

THE METRIC

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David lives in California with his family. After a very long absence, we're delighted to have him back in our pages with this thrilling story about deep, deep time and . . .

THE METRIC

The Ship
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The ship was a billion years old, and it was dying. The incalculable energies that had forced open the metric to permit its passage were all but spent, and now the relentless quintessence was taking over again: pulling the metric tighter, so that from instant to instant the needle-eye the ship tried to thread was that much narrower, the forces pulling the ship apart that much stronger. Fields that could have carried the ship intact through the event horizon of a stellar-mass black hole were tearing like dry paper; decks and bulkheads built to withstand the heat and pressure at the heart of a star were being ground away in a shower of exotic particles that decayed instantly to pure radiation and were gone.

The ship—whose name, in a language that had been dead for many long ages before its keel was laid, was *Thus is the Heaven a Vortex Pass'd Already, and the Earth a Vortex not yet Pass'd by the Traveller thro' Eternity*—had known when it set out that this was the most likely outcome; had argued, itself, for the impossibility of the task it had been asked to undertake, when they had woken it from its long sleep. Had gone to that sleep, so many millions of years past, expecting never to be woken, never again to be needed.

It had volunteered, all the same. It fought back now with shifts of mass, changes of geometry, striving with every trick learned in a long lifetime, thousands of voyages across millions of years, to protect its precious cargo; but the hungry quintessence tugged and the metric tightened like a knot, and there was just not enough space or

time left for the ship to exist in, any more. And now that its prediction was coming true, the ship felt—not bitter, certainly, but cheated; not by the ones who had sent it out, but by the quintessence itself, by the laws of physics, by the long life and the imminent, untimely death of the Universe.

The ship had hoped so much to see Earth one more time, before the end.

* * *

The city was called Septentrion, and in its current incarnation it was more than seventy thousand years old. It was said there were other cities yet remaining on the Earth, but it was long since word of any of them had been much more than rumor, and Septentrion was the oldest and the largest. Three-fourths of the remaining population of the Earth made their homes here within Septentrion's walls, where the mirrors and the latent heat of the world's core still kept land and sea free of the ice ten months of the year: thirty million of the living, tens of millions of motiles, millions of sessile ghosts inextricable from the fabric of the city, uncountable billions of computational and functionals, and this was not a tenth of what the city had held at its peak.

It was said that Septentrion was so old that when its first stones were laid, there were still stars in the sky. This was untrue and would have been untrue, had the city been a hundred times older; but it was certainly more ancient than any of the living could comprehend, and its origins, like those of the sun and the sky, the lake and the sea and the Earth, belonged to that deep time in which every ancient thing seems more or less contemporary with every other, and the age of all of them is the same, which is: unimaginable.

Piper and Petal Anchialine were born in Old South Port (which had not been a port in living generations, and which was more west now than south), in a house overlooking the 110° Canal. The twins were born a hundred days apart, Piper near the end of Frimaire and Petal at the beginning of Germinal, Piper into the Cricket sodality and Petal into the Primrose; and they were born among the living—which is to say they were biological creatures, their bodies symbioses of cells animal and fungal and bacterial, distinctions less important now than in earlier times.

Not all the living were born in the traditional manner, but the Anchialine twins were, and the forms they grew into, like those of their parents Swan and Cutter and Hare, would have seemed only a little strange to a living human of primordial days. They both had Cutter's compact bones, and Swan's straight hair (though Petal tended to wear it short these days, while Piper's was shoulder-length like Swan's), and if Petal had a bit more of Swan's quiet thoughtfulness and Piper a bit more of Cutter's fierce temper, they were in most respects as alike and close as twins could get; and (to Cutter's occasional chagrin, and Swan's secret delight) they had both inherited a full share of Hare's restless energy.

Piper was fifteen and Petal was fourteen, the day the ship came.

Thus is the Heaven a Vortex Pass'd Already announced itself in the early hours of the third watch, a flare of violet-white at the very edge of the empty sky, a sun-bright pinpoint that made the night into a brief, unnatural day, and buried itself in the mountains east of the city with a thunderclap that shattered windows in the outward precincts and sent brackish waves flowing backward up the canals.

The twins were awake, as it happened, though they were not supposed to be: both of them on the floor of their room in their nightclothes, playing a prehistoric count-and-capture game with haptic projected pieces. Petal was bored and starting to make up new rules, to Piper's increasing irritation, and at any moment one of their parents was going to come in and put a stop to the argument and the game both, when the light interrupted them.

Piper, reaching for a piece, thought at first something was wrong with the board, the pieces no longer substantial but ghostly, the board itself gone translucent, so that

the pattern of the floor showed clearly through; and then the floor brightened, and the walls, brighter and brighter, until the twins had to cover their eyes; all of this in total silence. And then the light was gone, more quickly than it had appeared, leaving them blinking at yellowish afterimages in the dark.

“What was that?” Piper said.

“I don’t know,” said Petal.

“I wasn’t asking you,” Piper said. “Halocline. What was that?”

Halocline, the ancient ghost of Anchialine House, did not immediately answer, and that itself was more frightening than the light. The ghost was far older than the Anchialine phyle, dating to the times when the house had been just one cell of a manufactory that ran the length of the canal, and if it was occasionally cantankerous, occasionally exasperated (particularly by the twins), by and large it treated the generations of Anchialines that filled the house as wayward but beloved grandchildren; and it could think and learn much faster than any living human.

“I don’t know,” the ghost said eventually. And then, sharply: “Get down.”

The twins, who were already as *down* as it seemed possible to get, looked at each other in the dark, eyes wide.

And then the shockwave hit: thunder, like a summer storm over the lake, but it went on and on, louder and louder until the twins covered their ears and buried their faces in their arms, and the whole house moved in a sudden convulsive jump that caused the floor to fly up and hit Piper in the nose.

The noise died away, and other noises began: shouts from inside the house and outside, alarms of various kinds, the sirens of City Response vehicles and the amplified voices of aerial sentinel motiles.

“All right, we’re all right,” Halocline said.

“Speak for yourself,” said Piper in a muffled voice.

“Piper’s nose is bleeding,” Petal said.

“Wipe it,” Halocline said, without much sympathy.

“What was that?” said Piper, sniffing.

“Something new,” said Petal.

* * *

2. The Stranger

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The ship was new, the first new thing in Septentrion in a long time. That it was a ship at all was something City Authority had to work out by the old process of eliminating the impossible to make room for the improbable, and then on discovering there were no impossibles left, backtracking to allow for the chance that City Authority might be wrong in its ideas of what was possible and what was not.

To most of Septentrion the metric was not even history but legend, and not the most popular or interesting legend; the long aeons of Earth’s isolation and the heaped millennia of city history piled fact upon fact and myth upon myth, so that even in children’s tales of adventure the city looked mostly to more recent times, and still thought them ancient.

Nor in all Septentrion’s hundreds of centuries had any in the city—any in their right minds, and in possession of all the facts—imagined they might see a ship again cross the gulfs that separated Earth from the invisible stars. The quintessence, the primordial dark energy—weaker in the early aeons than gravity, but by the birth of humanity’s sun beginning already to overcome it—was too strong, the metric long since too constricted, and most of those few in the city who remembered when the

metric's vertices had permitted passage—a handful of the most ancient and most baroquely elaborated computational, older than the city, inheritors of labyrinthine memory-complexes older still—would have guessed those passages closed long ago, the suns and worlds they connected sundered forever.

But evidence was evidence, and City Authority respected abductive inference over enumerative induction. A flock of aerial motiles, dared into venturing beyond the walls to overfly the new valley gouged into the foothills, reported *something* there, at any rate; and one of them volunteered the additional opinion that whatever it was, it was most likely either dead or in severe distress.

City Authority's duty was clear. It thought over its options, made a decision, and came to Hare.

There were not many in Septentrion in those autumn days who made a habit of leaving the walls of the city; and of those who did, there was not one among the living that had traveled half as far as Hare Anchialine. Hare, alone among Septentrion's living citizens, had been born under another name three thousand leagues away in Meridion, Septentrion's antipodal twin. At seventeen, Hare, with five companions, had left it and headed north.

Now Hare did the Anchialine accounts, and rode the Anchialine float in the annual Canal Parade, and played the ophicleide in the Old South Port clique's festival band, and in general played the part of a model citizen. But in the summer, Hare would lead expeditions of the restless or curious across the lake or into the mountains. And it was to those players at adventure that City Authority came now.

Piper and Petal, Hare and Cutter and Swan; half a dozen of Hare's students; and with them a living official from City Response named Tanner Campestral, and a motile from the Archive named Gauge Malpais. They were up before dawn of the second day after the ship's arrival, in that time when the city took care of all the tens of thousands of little things that needed taking care of, between one day and the next. Barges moved on the canals, cleaners and their attendant recyclers trotted industriously along the pavements, poking into doorways and under hedges; long trains of empty cars gathered at the trackline stations to wait for the morning's work. Of the excitement of two nights ago there was no obvious sign, unless it was that the dust from the mountains made the night mist that reflected the city's light fall a little heavier, that the first breeze from the east brought with it a hint of pine-smoke.

