .'

It was a philosophy of decadence, Hama thought angrily. A philosophy of morbid contemplation, a consolation for ageless pharaohs as they sought to justify the way they administered the suffering of their fellow creatures. No wonder it appealed to them so much.

Gemo and Reth talked on, more and more rapidly, entering realms of speculation he couldn't begin to follow.

Callisto told Asgard what she was intending to do.

She walked along the narrowing beach, seeking scraps of people, of newborns and others, washed up by the pitiless black sea.

She picked up what looked like a human foot. It was oddly dry, cold, the flesh and even the bones

crumbling at her touch.

She collected as many of these hideous shards as she could hold, and toiled back along the barren dust.

Then she worked her way through the forest back to the great tree, where she had encountered the creature called Night. She paused every few paces and pushed a section of corpse into the ground. She covered each fragment over with ripped-up grass and bits of bark.

'You're crazy,' Asgard said, trailing her, arms full of dried, crumbling flesh and bone.

'I know,' Callisto said. 'I'm going anyway.'

Asgard would not come far enough to reach the tree itself. So Callisto completed her journey alone.

Once more she reached the base of the tree. Once more, her heart thumping hard, she began to climb.

The creature, Night, seemed to have expected her. He moved from branch to branch, far above, a massive blur, and he clambered with ferocious purpose down the trunk.

She scrambled hurriedly back to the ground.

He followed her - but not all the way to the ground. He clung to his trunk, his broad face broken by that immense, bloody mouth, hissing at her.

She glowered back, and took a tentative step towards the tree. 'Come get me,' she muttered. 'What are you waiting for?' She took a piece of corpse (a *hand* - briefly her stomach turned), and she hurled it up at him.

He ducked aside, startled. But he swivelled that immense head. As the hand descended he caught it neatly

in his scoop of a mouth, crunched once and swallowed it whole. He looked down at her with new interest.

And he took one tentative step towards the ground.

That's it,' she crooned. 'Come on. Come eat the flesh. Come eat *me*, if that's what you want -'

Without warning he leapt from the trunk, immense hands splayed.

She screamed and staggered back. He crashed to the ground perhaps an arm's length from her. One massive fist slammed into her ankle, sending a stab of pain that made her cry out.

If he'd landed on top of her he would surely have crushed her.

The beast, winded, was already clambering to his feet.

She got to her feet and ran, ignoring the pain of her ankle. Night followed her, his lumbering four-legged pursuit slow but relentless. As she ran she kicked open her buried caches of body parts. He snapped them up and gobbled them down, barely slowing. The morsels seemed pathetically inadequate in the face of Night's giant reality.

She burst out onto the open beach, still running for her life. She reached the lip of the sea, skidding to a halt before the lapping black liquid. Her plan had been to reach the sea, to lure Night into it.

But when she turned, she saw that Night had hesitated on the fringe of the forest, blinking in the light. Perhaps he was aware that she had deliberately drawn him here.

He stepped forward deliberately, his immense feet sinking into the soft dust. There was no need for him to rush.

Callisto was already exhausted, and, trapped before the sea, there was nowhere for her to run.

Now he was out in the open she saw how far from the human form he had become, with his body a distorted slab of muscle, a mouth that had widened until it stretched around his head. And yet scraps of clothing clung to him, the remnants of a coverall of the same unidentifiable colour as her own.

Once this creature, too, had been a newborn here, landing screaming on this desolate beach.

He towered over her, and she wondered how many unfortunates he had devoured to reach such proportions.

Beyond his looming shoulder, she could see Asgard, pacing back and forth along the beach.

'Great plan,' Asgard called. 'Now what?'

'I -'

Night raised up on his hind legs, huge hands pawing at the air over her head. He roared wordlessly, and bloody breath gushed over her.

Close your eyes, Callisto thought. This won't hurt.

'No,' Asgard said. She took a step towards the looming beast, began to run. 'No, no, *no*!' With a final yell she hurled herself at his back.

He looked around, startled, and swiped at Asgard with one giant paw. She was flung away like a scrap of bark, to land in a heap on the dust. But Night, off-balance, was stumbling backward, back toward the sea.

When his foot sank into the oily ocean, he looked down, as if surprised.

Even as he lifted his leg from the fluid the flesh was drying, crumbling, the muscles and bone sloughing away in layers of purple and white. He roared his defiance, and cuffed at the sea - then gazed in horror at one immense hand left shredded by contact with the entropic ooze.

He began to fall, slowly, ponderously. Without a splash, the fluid opened up to accept his immense bulk. He was immediately submerged, the shallow fluid flowing eagerly over him.

In one last burst of defiance he broke the surface, mouth open, his flesh dissolving. His face was restored, briefly, to the human, his eyes a startling blue. He cried out, his voice thin: '*Reth!*'

The name sent a shiver of recognition through Callisto.

Then he fell back, and was gone.

She hurried to Asgard.

Asgard's chest was crushed, she saw immediately, imploded to an implausible degree, and her limbs were splayed around her at impossible angles. Her face was growing smooth, featureless, like a child's, beautiful in its innocence. Her gaze slid over Callisto.

Callisto cradled Asgard's head. 'This won't hurt,' she murmured. 'Close your eyes.'

Asgard sighed, and was still.

'Let me tell you about pharaohs,' Nomi said bitterly.

Hama listened in silence.

They stood on the Valhalla ridge, overlooking the old, dark settlement; the brightest point on the silver-black surface of Callisto was their own lifedome.

Nomi said, This was just after the Qax left. I got this

from a couple of our people who survived, who were *there*. There was a nest of the pharaohs, in one of the biggest Conurbations - one of the first to be constructed, one of the oldest. The pharaohs retreated into a pit, under the surface dwellings. They fought hard; we didn't know why. They had to be torched out. A lot of good people, good *mayflies*, died that day. When our people had dealt with the pharaohs, shut down the mines and drone robots and booby-traps . . . after all that, they went into the pit. It was dark. But it was warm, the air was moist, and there was movement everywhere. Small movements. And, so they say, there was a smell. *Of milk.*'

Nomi was silent for a long moment; Hama waited.

'Hama, I can't have children. I grew up knowing that. So maybe I ought to find some pity for the pharaohs. They don't breed true - like Gemo and Sarfi. But Sarfi is the exception, I think. Sometimes their children *are* born with Qax immortality. But -'

'Yes?'

'But they don't grow. They stop developing, at the age of two years or one year or six months or a month; some of them even stop growing before they are ready to be born, and have to be plucked from their mothers' wombs.

'And that was what our soldiers found in the pit, Hama. Racked up like specimens in a lab, hundreds of them. Must have been accumulating for centuries. Plugged into machines, mewling and crying.'

'Lethe.' Maybe Gemo is right, Hama thought; maybe the pharaohs really have paid a price we can't begin to understand.

The pit was torched

Hama thought he saw a shadow pass across the sky, the scattered stars. 'Why are you telling me this, Nomi?'

Nomi pointed. There's a line of shallow graves over there. Not hard to find, in the end.'

'Ah.'

The killings seemed to be uniform, the same method every time. A laser to the head. The bodies seemed peaceful,' Nomi mused. 'Almost as if they welcomed it.'

He had killed them. Reth had killed the other pharaohs who came here, one by one. But why?

And why would an immortal welcome death? Only if -his mind raced - only if she were promised a better place to go -

Everything happened at once.

A shadow, unmistakable now, spread out over the stars: a hole in the sky, black as night, winged, purposeful. And, low towards the horizon, there was a flare of light.

'Lethe,' said Nomi softly. That was the GUTship. It's *gone* - just like that.'

Then we aren't going home.' Hama felt numb; he seemed beyond shock.

'... Help me. Oh, help me ...'

A form coalesced before them, a cloud of blocky pixels. Hama made out a sketch of limbs, a face, an open, Pleading mouth. It was Sarfi, and she wasn't in a Protective suit. Her face was twisted in pain; she must be breaking all her consistency overrides to have projected herself to the surface like this.

Hama held out his gloved hands, driven by an impulse to hold her; but that, of course, was impossible.

'Please,' she whispered, her voice a thin, badly-realised scratch. 'It is Reth. He plans to kill Gemo.'