A City Maintenance train took them to the eastern gate, and through it, on a disused section of track reactivated for the purpose. A crawler, likewise from City Maintenance, took them through the abandoned exurbs and up into the hills. It was a route Piper and Petal had taken before but always on foot, when they would walk a day or more beside some disused exurban road, camping in the overgrown foundations of some long-gone structure, and then more days along game trails and old tracklines, up out of the empty plain. Now they rode, half asleep—they'd been up early, packing in the dark, Petal complaining of the hour and the cold until Hare offered the option of staying behind—watching the late-winter landscape roll by, dreamlike.

The crawler carried them up, the switchback paths they had taken on other occasions winding back and forth across hillsides just beginning to green, with some snow lingering on the northern slopes; over a ridge then, and down, into the basin that had not been there when last they climbed this way. It was a place of downed trees, needles and branches stripped, their trunks aligned with almost deliberate precision toward the center of the valley, where a little river ran over and through an obstacle course of rubble and tumbled logs, all of it lightly dusted with morning snow. It was always colder here, outside the focus of Septentrion's mirrors.

"There's nothing left," said Piper.

"We need to be sure," said Swan, and Cutter and Hare nodded. Swan was by five

years the oldest of the three, thin and wiry, barely taller than Piper and Petal, with a quick wit and usually a quicker smile, but serious now, as they all were. Cutter was a year younger than Hare and a little shorter, solid as the city and as generous. It was Cutter who at sixteen had convinced Anchialine House to open itself to Hare the starving traveler, and Swan who had made the case for Hare's citizenship to City Authority; and though they said nothing of this aloud, the three looked at each other and knew it was on all of their minds, as they looked to see what new stranded voyagers might have come to ask the city for aid.

The crawler came to a stop then, and Hare put the armor on.

The armor was what had kept Hare alive, on that journey around the world. It was millennia old, an heirloom of Hare's Meridionese phyle (*tagma* was the word Hare used), the product of crafts forgotten in peaceful Septentrion, or never learned. Its ghost was equally old, and clever. With the armor, Hare was stronger than any three of the living, and proof against fire and ice and thin air and deep water, and against thirst and starvation and exhaustion and despair.

The armor was a marvel, and on that long journey it had barely been enough. Of the six, all similarly equipped, who set out from Meridion, only Hare had reached their destination.

Of the ship itself, even seen through the armor's eyes, there was hardly anything left: a few splinters of feather-light metallic microlattice, none longer than a finger, arranged like the fallen trees in that same radial pattern, and some anomalous smudges of fullerene carbon.

"Is it safe?" Piper called from the door of the crawler, thinking of bugbears out of old stories: nanites, poisons, radiation, malign enchantments.

"Safe enough," Hare called back.

"Come on, Piper," said Petal, climbing out. "I'll race you."

With the challenge all of Piper's misgivings vanished, and in a moment both the twins were gone, down the slope and over the rough timber fast and sure as monkeys. The rest of the party followed after them, a little more carefully, with Hare at the rear most careful of all, mindful of the armor's extra weight and watchful for anything its eyes might have missed.

"There!"

Piper spotted it first: something small and bright, a red-orange speck against the burnt black earth. The twins chased each other down into the crater before Hare and the others could stop them, laughing and shoving each other as they ran.

"Me first!"

"I saw it first."

They reached it at the same time: a sphere that might have been rough stone or painted metal, etched with fine yellow whorls, barely larger than a closed fist. It sat atop a cone of fine dirt like a knee-high anthill—as if it had been buried in the crash, and burrowed its way out.

"Wait—" Piper said, suddenly cautious again; but too late. Petal had picked it up.

And there was someone there. Standing next to them.

Petal dropped the sphere in surprise—it rolled a little way down the anthill—and the stranger was gone.

"Where—" Piper began, looking around.

Petal scrambled down, picked the sphere up again, and the stranger was back.

A living person, or the appearance of one, of ancient form, brown, slender, exactly the twins' height, dressed in a simple red chiton, leaving arms and feet bare. Hair a puffball of black shading to copper; face proud, if unfamiliar, deep-set black eyes beneath a round forehead, nose long and straight, chin narrow and pointed.

The stranger looked at Petal and in a voice musical, serious, and urgent, said

something neither of the twins understood.

Petal looked at Piper, who shrugged.

The stranger said something else, in some other language, richer and darker, and waited; then when the twins didn't answer, a third, full of lilting tones and short nasal syllables. Then a fourth.

"We don't understand you," said Petal.

Hare and Gauge caught up with them.

"I do," said the motile. It hesitated a moment, and then said something to the stranger, in the first language the stranger had used. The stranger nodded.

"Can your armor translate?" Gauge asked Hare, who nodded.

The stranger repeated that first urgent sentence.

"What?" Petal demanded. "What is it?"

Hare and the motile looked at each other. The motile bobbed indecisively. Hare looked at the twins, head cocked, listening to the voice of the armor, and frowned.

Petal turned back to the stranger.

"Don't talk to it," Piper hissed.

"Hi," Petal said. "My name is Petal Anchialine."

The stranger glanced at Gauge, who said nothing.

"It doesn't understand," said Piper.

But Piper was wrong.

"Bring the message to your old machines," the stranger told Petal. "Speak to them." The musical, serious voice was the same; the accent was Gauge's, or Halocline's, the accent of the oldest motiles, of ghosts.

"What message?" Petal asked.

"This message," the stranger said. "The world is ending."

* * *

They took the stranger—who seemed less than clear on the concept of names but who agreed, after a conversation with Gauge in that old language, to answer to *Tirah*—back to the city. (Petal asked what the name meant, but Tirah ignored the question, and Gauge refused to translate, saying the word was too ambiguous.)

Septentrion's most ancient intelligences—Tirah's "old machines"—were not properly part of the city at all. They were in communication with the city's computational matrix, but predated it—predated Septentrion altogether, Gauge Malpais said, and perhaps the Earth as well, at least in its current form, belonging instead to that ancient age when there had still been stars in the sky, when light from distant galaxies had still reached the Earth and the quintessence had not yet stretched the gulfs between those galaxies wider than the observable universe: the age that had birthed the metric.

Tirah's first request—transcription to city tape, direct contact with those intelligences—was held for review by City Integrity, an agency of which Petal had never even heard. But there were places—the sacella—where a corporeal citizen could still address the ancient intelligences, and City Authority had granted Tirah provisional citizenship. The request for incorporation into the city's matrix being denied, Tirah had therefore requested a new body, built to specification. City Integrity objected to this as well, but—Swan argued, as Tirah's advocate—the ethics were clear, as were the precedents. City Authority could not without cause sentence a citizen, even a provisional one, to be carried around in Petal's pocket like a pet imp; nor could a citizen that desired to be motile be confined to some structure as a ghost; nor, without cause, could City Authority withdraw Tirah's status as a provisional citizen, once granted.

And so Tirah's new body—the image of the projection Petal and Piper had first seen on the mountain—began to grow, layer by layer, in one of the Archive's fabricaria; and while it was growing, Petal and Gauge would sit with Tirah in the salons,

or walk, Petal carrying the little sphere in one hand through the dappled leaf-shadows of the Archive gardens, Tirah's projection walking beside.

* * *

"You're spending all your time at the Archive," Piper said, sitting up.

It was true enough. Tonight Petal had come home late, late enough that Piper was already in bed.

"I *asked* you to come," Petal said defensively. "It's interesting. You'd think it was interesting, too, if you'd just come."

"*Interesting*," Piper repeated, making it sound like something obscene.

"Piper," Petal said, "this is important."

Piper fell back into the bedclothes, with an exasperated noise.

"This is the biggest thing," Petal persisted, "the biggest thing that's happened in our lifetimes. Maybe the biggest thing that's *going* to happen, now, *ever*. I'm not going to miss it. If that means spending all my time at the Archive, fine."

"*That's* not why you're spending all your time at the Archive," Piper said darkly, from somewhere in the nest of bedding.

"What's that supposed to mean?" Petal demanded.

But Piper wouldn't answer.

* * *

Tirah's message—"the world is ending"—was too huge a thing for Petal to take in, and the details, Tirah said, the explanations and justifications, required mathematics that Petal would need years to begin to learn. So mostly they talked of other things: Petal of the city and life in it, Gauge of the history and legend out of which Tirah came—and Tirah of those who had sent the message, and what they had given up in sending it.

The history Petal knew at least in outline: that once, when the quintessence had been weak, there had been stars in the sky, and worlds around those stars, worlds found, or made, as the people of those primordial times had gone out from this Earth, or one much like it; that they had built ships, magical ships the size of cities, to sail between those stars, almost as fast as light, and then faster. That as the quintessence grew stronger and threatened to tear those stars from one another they had knit and forged the metric out of space-time itself to hold them together. And that it had held, for an age as long as all the time before, linking the worlds of humanity by secret fast ways, even as the sky went dark.

But in the end, Petal also knew, even the metric had not been enough—the quintessence, pulling apart the nodes of the metric and pulling the metric itself ever tighter, had prevailed.

Hoddmímis Holt, the world that had sent Tirah, had been built perhaps two hundred million years ago, as Septentrion counted years; built when there were still stars in the sky, and when ships like *Thus is the Heaven* still plied the metric, knitting a web that spanned galaxies, even as the quintessence was drawing those galaxies apart, emptying the spaces between the stars to drown each galaxy alone in red darkness. It was a great city, as Petal understood it, built mostly of things more clever and more enduring than brute matter: noötic mass, dissociated fields, knots of space-time akin to the metric itself; and home only to purely computational intelligences, as far beyond the computational of Septentrion as the Holt itself was beyond Septentrion's towers of carbon and crystal.

The Holt was made in nearly full knowledge of the inevitability of the quintessence and the limitations of the metric, and made to last. Its makers poised it on the edge of a singularity with the mass of twenty billion stars, the core of a galaxy far from humanity's birthplace, a black hole so enormous that even light would take days to girdle its vast event horizon; and there it spun, balanced at the equilibrium

point between the singularity's hungry mass and the even hungrier quintessence.

"I wish I could see it, one day," Petal said.

"It's not possible," said Tirah.

"Because we don't have the ships?" Petal asked, turning to Gauge. "We could build one, couldn't we? We have the records, in the Archive?"

Gauge hesitated.

"Even if we could," it said, "you saw what happened to Tirah's ship. . . ."

"A stronger one."

"To force the metric open," Tirah said, "in these times, against the quintessence, takes an unimaginable amount of energy. The mass of your whole world, converted to energy, and its sun along with it, would not open the metric wide enough to admit a grain of sand."

"So you're stuck with us," Petal said. "You can't go home."

"You still don't understand," Tirah said. "The mass of Hoddmimis Holt itself only just sufficed to part the metric for a ship; and the ship did not survive."

"The mass of the entire habitat?" Gauge said.

"The habitat. And the singularity." Tirah's eyes were dark and deep. "The singularity, the Holt, and everyone in it. They sacrificed themselves, all of them, to send this message. And still, it almost wasn't enough."

"Why?" Petal asked. "What could be that important?"

"The world is ending," Tirah said. "The features of the metric that protect this space—any space—from the quintessence, are like loops knotted in a string. As the string is drawn tighter, the loops begin to slip—first little by little, then all at once. The knot is pulled tight, and the loops disappear."

"You came to warn us," Petal said. "But how can we stop it? What can we do?"

"Nothing," Tirah said. "Already the metric is stretched tight. Soon this loop will collapse."

"The world is ending," said Petal.

"How soon?" asked Gauge.

"Perhaps a few billion seconds," Tirah said. "Perhaps only tens of millions. Perhaps less."

"A few lives of the living," Gauge translated, "or perhaps only a season."

"That's how much time is left?" asked Petal.

"The computationals of Hoddmimis Holt could fit eternity in an instant," Tirah said. "These forms, bound by matter and time—" the projection gestured at Petal, at Gauge—"these forms cannot."

"Then why?" Petal asked. "Why even tell us about it, if there's nothing we can do?"

"This world will end," Tirah said. "But space and time will go on." Tirah looked at Petal. "If a new world is to be born, then space and time, too, must come to an end."

* * *

"There's something wrong with you," Piper said, as Petal was leaving for the Archive again.

"There is not," Petal said.

"There's a rogue process loose in your head," Piper said. "A parasitic replicator. That—*thing* put it there. It's taken over your brain and turned you into a functional."

"Shut up," said Petal.

"It didn't work on me," Piper said, "because I'm not *stupid*."

"We're twins," said Petal. "If I'm stupid, you're stupid too."

"Different wombs," Piper said. "Different neonatal environments. Also I'm a hundred days older than you, and everyone knows Primroses are *stupid*."

"Everyone knows Crickets are crybabies," Petal said. "So quit crying and shut up." And Petal left.

3. The Message $t_0 - 3.2369 \times 10^7$

After that Piper spoke to Petal less, if anything, and Petal spent even less time at home; and by the time Tirah's body was ready, Piper was hardly speaking to Petal at all.

City Integrity, in its objections to Tirah's incarnation, had gained one concession: before being allowed to enter one of the sacella and make Hoddmimis Holt's case to the "old machines," Tirah would first have to make it to City Authority. The room where Tirah was to testify was a semicircular chamber the size of a netball arena, right at the top of the Archive under a broad low dome. Gauge Malpais said the room had served some governmental purpose, once, long ago when the Archive had been a palace, and then it had been a reading room, later, in an austere period when scrolls and paper codices had been in fashion, but now it stood empty more often than not.

The desks were still there, though, in row on concentric row. Not all the desks were filled; Petal was disappointed. A hundred or so embodied citizens occupied perhaps a quarter of the seats: mostly the living, with a scattering of motiles. The ghost of the Archive was present as well, of course, and the reading room had its own genius loci, an ancient sessile intelligence, affiliated in some way with City Integrity, that Gauge called the Aedile; and according to them a few hundred computationals and functionals were attending via the Archive's systems. But that was all.

Piper, of course, had refused to come.

"Provisional citizen Tirah," the Aedile said, "you may begin your testimony."

The Aedile had produced a podium, an imposing thing from palace times, twice Petal's height, a monolith of mirror-polished blue-black set with seven silver stars in an asymmetrical pattern—an old symbol for the city, Gauge said.

Tirah ignored it, standing next to the podium, looking small and serious.

"Words will not convince you," Tirah told the audience, living and constructed and computational. "Not enough of you. Not in time."

Tirah looked directly at Petal.

"The truth must be shown."

Tirah's dark eyes were the sky.

The sky was full of stars.

There were stars everywhere Petal looked, and more stars in the spaces between the stars, and galaxies. It was a young sky, in a young universe, one that still echoed in microwave frequencies from the report of its birth; and if Petal looked hard enough into the spaces between the galaxies it was possible to see almost all the way back to the beginning of time.

Humanity was young, too, just a few million years into its great diaspora, ubiquitous in its home galaxy, but barely beginning to venture across the gulfs beyond. The quintessence was a scientific curiosity, its effects visible only at the largest scales and of interest only to cosmogoners and eschatologists.

The metric was not yet even a dream.

Tirah and Petal were born in a sphere habitat sweeping the circumstellar disk of an orange main-sequence sun less than a hundred million years old and less than a thousand light-years from humanity's birthplace. Tirah was ten years Petal's senior, and the most brilliant philosopher of the age. Petal was Tirah's best student.

They were collaborators, rivals, lovers. Their home was a place of coral cities in

warm shallow seas, golden plains dotted with wooden towns, towering low-gravity forests wreathed in permanent cloud. They climbed the trees in the tall forests and swam in the shallow seas and danced the carnivals in the towns, and all the time they threw ideas back and forth like jugglers' clubs. They took what humanity thought it knew about the shape and structure and history and future of the universe and pried it apart and put it back together into elegant new structures that were simpler and at the same time more fruitful than what had come before, the epicenter of a tidal wave of new physics and new engineering that rippled outward from the sphere habitat's orange sun and washed up on every inhabited shore.

Tirah was the one who first proved what humanity had long feared: that thanks to the accelerating quintessence, the end of time would come, not with an intruding collapse and the fiery birth of a new universe, nor with a long twilight and unimaginably longer darkness as the last stars were born and died and the last singularities evaporated—but with a violent breach, as galaxy was torn from galaxy, star from star, and in the end atom from atom and quark from quark, world-line from world-line, snapping the links of the causal networks that bound the vacuum together; and that this end would come, not in the uncountable eons of black hole decay nor yet the trillion centuries to the natural death of the last stars, but in a number of years measured in mere billions.

Humanity's cosmos, though still in its infancy, was doomed never to see old age.

But Tirah and Petal uncovered consolations in their work, discoveries that pointed the way to new modes of conveyance and communication, flowerings of knowledge that promised both to knit scattered humanity more closely together and to let humanity explore every corner of the young cosmos before it was taken away.

And there was their greatest invention, the most lasting, the inspiration that would give humanity the ability to tie galaxies and stars and worlds together even as the universe was torn apart around them, and cheat the quintessence, for a time: the theory of the metric.

So despite the somber truths they had uncovered, it was said of Petal and Tirah, as they grew old together, that they had done more for the inhabitants of humanity's brief-lived universe than anyone could ask.

But Petal had one last discovery to make. Petal, who had never been willing to surrender to fate, never been willing to admit that mortality was inevitable: Petal, in Tirah and Petal's old age, was the one who proved that the darkness and isolation of the quintessence need not be the end.

It was a known result, so old as to be almost forgotten among the bones of the earliest discarded cosmologies, that the far future of a flat universe—smooth and dark and empty after the last matter was gathered into the last singularities and the singularities themselves had finally evaporated in the slow trickle of virtual particles through event horizons—was mathematically isomorphic to the universe's distant past: similarly smooth, similarly empty of matter yet filled with energy; but radically different in scale—the unimaginably large, mirroring the unimaginably small.