Nomi set off down the ridge slope in a bouncing low-G run.

Hama said to Sarfi, 'Don't worry. We'll help your mother -'

Now he saw anger in that blurred, sketchy face. 'To Lethe with her! Save *me* ...'

The pixels dispersed into a meaningless cloud, and winked out.

Callisto reached the great tree.

The trunk soared upwards, a pillar of rigid logic and history and consistency. She slapped its hide, its solidity giving her renewed confidence. And now there was no Night, no lurking monster, waiting up there to oppose her.

With purpose, ignoring the aches of her healing flesh and torn muscles, she began to climb.

As she rose above the trunk's lower tangle and encountered the merged and melded upper length, the search for crevices became more difficult, just as it had before. But she was immersed in the rhythm of the climb, and however high she rose there seemed to be pocks and ledges moulded into the smooth surface of the trunk, sufficient to support her progress.

Soon she had far surpassed the heights she had reached that first time she had tried. The mist was thick here, and

when she looked down the ground was already lost: the great trunk rose from blank emptiness, as if rooted in nothingness.

But she thought she could see shadows, moving along the trunk's perspective-dwindled immensity: the others from the beach, some of them at least, were following her on her unlikely adventure.

And still she climbed.

The trunk began to split into great arcing branches that pushed through the thick mist. She paused, breathing deeply. Some of the branches were thin, spindly limbs that dwindled away from the main trunk. But others were much more substantial, great highways that seemed anchored to the invisible sky.

She picked the most solid-looking of these upper branches, and continued her climb.

Impeded by her damaged arm, her progress was slow but steady. It was actually more difficult to make her way along, this tipped-over branch than it had been to climb the vertical trunk. But she was able to find handholds, and places where she could wrap her limbs around the branch.

The mist thickened further until she could see nothing around her but this branch: no sky or ground, not even the rest of this great tree, as if nothing existed but herself and the climb, as if the branch came from the mist and finished in the mist, a strange smooth surface over which she must toil forever.

And then, without warning, she broke through the mist.

In a pit dug into the heart of Callisto, illuminated by a single hovering globe lamp, Gemo Cana lay on a flat, hard pallet, unmoving.

Her brother stood hunched over her, working at her face with gleaming equipment. 'This won't hurt.

Close your eyes ...'

'Stop this!' Sarfi ran forward. She pushed her hands into Gemo's face, crying out as the pain of consistency violation pulsed through her.

Gemo turned, blindly. Hama saw that a silvery mask had been laid over her eyes, hugging the flesh there. 'Sarfi? ...'

Nomi stepped forward, laser pistol poised. 'Stop this obscenity.'

Reth wore a mask of his own, a smaller cap that covered half his face; the exposed eye peered at them,

hard, suspicious, calculating. 'Don't try to stop us. You'll kill her if you try. *Let us go*, Hama Druz.' Nomi raised her pistol at his head.

But Hama touched the soldier's arm. 'Not yet.'

On her pallet, Gemo Cana turned her head blindly. She whispered, 'There's so much you don't understand.'

Hama snapped, 'You'd better make us understand, Reth Cana, before I let Nomi here off the leash.'

Reth paced back and forth. 'Yes - technically, this is a kind of death. But not a single one of the pharaohs who passed through here did it against his or her will.'

Hama frowned. "'Passed through"?'

Reth stroked the metal clinging to Gemo's face; his sister turned her head in response. 'The core technology

is an interface to the brain via the optic nerve. In this way I can connect the quantum structures which encode human consciousness to the structures stored in the Callisto bacteria - or rather, the structures which serve as, umm, a gateway to configuration space

Hama started to see it. 'You're attempting to download human minds into your configuration space.'

Reth smiled. 'It was not enough, you see, to study configuration space at second-hand, through quantum structures embedded in these silent bacteria. The next step had to be direct apprehension by the human sensorium.'

The next step in what?'

'In our evolution, perhaps,' Reth murmured. 'With the help of the Qax, we have banished death. Now we can break down the walls of this shadow theatre we call reality.' He eyed Hama. 'This dismal pit is not a grave, but a gateway. And I am the gatekeeper.'