Petal showed that the same would hold true of the far future of the quintessence—not an empty universe, but a universe of furious energy, its edge receding so quickly that light, if there were still light, could not cross the width of an atomic nucleus before the expansion of space itself would stretch that distance to infinity. Petal proved that the infinite distances, the infinite divergence, the causal rupture implied by the quintessence portended not a cosmos of infinite scale, but a cosmos *without* scale: a cosmos of distances that, because infinite, were immeasurable, and because immeasurable—meaningless. Small and large would become one. The same physical mechanism that would tear the cosmos apart, Petal demonstrated, would provide the transformation mapping the final singularity of infinite expansion onto the initial

singularity of infinite compression.

Petal was the one who showed that beyond the end of their universe was a new beginning. That if, as Tirah had told Petal and Gauge in the gardens of the Archive, time and space were to come to an end—still, a new future lay beyond.

Petal was the one who gave them hope.

But as long as the metric was in place—Petal’s mathematics also showed—the divergence could never go all the way to infinity. Even in its final state, with Earth and all the homes of humanity torn apart, the metric’s nodes collapsed to lifeless, dimensionless points, the vertices that linked them pulled to threads narrower than a photon and stretched beyond the edges of any observable universe, the metric would remain, the nodes would remain causally connected, and distance would still have meaning. The old cosmos, though uninhabited, uninhabitable, stretched and twisted beyond recognition, would never truly die, and the new cosmos would never be born.

But that fate, Petal was sure, would be averted by a later age. When the metric no longer served to link the worlds, but—for a time—still provided them a bulwark against the quintessence, the last custodians of the metric would break it down. They would trade those worlds’ last days for the possibility of a future.

The old universe would pass away, and the new would be allowed to begin.

* * *

Petal, in the old reading room at the top of the Archive, knew this was fiction. Recorded lives—real and reconstructed and invented, with more or less structure, more or less control, more or less agency—were not rare in the city, and Petal had lived enough of them to recognize this one for what it was.

There had never been a Petal or a Tirah born circling an orange sun under a star-filled sky. The reality of the quintessence and the theory of the metric were too complex for any one living mind to contain, let alone invent; humanity had come to know both through the patient accumulation of knowledge over centuries, the slow work of generations of synthesis, not through the flash of insight of some solitary genius or even some pair of geniuses. “Petal’s” final inspiration—the potential for the birth of a new cosmos out of the fatal, final unraveling of the world-lines of the old, and the necessity of the dismantling of the metric, if that unraveling was to be completed—had not been known at all to ancient times; only in the long dark time after the ascendancy of the quintessence, the constriction of the metric and the final diaspora, had it been discovered, and even then not by the living nor yet by the calculating minds of computationalists such as lived in Septentrion’s city systems, but by the massed intellect of Hoddmimis Holt, as far beyond Septentrion as the city was beyond the bees in Cutter’s garden.

Even now the mathematics of it, that only moments ago had seemed so clear, so much Petal’s own, were vanishing from Petal’s mind like frost in sunlight.

But Petal understood the conclusion.

There was one place—here, at the nexus where all the metric’s strands wound together; here, on this world built in memory of humanity’s birthplace—one place where the knot of the metric could be cut. Here.

The Earth, Petal knew, had to be destroyed.

* * *

The sacella were placed under guard. Tirah was confined to the Archive grounds. Gauge was allowed to visit, and Campestral, and a few others—mostly motiles in the service of the Archive, or of City Integrity. Petal was not among them.

“Well?” Petal asked Gauge, after one of the latter’s visits.

“We spoke about city history and city governance,” Gauge said. “I answered Tirah’s questions as best I could and showed how to invoke an archivist to learn more. After that we hardly spoke.”

"It's not fair," said Petal. "They can't just keep someone locked in the Archive forever."
 "The Aedile says they can," Gauge said. "But I wonder."

They were on a terrace above the great square of Limit Cardinal. Below them was a makeshift camp, a few dozen shelters, some of those who had been in the audience for Tirah's testimony, and more who had only listened to those who had. Projections twisted in the air above them: abstract geometries, meaningless in less than five dimensions, that nonetheless plucked at Petal's mathematical dream-memories of the metric and the quintessence—or crude political graffiti, stylized City Authority figures performing acts anatomically improbable for any of the living, and meaningless to the Authority ghosts. There was chanting. There was music.

"Can it be done?" Petal asked. "What Tirah wants, I mean."

"Tirah seems to think so," Gauge said. "The Archive ghosts think it's likely that the machines that manage the metric still exist, among those that could be reached through the sacella."

"Would they do what Tirah asked?" Petal said.

"I don't know," said Gauge. "But apparently City Authority doesn't want to find out."

"They can't keep Tirah locked away forever," Petal repeated. "These citizens won't allow it. They want Tirah to be heard."

The motile's smooth head moved in a birdlike sideways bob, not in disagreement, but not in complete agreement either.

"Some of them want that," Gauge said. "Some of them want to dismantle City Authority and institute distributed governance. Some of them want heat rationing. Some of them want incarnation rights for functionals. Some of them want *disincarnation* rights and city tape allocation for motiles and biologicals. Some of them want the Corn Divinity to bring back the Moon."

"The *what* to do *what*?" said Petal.

"Never mind," said Gauge.

"They want change," Petal said.

"Or they want things the way they used to be," Gauge said.

"Is that so bad?" Petal asked.

"No," the motile said. Its head moved again. "But I don't think it's possible."

They were silent for a little while, looking out over the camp, watching the twisting mathematical shapes.

"What did you see?" Petal asked quietly, still watching the projections. "At the Archive, I mean, when Tirah testified."

Gauge took some time to answer.

"I think the message was the same," it said eventually. "What form it took—what Tirah meant to say to each of us, what each of us brought to it . . ." The motile made an equivocal gesture. "Who knows?"

"But the message—" Petal asked—"was it true?"

"I think we all saw what we all saw," Gauge said.

"You know what I mean," Petal said. "Was Tirah telling the truth?"

"What is the truth?" Gauge asked. "I spoke to some computationals who attended. They agreed that the mathematics seemed compelling. But also that what Tirah showed us—what Tirah showed them, even, vastly more complex and detailed than what you and I saw, I'm sure—was only a simplification, an approximation. Not even an approximation. An analogy. A toy model, to demonstrate certain aspects of a theory. Does the theory represent the truth?" It made the equivocal gesture again. "They couldn't say."

"If what Tirah told us is true . . ." Petal began.

"If what Tirah told us is true," Gauge said, "we're unlikely to live long enough to invent the science that would let us build the instruments that would let us perform

the experiments that would tell us whether what Tirah told us is true.”

“But if what Tirah told us is true,” Petal said again—“would you do it? Would you break down the metric?”

“Would I break down the only thing protecting us from the quintessence, you mean?” Gauge asked. “Would I destroy the world?”

“If you want to put it like that,” Petal said.

“If it was true?” said Gauge.

“If you *knew* it was true,” said Petal. “If you knew the world was going to end anyway. Tomorrow, or next week, or next year.”

The motile was silent. Petal watched the twisting shapes, and listened to the chanting crowd. The chant was always changing but was still hypnotically deterministic, the output perhaps of some uncharacteristically articulate functional.

“I don’t know,” Gauge said, finally. “If I was there, at the end—if I knew, if I was certain—I suppose I would. Why not?” It looked at Petal. “But what if you didn’t know? What if you *couldn’t* be certain? Would you do it then? That’s the difficult choice.”

Petal had no answer to that.

“Piper said—” Petal began, and hesitated. “Piper said Tirah put something in my head. Like a trophic facilitator, or an epistemic façade.”

“I wouldn’t worry about that.” If the motile had had a face, Petal thought, it might have smiled. “I’m sure City Integrity would have noticed; and that sort of thing is much harder to do than Piper probably thinks, anyway,” it said. “Much harder, especially, to do to the living.”

“I suppose,” Petal said.

Gauge looked down at the crowd.

“I don’t think Tirah understands the living that well, really,” it said. “Or any of us, for that matter, decadent throwbacks that we are. I’m sure we’re not what Hoddmimis Holt expected to find, when they sent Tirah here.”

“They probably expected something like themselves,” Petal said.

“Exactly,” said Gauge. “So Tirah has had to improvise. But the only thing put into your head—” the motile tapped its own—“is an idea. What to do with that idea . . .” It made that gesture again.

. . . *is up to me*, Petal thought.

Aloud, Petal said, “Will you give Tirah something?”

“I don’t see why not,” Gauge said.

It took the offering: a crystal globe, small enough to be enclosed in one hand, its inner surface ringed in projected blue and brown and green, dotted with swirls of white cloud, the whole lit by some unseen source with a glow of sunrise orange. On close inspection the green resolved into cloud forests, the brown to golden grass. And on the crystal’s shadowed side, almost invisible, were the reflections of stars.

“It’s very pretty,” Gauge said.

“Halocline helped me make it,” Petal said. “Will you take it? Please?”

“Of course,” said Gauge.

“I just want Tirah to know I haven’t forgotten,” Petal said.

* * *

“You’re going to get caught,” said Piper.

Petal hauled the armor down from the shelf where Hare kept it. In its boxy stored form it was surprisingly light, though awkward.

“Are you going to tell on me?” asked Petal.

“No,” said Piper. “But you’re going to get caught.”

It was two nights later. Tirah had accepted Petal’s gift, Gauge had said, but had given the motile no message.

"At least I'll get caught *doing* something," Petal said, and shut the door in Piper's face.

The first part of putting on the armor you had to do yourself: unfolding the gray slab butterfly of the vest, head through the collar; heavy tails swinging loose at front and back. Fingers down into the gloves, toes down into the boots.

—*Cadet Petal Angyldsbearn*, the armor said.

The voice of the armor was a little like Hare's but dispassionate and precise, without Hare's warmth but also without judgment or impatience. Its name was *Castre*, which Hare had told Piper and Petal meant *Rook*.

Its voice wasn't really a voice, most of the time; most of the time it was only in your head. Likewise you didn't really have to talk for *Castre* to hear you, just think about talking.

—*Castre*.

—*I am authorized to protect you in emergency situations*, *Castre* said.

It spoke the language of Meridion, or one of them—Hare said there were two, the tribunes' speech and the cohorts'. *Castre* was of the former; the name it gave Petal, *Angyldsbearn*, was of the latter—Hare's birth-name had been *Angyld Haemedsbearn*. But the tribunes' speech was not far from that of Septentrion's older ghosts and motiles, like *Gauge* and the *Aedile*, and *Castre* had been in Septentrion for a long time.

"This *is* an emergency situation," Petal said—aloud, but quietly, and in the privacy of the helmet. The armor moved then, helmet and collar locking, the vest closing around Petal like a live thing—Piper had never liked that, when Hare had let them try the armor, had thought it was creepy, but to Petal it was comforting, like a parent tugging a child's jacket down. Like being held.

Petal crept out of *Anchialine House* and down to the canal, silent as only the armor could be, and invisible even to the City's senses. The water in the canal was rippling glass, black and empty as the sky except where it reflected the watch-lamps of the houses above. Petal shivered, momentarily, inside the armor, imagining the quintessence already victorious, the canal a fissure in the Earth, the night welling through like a live thing.

And then Petal looked to the horizon, where the globe *Halocline* had helped make for *Tirah* glowed in the armor's sight, pinpointing *Tirah's* location through buildings and walls and fields.

Petal gathered the armor's strength and leapt.

* * *

4. The Lake

t₀-3.0157×10⁷

They all thought it was Hare's fault. *Swan* thought so, *Cutter* thought so, Hare thought so. The only one who knew better was Piper, and that was because Piper knew it was Piper's fault. *You'll get caught*, Piper had said, but Petal hadn't been, Petal had gone straight up over the wall of the *Archive* like some thief in a children's story and stolen *Tirah* right out of it, back over the wall and gone. And now Petal was gone, and Hare's armor which Petal had been wearing, and *Tirah* was gone, too, not to be found anywhere in the city, according to *City Oversight*. And they'd stolen a boat, a fast one, and *City Oversight* should have been able to find that, but it couldn't, and Hare said that probably Petal and *Tirah* had disabled the locator, which the armor could have shown them how to do. And there were *City Response* boats out, and flyers, but if Petal and *Tirah* had just pointed their boat straight across the lake and told it *go*, there was no way the *City Response* boats were going

to catch it, and the weather was getting bad for flyers. Gauge, the Archive motile, said that once there would have been eyes higher up, eyes that could have seen the boat from space, weather or no weather, but that like the mirrors they'd one by one drifted out of position and nobody'd seen any urgent need to replace them. And so Petal and Tirah had got clean away, and nobody knew where they were going. Except Piper.

"Meridion," Piper said. "They're going to Meridion."

They'd all gone after them, Hare and Cutter and Swan, and Gauge, and Tanner Campestral from City Response.

And Piper had come, too, which the rest discovered when their boat was two hours out and a dozen leagues from the city.

"I left a note," Piper said.

"And you think that makes it all right?" Swan said.

"It's not fair," said Piper. "Petal's the one who stole Hare's armor and broke into the Archive. I haven't done anything wrong."

"Yes, you have," said Cutter, "and we're turning around."

"You can't," said Piper. "You're four hours behind Petal already."

The boat flew over the black water. Hare looked back, toward the city, already vanished in the wintry haze, and then forward again, out toward the southern horizon and the wind-whipped waves, flecked with white.

"Every hour we lose," Hare said, "our chances of catching them get that much worse." And so Piper stayed.

And now they were arguing, Campestral with Piper's parents and all three parents with each other.

"Meridion!"

Piper had to repeat it twice more, louder each time, before the adults would leave off arguing and turn to listen.

"It makes sense," said Hare.

Campestral looked at Gauge.

"Hare knows Meridion best," the motile said. "But it's old, like Septentrion, and like Septentrion its roots are very, very old. Whatever Tirah meant to do here, I imagine it could be done there."

"Would Meridion City Authority let them in?" Swan asked.

"They'd have to pass the tagmata first," Hare said. "I don't know. It might, it might not."

"Tirah," Gauge said, "can be persuasive."

They all fell silent.

"We'll be on the southern shore in another hour," Gauge offered. "I'm sure we'll overtake them before nightfall."

But they didn't.

* * *

There was no harbor on the south shore, not that Petal could see, no sign of civilization whatsoever, only a long stretch of gray gravel beach and behind it low dunes topped with scraggly dry grass, its yellow so faded it was hardly more colorful than the gravel. In the end Petal just had the boat run itself straight into the shallows, the keel grating on the bottom and the whole boat finally tipping over sideways, half a cable from the shore.

Petal hopped over the rail into water waist deep, expecting cold, but in the armor it was like the water had no temperature at all. There was a slight hesitation in the armor's movements, as it pushed through the water, and the faint scraping of boots in gravel, transmitted through layers of insulation, but that was all.

"I'll carry you," said Petal.

"No need," said Tirah, slipping into the water with hardly a splash. Petal was taller

now, in the armor, and the water came halfway up Tirah's chest.

"You're not cold?" Petal asked, watching the water soak through the top of Tirah's tunic, right up to the collar.

"The water is close to freezing," Tirah said. "But that temperature is well within this body's tolerances."

"It's just as well. I didn't think to bring warm clothes." Petal looked back, into the fog, in the direction of the city. "I didn't think much at all, really." Petal sighed. "I just did it."

"We should keep moving," Tirah said.

"We should," Petal said. "And it'll still be faster if I carry you."

They made it to the shore in three parabolic bounds, and Petal only dropped Tirah on the first one, and then not really, the armor itself taking over before they could lose their balance; on the second jump Petal was ready for the awkward footing, landing in the water and the loose gravel, and by the third they were on the beach. Petal kept on holding Tirah, sometimes with one arm, as they clambered over the dunes. To the armor, the weight of Tirah's body was nothing.

Beyond the dunes they came to a plain, the dry grass no more than ankle-high and stretching as far as the eye could see, under a gray sky. The sun was somewhere low in the west, invisible in the fog; one mirror was still overhead, a narrow, skewed oval of brighter gray.

"Which way?" said Tirah.

Petal cycled through the armor's vision modes, infrared and image-enhancement and passive and active radar. There was nothing but grass.

"South," said Petal, trying to sound confident. "We go south."

A fine, almost dry snow was beginning to fall.

* * *

They found Petal's boat as the last mirror was setting, a line of lurid red low over the water. By then Piper was tired, and it was very cold. Hare ran their boat up next to Petal's, keel raised—apparently Petal hadn't known how to do that—and had it hold itself in place with the impellers, as Hare and Campestral clambered over the other boat's railing to its sloping deck. Snow was starting to pile up against the side of the wheelhouse.

"Gone," Hare pronounced. "Cutter, tell that boat to back off a little; I'm going to see if I can get this one righted. Campestral, hold on to something."

Piper and the others watched from a safe distance as, Hare retracting the keel, Petal's boat tilted and slid and finally splashed down level, its prow slewing around sideways, before Hare and Campestral got it pointed in the right direction and headed toward shore. Then they followed.

They got both boats to push themselves as far up the gravelly shore as they would go; and Gauge, which said it didn't mind the wet, climbed out in shin-deep water and helped each of them out and onto dry land, such as it was: icy, with new snow crunching under their boots. It was full dark now, the only illumination from the boats' lamps, and the smaller lights Campestral and Piper's parents had clipped to their City Response jackets.

From the boat, Gauge produced packs, for itself and for the adults. They didn't have armor like the set Petal had taken—no one in Septentrion had armor like that, any more than they had spears or siege engines or ironclad warships. Piper's parents and Campestral had City Response suits, with environmental liners and smart collars that would keep them alive in a fire or a flood or an avalanche. Piper just had an insulated jacket and winter boots, and a smaller pack, containing a somewhat random collection of things that had seemed as though they might be useful: climbing kit, water bags, a survival blanket, a warmer hat, a box of Petal's favorite tea, a change of underwear. Now it seemed pitifully inadequate. Even the hat wasn't warm enough.

Hare and Campestral went aside and spoke to one another in low voices, words Piper couldn't hear over the slap of the water against the sides of the boats. Then Campestral headed up the beach, disappearing out of the arc of light cast by the boat lamps, and Hare came back, alone.