Hama said tightly, 'You destroy minds on the promise of afterlife - a promise concocted of theory and a scraping of cryptoendolith bacteria.'

'Not a theory,' Gemo whispered. 'I have *seen* it.'

Nomi grunted, 'We don't have time for this.'

But Hama asked, despite himself: 'What was it like?'

It was, Gemo said, a vast, spreading landscape, under a towering sky; she had glimpsed a beach, a rising, oily sea, an immense mountain shrouded in mist . . .

Reth stalked back and forth, arms spread wide. 'We remain human, Hama Druz. *I* cannot apprehend a multidimensional continuum. So I sought a metaphor. A

human interface. A beach of reality dust. A sea of -entropy, chaos. The structures folded into the living things, the shape of the landscape, represent consistency - what we time-bound creatures apprehend as causality.'

'And the rising sea -'

The threat of the Xeelee,' he said, smiling thinly. 'The destruction to come. The obliteration of possibility. Even there, threats can reach . . . but life, mind can persist.'

'Configuration space is real, Hama Druz. This isn't a new idea; *Pleh-toh* saw that, thousands of years ago . . . Ah, but you know nothing of *Pleh-toh*, do you? The higher manifold always existed, you see, long before the coming of mankind, of life itself. All that has changed is that through the patient, blind growth of the Callisto bacteria, I have found a way to reach it. And there, we can truly live forever -'

The ice floor shuddered, causing them to stagger.

Reth peered up the length of the shaft, smiling grimly. 'Ah. Our visitors make their presence known.'

Callisto is a small, hard, static world; it rings like a bell even at the fall of a footstep. And the footsteps of the Xeelee are heavy indeed

Sarfi pushed forward again, hands twisting, agonised by her inability to touch and be touched. She said to Gemo, 'Why do you have to *die*?''

Gemo's voice was slow, sleepy; Hama wondered what sedative agents Reth had fed her. 'You won't feel anything, Sarfi. It will be as if you never existed at all, as if all this pain never occurred. Won't that be better?'

The ground shuddered again, waves of energy from

some remote Xeelee-induced explosion pulsing through Callisto's patient ice, and the walls groaned, stressed.

Hama tried to imagine the black sea, the sharp-grained dust of the beach. Could it be true that Reth

was accessing some meta-universe of theory and possibility - a place where every dust grain truly did represent an instant in *this* universe, a frozen slice of time, stars and galaxies and people and Xeelee and unfolding cosmos all embedded within?

But Hama had once visited the ocean - Earth's ocean -to oversee the reclamation of an abandoned Qax sea farm. He remembered the stink of ozone, the taste of salt in the damp air. He had hated it.

Reth seemed to sense his thoughts. 'Ah, but I forgot. You are creatures of the Conurbations, of the Extirpation. Of round-walled caverns and a landscape of grey dust. But this is how the Earth used to be, you see, before the Qax unleashed their nanotech plague. No wonder you find the idea strange. But not us.' He slipped his hand into his sister's. 'For us, you see, it will be like coming home.'

On the table, Gemo was convulsing, her mouth open, laced with drool.

Sarfi screamed, *a* thin wail that echoed from the high walls of the shaft. Once more she reached out to Gemo; once more her fluttering fingers passed through Gemo's face, sparkling.

'Gemo Cana is a collaborator,' Nomi said. 'Hama, you're letting her escape justice.'

Yes, Hama thought, surprised. Nomi, in her blunt way, had once more hit on the essence of the situation

here. The pharaohs were the refugees now, and Reth's configuration space - if it existed at all - might prove their ultimate bolt-hole. Gemo Cana was escaping, leaving behind the consequences of her work, for good or ill.

But did that justify killing her?

The pharaoh turned her head.

Sarfi was crying. 'Mother, please. I'll die.'