"This way," Hare said.

"Won't the snow cover their tracks?" asked Piper.

"I'm sure it already has," Swan said.

They followed Hare up into the dunes. The snow was heavier now. Piper watched it falling, in the glow of the jacket lamps, and tried not to stumble. To the sides Piper saw snow, dry grass, more snow. Piper's own feet were lost in the darkness.

Piper saw Campestral's light first, and then a Campestral-shaped hole in the snow, and Campestral's face, or rather a horizontal band of it, between a high collar and a hat pulled down low.

"How far down do your eyes go?" Campestral asked Gauge.

"Ten microns or so," Gauge said. "I can see your face quite clearly. What there is of it."

"Good."

"You're hoping I'll be able to see them," Gauge said. "I can't, in this." Gauge gestured at the falling snow. "Not from any distance. We'd practically have to trip over them."

"Let's hope we do, then," said Hare. "Or that it lets up. Come on. Piper, stick with Swan."

They set out, trudging across the snow.

* * *

Petal and Tirah made more than twenty leagues that first day, the flat land of the lakeshore giving way to rolling hills, and there was just no reason to stop, not when Petal didn't feel tired, not when the going was so easy, and Tirah so light in Petal's arms. Petal could have kept on, continuing into the dark. But the scale of what they'd done, what Petal was committing to, was starting to sink in.

They'd outrun the storm, or it had passed over them, and they were under a clear black sky with only a faint dusting of silver sparks, very high up, that Tirah said was probably debris from colliding mirrors. The snow was smooth and very flat and seemed, through the armor's eyes, to shine with its own light.

"What will it be like?" Petal asked—meaning the new cosmos. "Will there be stars?"

"Not to be known," Tirah said. "It might be the same. It might be different. What's most important is that it will *be*."

Petal's hand sought and found Tirah's.

"I'm glad you're here," Petal said.

Tirah said nothing.

They couldn't really touch, not through the armor, and in this cold the armor wouldn't have opened if Petal had asked. But it was almost as though they could.

Three thousand leagues, Petal and Tirah, just the two of them.

And at the end of it, the end of the world.

Well, Petal thought, *we've been alone before*. Remembering the warm light of the sphere habitat, the high trees and the seas of golden grass.

It was a lie at worst, at best a dream, but Petal clung to it anyway.

They lay there, under the black sky, and before long the armor let Petal sleep.

* * *

They didn't find Petal and Tirah that night. They lasted about three hours, in the dark, as it grew colder and colder, and by the time they stopped they were in snow up over the tops of their boots, and Piper's toes were numb. Hare and Campestral went off again, with Cutter this time, and this time it sounded like an argument.

"W-what do you think t-they're arguing about?" Piper asked, teeth chattering.

"Whether to stop or k-keep going?"

"Gauge could keep going," Swan said. "Maybe Hare could. Maybe Cutter. But you can't, and I'm fading."

Hare came back, pack dangling from one hand, Cutter following behind.

"What now?" asked Swan.

We go back, Piper thought, for a moment—hoped, almost—Hare might say.

But Hare didn't. Hare didn't say anything. Nor did Cutter, or Swan.

And Piper thought about what it would be like, back in their room at Anchialine House, with Petal's bed empty, neatly made, to stay neatly made and empty forever.

"We keep going," Piper said. "Right?"

Hare looked at Swan and Cutter.

"We keep going," said Cutter.

Swan nodded.

"All right," said Hare. "But for tonight, we're done. Piper, help me with this tent."

They unpacked it and laid it out on the snow, an adjustable structure that could collapse down to shelter just one bedroll, or open to a comfortable bunkhouse for a dozen people. By unspoken agreement, they kept it small.

"I'm s-sorry," Piper said, still shivering, as they waited for the shelter to inflate.

"For what?" asked Hare.

"For slowing you d-down."

Hare took off the City Response jacket and wrapped it around Piper's shoulders.

"You're not," Hare said, holding Piper tight. "We'd have to rest soon anyway. Besides, the armor has thermal camouflage, and that body Petal's friend's wearing is like a motile's; it'll be barely above ambient temperature. We were never going to find them tonight. Not if they didn't want to be found."

In the shelter, in the dark, the four of them packed tightly together, Piper nestled between Hare and Swan, Piper said:

"So we're counting on Petal to give up."

Hare sighed. "I suppose we are."

Piper said, "That might not happen."

Hare said, "I know."

* * *

5. The Ice

$t_0-3.0132 \times 10^7$

The flat plain of the lakeshore gave way to rolling hills, and the hills piled up into something like mountains, but low and rounded, slumped under the weight of time. At first there were trees, stunted evergreens in protected gullies, clinging to the slopes that faced the sun or Septentrion's mirror-track, and once or twice Petal saw birds, or even some small ground-dwelling creature, camouflage-white against the snow but marked for the armor by the warmth of its breath in the cold air. But the mirrors narrowed from circles to ellipses to hairline scribbles of light and then disappeared altogether, so there was only the sun, a cold white circle low over the horizon ahead of them, and the birds and small animals vanished, and the trees dwindled away to nothing, and the grass, and one day—the first of *Geminal*, Petal's birthday—they crossed a ridge swept clear of snow by the wind, and there was just a jumble of gray-black rock, the bones of the old mountain shattered into a million hand-sized fragments.

And they came down the other side of the ridge, and there it was, flat and unbroken as far as the eye could see: the ice. Tirah said it most likely covered the whole

world, apart from the mirror tracks, and perhaps a narrow band near the equator, and Castre—whose route they were following now, the route Hare, hardly older than Petal was now, had taken north—agreed.

In Hare's tales of the journey to Septentrion—in the handful told to the twins, at least, and it was only a handful, so few that Petal could almost count them—there was rarely danger, and never any sense of fear. Even the dangers—cyclone storms of hail and lightning, brittle icefalls a kilometer high, pocket gardens inhabited only by mad ghosts and hostile automata—were described sometimes as wonders, sometimes as obstacles, but mostly as brute phenomena.

Mostly there was strangeness, and sometimes beauty, and always an immense emptiness. Of Hare—of any living witness, anyone to be made lonely by the solitude or small by the inhuman scale of the empty world—there was hardly a trace. *We did this*, Hare would say, or *I did that*, matter-of-fact. *We cleared the bridge. We scaled the cliff. I broke through the ice.* What Hare had felt, then, or how Hare felt now, remembering, was not part of the story.

Of Hare's companions, how they had died, Hare would say very little. Only once, when Petal had pressed, Hare had said: *We told ourselves we were the most dangerous things on the ice. And we were right.* Piper and Petal had argued about what Hare had meant. And now Petal wondered.

It was easy, in the armor, to forget you were tired. Some of that was the strength it gave you, the easy movement, the way a step so effortlessly became a leap, a walk so effortlessly a run. It kept you fed, too—or the equivalent, the armor inserting itself into the cellular respiration process, providing its own stored power in place of the energy ordinarily released by glycolysis and phosphorylation—and hydrated. But it did something to your blood, as well, taking on some of the work that would ordinarily be done by your renal and digestive systems, so that you never had to go to the toilet and never had to throw up, and in the process—Castre had told them once—it adjusted the mix of your hormones and neurotransmitters to keep you alert and keep you committed to the mission.

Piper had been frightened by that, but Petal hadn't. It was like making a promise, Petal reasoned; making a promise, and then taking steps to be sure you couldn't break it, later, in some moment of weakness, even if you wanted to. And what was wrong with that?

So long as you promised to do the right thing.

* * *

Over days, then weeks, they fell into a routine, and Petal fell into a marching rhythm, step by crunching step, at what the armor said was the most efficient pace, on this slippery, uneven ground. At any distance the packed snow looked flat, but close up it was a world of its own, a million tiny ridges, valleys, ranges, and plateaus, so that it was easy for Petal to lose all sense of scale, to hallucinate for long minutes that they were giants together, striding across that landscape leagues at a step. And there were colors: purples and grays and blues in the shadows, but new colors too that Petal had never seen. It had never before occurred to Petal that there might be such things as different shades of white, but there were.

It was not all flat and empty. There were crevasses, cracks in the ice, some of them quite wide, so that Petal and Tirah had to search a league or more up or down before finding a spot narrow enough to jump. And sometimes there wasn't any place Petal could jump, even in the armor, and they had the more arduous task of finding somewhere to climb down and back up again—with the help of the armor's strength, but carrying its weight as well, and sometimes Tirah's, a tricky problem of shear forces and friction and balance. There were mountains, only the wind-worn black peaks visible above the ice, barren islands in a frozen sea. Once they did cross a

frozen sea, or perhaps a lake, green ice smooth as glass swept clean by the wind, and in the depths—Petal thought, though Tirah said it was imagination—there was the outline of some vast ship, its superstructure like the skyline of a sunken city. And once there was a city, or anyway a single tower, so tall they walked in its shadow for most of an afternoon: a glittering, tapering gray thing of angles and curves, in appearance more carved than built. The armor said that it went cables and cables down into the ice and that there was still heat, some power source deep inside, and Petal took twenty minutes to circle it looking for an opening, while Tirah tried on every frequency to find an active ghost or some working computational; but there were no doors, no windows, and no answers, and eventually they moved on.