'Hush,' said Gemo. 'You can't die. You were never alive. Don't you see that? You will always be with me, Sarfi. In a way. In my heart.' Her back arched. '*Oh . . .*'

Sarfi straightened and looked at her hands. The illusion of solidity was breaking down, Hama saw; pixels swarmed like fat, cubic insects, grudgingly cooperating to maintain the girl's form. Sarfi looked up at Hama with eyes like pits of darkness, and her voice was a flat, emotionless husk, devoid of intonation and character. '*Help me.*'

Again Hama reached out to her; again he dropped his hands, the most basic of human instincts invalidated. 'I'm sorry -'

'*It hurts.*' Her face swarmed with pixels that erupted and evaporated from the crumbling surface of her skin. Now the pixels fled her body, as if evaporating; she was becoming tenuous, unstable.

Hama forced himself to meet her gaze. 'It's all right,' he murmured. 'It will be over soon . . .' On and on, meaningless endearments; but she gazed into his eyes, as if seeking refuge there.

For a last instant her face congealed, clearly, from the dispersing cloud. '*Oh . . .*' She reached up to him with a hand that was no more than a mass of diffuse light.

And then, with a silent implosion, her face crumbled, eyes closing.

Gemo shuddered once, and was still.

Hama could feel his heart pulse within him, the warm blood course. Nomi placed her strong hand on his shoulder, and he relished its fierce solidity.

Hama faced Reth. 'You are monsters.'

Reth smiled easily. 'Gemo is beyond your mayfly reproach. And as for the Virtual child - you may learn, Hama Druz, if you pass beyond your current limitations, that the first thing to be eroded by time is sentiment.'

Hama flared. 'I will never be like you, pharaoh. Sarfi was no toy.'

'But you still don't see it,' Reth said evenly. '*She is still alive* - but our time-bound language can't describe it - she persists, somewhere out there, beyond the walls of our petty realisation

Again the moon shuddered, and primordial ice groaned.

Reth murmured, 'Callisto was not designed to take such hammer blows . . . The situation is reduced, you see. *Now* there is only me.'

'And me.' Nomi raised the laser pistol.

'Is this what you want?' Reth asked of Hama. 'To cut down centuries of endeavour with a bolt of light?'

Hama shook his head. 'You really believe you can reach your configuration space - that you can

survive there?'

'But I have proof,' Reth said. 'You saw it.'

'All I saw was a woman dying on a slab.'

Reth glowered at him. 'Hama Druz, make your decision.'

Nomi aimed the laser pistol.

'Let him go,' Hama said bitterly. 'He has only contempt for mayfly justice anyhow.'

Reth grinned and stepped back. 'You may be a mayfly, but you have the beginnings of wisdom, Hama Druz.'

'Yes,' Hama said quietly. 'Yes, I believe I do. Perhaps there *is* something there, some new realm of logic to be explored. But you, Reth, are blinded by your arrogance and your obsessions. Surely this new reality is nothing like the Earth of your childhood. And it will have little sympathy for your ambitions. Perhaps whatever survives the download will have no resemblance to *you*. Perhaps you won't even remember who you were. What then?'

Reth's mask sparkled; he raised his hand to his face. He made for the pallet, to lie beside the cooling body of his sister. But he stumbled and fell before he got there.

Hama and Nomi watched, neither moving to help him.

Reth, on his hands and knees, turned his masked face to Hama. 'You can come with me, Hama Druz. To a better place, a higher place.'

'You go alone, pharaoh.'

Reth forced a laugh. Then he cried out, his back arching.

He fell forward, and was still.

Nomi raked the body with laser fire. 'Good riddance,' she growled. '*Now* can we get out of here?'

There was a mountain.

It rose high above the night-dark sea, proudly challenging the featureless, glowing sky. Rivers flowed from that single great peak, she saw: black and massive, striping its huge conical flanks, merging into great tumbling cascades that poured into the ocean.

The mountain was the centre of the world, thrusting from the sea.

She was high above an island, a small scrap of land that defied the dissolving drenching of the featureless sea. Islands were few, small, scattered, threatened everywhere by the black, crowding ocean.

But, not far away, there was another island, she saw, pushing above the sea of mist. It was a heaping of dust on which trees grew thickly, their branches tangled. In fact the branches reached across the neck of sea that separated this island from her own. She thought she could see a way to reach that island, scrambling from tree to tree, following a great highway of branches.

The other island rose higher than her own above the encroaching sea. There, she thought, she - and whoever followed her - would be safe from lapping dissolution. For now, anyhow.

But what did that mean? What would Pharaoh have said of this - that the new island was an unlikely heap of reality dust, further from looming entropic destruction?

She shook her head. The deeper meaning of her journey scarcely mattered - and nor did its connection to any other place. If this world were a symbol, so be it:

this was where she lived, and this was where she would, with determination and perseverance, survive.

She looked one last time at the towering mountain. Damaged arm or not, she itched to climb it, to challenge its negentropic heights. But in the future, perhaps. Not now.

Carefully, clinging to her branch with arms and legs and her one good hand, she made her way along the branch to the low-probability island. One by one, the people of the beach followed her.

In the mist, far below, she glimpsed slow, ponderous movement: huge beasts, perhaps giant depraved cousins of Night. But, though they bellowed up at her, they could not reach her.

Once more Hama and Nomi stood on the silver-black surface of Callisto, under a sky littered with stars. Just as before, the low, slumped ridges of Valhalla still marched to the silent horizon.

But this was no longer a world of antiquity and stillness. The shudders were coming every few minutes now. In places the ice crust was collapsing, ancient features subsiding, here and there sending up sprays of dust and ice splinters that sparkled briefly before falling back, all in utter silence.

Hama thought back to a time before this assignment, to the convocations he had joined. He had been a

foolish boy, he thought, his ideas half-formed. Now, when he looked into his heart, he saw crystal-hard determination.

'No more pharaohs,' Hama murmured. 'No more immortality. That way lies arrogance and compromise and introversion and surrender. A brief life burns brightly.'

Nomi growled, 'More theory, Hama? Let's count the ways we might die. The Xeelee starbreaker might cream us. One of these miniature quakes might erupt right under us. Or maybe we'll last long enough to suffocate in our own farts, stuck inside these damn suits. What do you think? I don't know why you let that arrogant pharaoh kill himself.'

Hama murmured, 'You see death as an escape?'

'If it's easy, if it's under your control - yes.'

'Reth did escape,' Hama said. 'But I don't think it was into death.'

'You *believed* all that stuff about theoretical worlds?'

'Yes,' Hama said. 'Yes, in the end I think I did believe it.'

'Why?'

'Because of *them*.' He gestured at the sky. The Xeelee. If our second-hand wisdom has any validity at all, we know that the Xeelee react to *what they fear*. And almost as soon as Reth constructed his interface to his world of logic and data, as soon as the pharaohs began to pass into it, they came here.'

'You think the Xeelee fear us?'

'Not us. The bugs in the ice: Reth's cryptoendoliths, dreaming their billion-year dreams . . . The Xeelee seem intent on keeping those dreams from escaping. And that's why I think Reth hit on a truth, you see. Because the Xeelee see it too.'

Now, over one horizon, there was a glowing crimson cloud, like dawn approaching - but there could be no dawn on this all-but-airless world.

'Starbreaker light,' murmured Nomi. The glow must be vapour, ice splinters, dust, thrown up from the trench they are digging.'

Hama felt a fierce anger burn. 'Once again aliens have walked into our System, for their own purposes, and we can do nothing to stop them. This mustn't happen again, Nomi. Let this be an end - and a beginning, a new Day Zero. You know, perhaps the Qax were right to attempt the Extirpation. If we are to survive in this dangerous universe we must remake ourselves, without sentiment, without nostalgia, without pity. History is irrelevant. Only the future is important.' He longed to be gone from this place, to bring his hard new ideas to the great debates that were shaping the future of mankind.

'You're starting to frighten me, my friend,' Nomi said gently. 'But not as much as *that*.'

Now the Xeelee nightfighter itself came climbing above the shattered fog of the horizon. It was like an immense, black-winged bird. Hama could see crimson starbreaker light stab down into the passive, defenceless ice of Callisto. The shuddering of the ground was constant now, as that mass of shattered ice and steam rolled relentlessly towards them.

Nomi grabbed onto him; holding each other, they struggled to stay on their feet as ice particles battered their faceplates. A tide of destruction spanned Callisto from horizon to horizon. There was, of course, no escape.

And then the world turned silver, and the stars swam.

Hama cried out, clinging to Nomi, and they fell. They hit the ice hard, despite the low gravity.