Most commonly, where the armor's charts gave the names of towns, rivers, countries, there was nothing; only ice, from horizon to horizon. They kept going.

Sometimes they marched in darkness, and that was its own different world, the black sky above and the snow below flat and abstract in the armor's night eyes. More often after fifteen or twenty leagues they'd stop, and Petal would fall asleep hand in hand with Tirah, listening to Tirah's voice, as Tirah spun stories of the long-ago days of stars and galaxies, or of the metric's heyday, when a million worlds held tight against the quintessence, or of the all but incomprehensible computational life of Hoddmimis Holt in its long twilight. And Petal would dream of orange light and golden fields, sunlit brown feet dancing on sunlit brown wood.

Then the wan sun would come up, and they'd start again.

* * *

They were nearing the halfway point when they found the message.

After a hundred and seventy days on the ice, it had begun to thin, the sheet dividing into glaciers overlying old worn peaks, with moraines of tumbled black stone between, some of the head-sized stones bearing the marks of old tools. The islands of rock grew more frequent. Finally the ice gave way entirely, the glaciers ending abruptly in a fringe of house-sized seracs that in turn gave way to a narrow, blue-green lake edged with rotten ice, and beyond that a broad plain of brown, broken ground barely dusted with snow. But though the sun was ever so slightly warmer at this latitude, there were no mirrors and nothing living that Petal could see, neither plant nor animal.

They came down off the ice onto that brown plateau, and from there down to a dry lakebed, or the shore of some ancient shallow sea, a horizon-wide plain of dirty salt as wide and flat as the ice. A ruin bordered it, a Septentrion-sized badland of rust and broken glass, with here and there the remains of some structure more solidly built, a roofless house or a stretch of old guideway. It had no name on the armor's charts, which meant it must have been less than twenty thousand years old; but it looked to have been abandoned for much of that time.

Petal was wary, remembering Hare's stories; but nothing moved here now, according to Castre, nor was there any signal, any sign of computation or even of ghosts. That being the case, Petal insisted on investigating—even though, Tirah said, the city was far too new to be of any use to them. And so they picked their way down to the old shoreline, over tilted slabs and fallen panels half-buried in drifting sand.

Toward the southern edge a few towers still stood, twisting spires that would not have looked greatly out of place in some parts of Septentrion—except that their cleaners had broken down or been taken away long ago, so that they were all the same color, a uniform dusty brown, apart from those closest to the shore, which were spotted salt-white on their southern faces.

At the top of one of the southernmost towers, something glittered. Apart from sky-blue it was the first real color they had seen since they came down off the ice, and nothing would do for Petal but to climb it and see what it was.

When they drew near to the tower they saw that even that effort was unnecessary;

the building was hollow, open on its northern side, and a spiral ramp led up through the core, a series of semicircular landings joined by curving staircases, most of them intact or nearly so; Petal could have made the ascent even without the armor. Before they reached the top they could see that what had drawn Petal's attention was a kind of dome or vault made from hundreds of glassy panels tinted in different colors, so that the light that shone down through it from the cold equatorial sun was washed with gold and green and coppery red. As they came out onto the sort of penthouse balcony that ringed the dome, they could see many of the other towers sported similar structures, but that every other was encrusted in dust and salt, where this one seemed to have been recently polished clean, and Petal wondered who or what had done it.

But then Petal chanced to look out over the balcony's still-intact railing to the salt plain, a cable and more below, and forgot all about the dome.

There, down on the plain, some way out from the old shoreline, someone had spread the black rock of the high country across the salt, spelling out the message in letters half a cable high. It read:

PETAL COME HOME WE LOVE YOU

* * *

They found the same message, two days later, at the approximate midpoint of the salt plain. And again two days after that as they neared the opposite shore, this time sprayed safety-red across a crumbling cliff-face. Again on a boulder the size of Anchialine House, overlooking the saddle of a mountain pass. Again in the snowbound ruin of a small nameless city, at the foot of an advancing glacier at the edge of the southern ice sheet.

PETAL COME HOME WE LOVE YOU

Each time they changed course to put the message out of sight. Petal consulted the armor's charts and, with an aversion that was almost instinctual, steered for the emptiest parts of them, away from any landmarks, away from any place with a name.

It worked. When they were back on the ice (much the same as it had been, but different, too, the cold sun behind them now, the shadows in front of them lengthening day by marching day) and far enough off the direct great-circle line from Septentrion to Meridion, the messages stopped.

Petal felt no relief, only exasperation with the loss of time. There was something else, too—a kind of guilt, it might have been—but it was bound up with a lot of other feelings, homesickness and loneliness and regret and self-doubt, that Petal kept wrapped tight and locked behind thick walls. The armor helped with that, regulating Petal's blood chemistry, keeping Petal on task; the armor, and the sight of Tirah's solemn face.

Only sometimes at night, Petal would wake from a forgotten dream, face behind the armor mask wet with tears.

* * *

Unbidden, Petal began to tell Tirah stories, Hare's stories of Meridion: of the tagmata, their colorful pageants and deadly rivalries, the games that were not quite wars, the wars that were not quite games; of a world out of storybooks, a world of honor and glory, of fierce passions and sudden, dramatic turns of fate. The armor's charts said they were getting close. There were mirrors in the sky again, and breaks in the ice—cold meltwater rivers meandering through gray valleys, stands of scraggly conifers. As they continued south these grew wider, till there were flocks of birds, forests that went to the horizon, marshes that took a day to circumnavigate. It was strange to see so much color, so much shadow, such stark contrasts between light and dark, after the months on the ice. Sometimes there were two or even three mirrors in the sky, and the land was correspondingly warmer, the vegetation richer—lush, even. There were plants Petal had never seen in Septentrion, not even in the conservatories, and the birds and animals the armor's eyes picked out now were camouflaged

not in white but in angular patterns of dazzling color and deep shadow.

Tirah said the drifting mirrors, like those farther north, were a symptom of the quintessence, and the fraying of the metric.

When Meridion was only a few days away, the land began to climb, the marshes and streams to dry up. It was still warm, but the plants grew sparse, their leaves small and waxy and edged with thorns, the living creatures more furtive and less colorful. The ground grew rocky, and there was a brown pall in the southern sky that Castre said was smoke.

Finally they came down out of the high country, to a vantage point on the south face of a dry ridge. Petal could see all the way to the horizon, a dull shimmering silver that the armor's charts said was the shore of the antipodal sea, under a gray-white sky; and stretched along that shore, for leagues and leagues, glittering in the mirror-light and the light of the sun at Petal's back, the towers of the city. They were less than a day away, across a broad valley of yellow grass and stunted, solitary trees. But the middle distance was obscured, and Petal saw the source of the overcast, and of the smoke.

The valley was on fire.

"The mirrors are out of alignment," Tirah said. "Where the sunlight is multiplied, the land is hot and dry, and any small spark may lead to a conflagration."

—*Most fires are the result of human action*, Castre said.—*Even now.*

"We'll be careful," Petal said.

As they moved down to the plain, toward the smoke, the armor kicked into a higher state of alertness, and Petal with it. Petal had never been so conscious of the armor's chemical manipulations as now, as it picked a path down from rock to rock, and Petal, jumping, seemed to float rather than fall, to have an eternity to correct any small problem of balance, and then to catch Tirah, falling; while down on the plain every movement, every hint of a suspicious shape or texture was preternaturally clear.

—*This is a controlled area*, Castre said, *within the meaning of the agreement.*

"What does that mean?" Petal asked.

—*Under the terms of the 57th Diatagmatic Symbasis and its implementing regulations and orders, entry to the peripheral conservation area is permitted only to authorized persons.*

"Can you get us through?" Petal asked. "Would Hare's phyle help us? Angyld's, I mean, Angyld's tagma?"

—*Dekarch Angyld Haemedsbearn has been absent without leave for more than one hundred eighty-three thousand hours*, Castre said.—*And your own field warrant has never been confirmed.*

Petal sighed and kept going.

As they came closer, the wind shifted, blowing the smoke away toward the west; and as the sun went lower and the shadows lengthened, the shapes of the distant towers became more distinct, their outlines more stark against the clearing sky, until finally Petal had to admit the truth of what they were seeing.

Meridion was in ruins.

"What happened?" Petal asked.

—*The breakdown of the 56th Symbasis . . .* Castre began.

"Never mind," Petal said. "How long has it been like this?"

—*Twenty-three years.*

All those times Hare had told stories of Meridion, Petal realized, it had never occurred to the twins to ask why Hare had left.

"Where are the people?" Petal asked.

—*Indeterminate*, said Castre.—*After the reconciliation of the 57th Symbasis, the*

surviving tagmata established camps outside the limits of the conservation area. The conservation area is patrolled, by sectors, but the sector boundaries will not likely have remained constant. There will have been conflict. The fires we see are likely evidence of such.

“They fought till they destroyed their city,” Tirah said. “Or till it drove them out. And then they took to fighting over what was left.”