Nomi, combat-hardened, was on her feet immediately. An oddly pink light caught her squat outline.

But Hama, winded, bewildered, found himself gazing up at the stars.

Different stars? No. Just - moved. The Xeelee ship was gone, vanished.

He struggled to his feet.

The wave of vapour and ice was subsiding, as quickly as it had been created; there was no air here to prevent the parabolic fall of the crystals back to the shattered land, little gravity to prevent the escape of the vapour into Jovian space. The land's shuddering ceased, though he could feel deep slow echoes of huge convulsions washing through the rigid ground . . .

But the stars had moved.

He turned, taking in the changed sky. Surely the shrunken sun was a little further up the dome of sky.

And a pink slice of Jupiter now showed above the smoothly curved horizon, where none had shown before on this tide-locked moon.

Nomi touched his arm, and pointed deep into the ice. *'Look.'*

It was like some immense fish, embedded in the ground, its spread-eagled black wings clearly visible through layers of dusty ice. A red glow shone fitfully at its heart; as Hama watched it sputtered, died, and the buried ship grew dark.

Nomi said, 'At first I thought the Xeelee must have lit up some exotic super-drive and got out of here. But I was wrong. That thing must be half a kilometre down. How did it *get* there?'

'I don't think it did,' Hama said. He turned away and peered at Jupiter. *'I think Callisto moved, Nomi.'* 'What . . . ?'

'It didn't have to be far. Just a couple of kilometres. Just enough to swallow up the Xeelee craft.'

Nomi was staring at him. 'That's insane, Hama, what can move a moon?'

Why, a child could, Hama thought in awe. A child playing on a beach - if every grain on that beach is a slice in time.

I see a line sketched in the dust, a history, smooth and complete. I pick out a grain with Callisto positioned just *here*. And I replace it with a grain in which Callisto is positioned just a little further over *there*. As easy, as wilful, as that.

No wonder the Xeelee are afraid.

A new shuddering began, deep and powerful.

'Lethe,' said Nomi. 'What now?'

Hama shouted, 'Not the Xeelee this time. Callisto spent four billion years settling into its slow waltz around Jupiter. Now I think it's going to have to learn those lessons over again.'

'Tides,' Nomi growled.

'It might be enough to melt the surface. Perhaps those cryptoendoliths will be wiped out after all. I wonder if the Xeelee *planned* it that way all along

He saw a slow grin spread across Nomi's face. 'We aren't done yet.' She pointed.

Hama turned. A new moon was rising over Callisto's tight horizon. It was a moon of flesh and metal, and it bore a sigil, a blue-green tetrahedron, burned into its hide.

'The Spline ship, by Lethe,' Nomi said. She punched Hama's arm. 'So the story goes on, my friend.'

Hama glared down into the ice, at the Xeelee craft buried there. Yes, the story goes on. But we have introduced a virus into the software of the universe. And I wonder what eyes will be here to see, when that ship is finally freed from this tortured ice.

An orifice opened up in the Spline's immense hide. A flitter squirted out and soared over Callisto's ice, seeking a place to land.

Exhausted, disoriented, Callisto and her followers stumbled down the last length of trunk and collapsed to the ground.

She dug her good hand into the loose grains of reality dust. She felt a surge of pride, of achievement.

This island, an island of a new possibility, was her island now.

Hers, perhaps, but not empty, she realised slowly. There was a newborn here: lost, bewildered, suddenly arrived. She saw his face smoothing over, working with anguish and doubt, as he *forgot*.

But when his gaze lit on her, he became animated.

He tried to stand, to walk towards her. He stumbled, weak and drained, and fell on his face.

Dredging up the last of her own strength, she went to him. She dug her hand under him and turned him on his back - as, once, Pharaoh had done for her.

He opened his mouth. Spittle looped between his lips, and his voice was a harsh rasp. 'Gemo!' he gasped. 'I made you! Help me! Love me!'

Something tugged at her: recognition - and resentment.

She held his head to her chest. This won't hurt,' she said. 'Close your eyes.' And she held him, until the last of his unwelcome memories had leaked away, and, forgetting who he was, he lay still.