Castre said nothing.

“Do we keep going?” Petal asked.

The conservation area is patrolled, Castre repeated. We can attempt to evade the patrols, but should we encounter one, I am unlikely to be able to protect you against an equally equipped superior force.

“What else is there to do?” Tirah asked.

“Nothing,” Petal said, and started down the slope.

* * *

They nearly made it.

* * *

6. The Other City

$t_0 - 2.88 \times 10^5$

Piper was asleep when they brought Petal in, two of the cohorts in dusty blue armor striped rust-red, helmets sealed and faceless, heaving aside the cracked ceramic slab that served as the door of the oubliette. (There were no locks—the slab was too heavy to be moved without armor-strength, or without leverage Piper didn’t have.)

Piper was thin and brown and hard after the better part of a year on the ice, face sun-browned and wind-burned, eyes narrow and wrinkle-set from all that time in the glare of the cold sun. But if Piper was thin, Petal was emaciated, reeking of ketoacidosis, hair sparse and lank, skin stretched sickly pale over atrophied muscles and a body little more than tendon and bone, shocking Piper to see it; an onlooker might have been hard pressed to mark Petal and Piper as of the same species, let alone family, let alone twins.

One of the cohorts tossed in another bedroll, like Piper’s but cleaner. Then they hauled the slab back into place, and Piper and Petal were alone.

Piper had imagined this moment a hundred times. A thousand. The curses Piper would hurl. The things Piper would say, would do, to show Petal, to make Petal understand, by force if necessary, the magnitude of Petal’s selfishness in bringing them here, and its cost.

But that was before seeing what it had cost Petal.

Piper wrapped arms around that thin body, and held Petal, and cried.

* * *

They slept and waked. There was light, from a strip on the back of the door, and sometimes there was sunlight around the edges of the slab. There was food, monotonous and uninspiring but solid, the sort of thing printed in sheets from organic scrap. There was water. Piper had to feed Petal, at first; it was as if Petal had forgotten how to eat and drink. Probably Petal had. They ate and drank and slept again. All that time Petal didn’t speak, and Piper didn’t either, except practicalities like *hold the cup*, or *this is the toilet*. Petal had to be reminded how to use that, too.

After two or three days, Petal said, voice weak, “How long have you been here? How did you get here?”

“A few weeks,” Piper said, voice hoarse, but stronger than Petal’s. “We got a crawler from City Authority. We camped on the ice. We never saw you. Sometimes we saw

where you'd been."

"I found your message," Petal said. "Your messages."

"That was Swan's idea," Piper said. "To get ahead of you."

"Are they here?" Petal asked. "Our parents?"

"We saw some monsters," Piper said, not answering the question. "Deranged motiles, or broken machines . . . we were never sure. Hare said there were more, twenty years ago. A lot of the ones we saw were dead."

"Everything's dying," Petal said. "I want to go home."

Piper didn't say anything.

"What's going to happen to us?" Petal asked.

"This isn't Hare's phyle," Piper said. "Hare's tagma, I mean. No one's supposed to come here, from outside. But I don't think anyone ever has, or anyway not in a long time. And Hare, Hare wasn't from outside, not exactly. I don't think they knew what to do with us. I suppose we'll stay here till they figure it out."

"Or until it's all over," Petal said.

Piper looked at Petal. Petal's eyes were fixed on something far away, in space or time, something only Petal could see.

"They killed the armor," Petal said, as if that followed naturally from what had come before. "Or froze it. Or something. Everything went dark. When I could see again, Tirah was going away with them. I called out. Tirah didn't look back."

"Gone to speak with their old machines." Piper didn't want to talk about Tirah.

"Maybe," Petal said. "I don't think there's much time left. It'll be over soon. One way or another."

* * *

The next day—Piper thought it was the next day—there came another earthquake. A big one, a shaking and a noise lasting almost as long as the thunder that had accompanied the arrival of *Thus is the Heaven*, though the movement of the earth was not so violent. The hour when the food would have come and went, and Piper had time to wonder whether they had truly been forgotten. But then the slab was moved aside, and two of the cohorts—again in that red-striped blue armor; Piper couldn't tell if they were the same ones who had brought Petal, or not—motioned them out.

"Come," one said, in the language of the tribunes, which was close to the language of Septentrion.

Piper helped Petal stand up, and together they went out into the camp, blinking in the daylight.

Piper hadn't seen much of the camp, when they'd been captured, and there wasn't much to see now: makeshift structures, dug into the rocky slopes of a narrow valley, hardly more than a gully; from the plain above they'd never noticed it. One of the structures was buried in scree, and armored figures were at work, digging it out.

Their escorts led them up a switchbacked gravel trail to the flatland above, and Petal stopped there a moment, looking south, toward the city. Piper wasn't sure, but it seemed as though there were even fewer towers standing than before. The light was strange, stripes and patches of the land seeming shadowed as if by cloud, though the sky was clear. And then, squinting up at the sky, Piper realized it was not that those places were in shadow, but that others were illuminated more brightly, three and four out-of-place mirrors adding their light to that of the sun.

There was a crawler, low and broad, darker blue than the cohorts' armor, with a half-familiar design of white stars. The twins' escorts ushered them into it, and the crawler set off, toward the city, across the strange landscape of light and shadow.

After an hour or so they came to what must have been Meridion's city wall, once; much of it was still intact, but parts had fallen, or been blown out. The crawler drove

through one of the gaps, through something not unlike Septentrion's abandoned ex-urbs, but blackened and burned.

And then they came to a square like Limit Cardinal back home, swept clean of dust and ash, with dozens of colorful pavilions arranged on it in ordered ranks, each guarded by cohorts in bright armor and topped with colored banners: the romantic Meridion of Hare's stories, finally, brought to life. Near the center of the grid of pavilions was an open space, and a pavilion larger than the others, with every tagma's banner flying, and above them all the banner of the city itself, blue-black with five silver stars.

They got out.

Gauge Malpais was there, and someone in armor like Hare's, gray striped with yellow, helmet down. A face that reminded Piper of Hare's, a little, but younger; the face of someone who had never set out to cross the ice of the world, let alone crossed it twice.

And there was Hare, still in the faded, much-repaired City Response jacket that had traveled with them all the way from Septentrion.

Piper and Hare flung their arms around one another, but Petal hung back.

"Where's Cutter?" Petal asked. "And Swan?"

"Swan died on the ice," Gauge said. "Cutter was killed on the salt plain, when Campestral tried to steal the crawler. Hare killed Campestral."

Petal stared at the motile for a moment, blank-faced, apparently uncomprehending; then turned away.

"I didn't want to tell you," Piper said. "I'm sorry."

Hare embraced Petal then, from behind, and Piper saw Petal stiffen for a moment, then turn and yield.

"It's my fault," Petal said, muffled. "It's all my fault."

"It's the end of the world," Hare said. "It's not anybody's fault."

Petal gave a laugh that was half a sob.

"The tagmata have met," said the armored stranger who looked like Hare. "The 59th Symbasis is reconciled. The messenger Tirah will be allowed to enter the city and to attempt one of the sacella."

Piper looked at Gauge.

"This is Flyma," Gauge said.

"Flyma Haemedsbearn," the other said.

"Haemedsbearn," Piper said, looking at Hare.

"Yes," said Flyma. "I was Angyld's kinswight, and so to you too; we should be gadlings."

"Cousins," Hare translated.

"Cousins," Flyma agreed.

Petal pulled back from Hare.

"They're letting Tirah into the city?"

"There are old defenses," Flyma said. "The sacella protect themselves. No one in armor may approach a sacellum. No machines. No one—" Flyma glanced at Gauge—"no one of the constructed. Only the living."

"Which of those is Tirah?" Piper asked.

"I don't know," said Gauge.

"The sacella will judge," said Flyma.

"Take me," Petal said. "I want to be there. I want to see."

"No!" Piper cried, voice breaking, all the pent-up anger of the year on the ice, coming back in a rush. "No. No. We have you. You're back. You're not leaving again. We're going *home*."

"Piper." It was not Petal who spoke, but Hare, a hand on Piper's shoulder.

All at once Piper collapsed.

"There's no home to go to," Piper said, "is there."

Hare didn't answer.

"Piper," Petal said. "You can come with me."

Piper looked up. "Will you come with us?" Piper asked Hare.

"I can't," Hare said.

"Angyld is being released to Xanthe Tagma," Flyma said. "To stand trial for desertion."

"Desertion!" Piper exclaimed.

"I don't think it'll come to that," Hare said. "I don't think there's that much time left." Hare took the City Response jacket and held it out to Petal. "Here. It gets cold in the shadows."

"I won't need it," Petal said.

"I'll take it," Piper said. "Just in case."

Hare hesitated, and then stepped closer to the twins, embracing both of them.

"I love you," Hare said. "Both of you."

Piper didn't answer, only hugged Hare more tightly.

Hare let them go, and stepped back.

"I want to remember your faces," Hare said. "For as much time as we have."

"As much time as there is," said Piper.

"I wish we had more," Petal said. "But we don't." And, turning to Flyma: "Let's go." And they did.

* * *

7. The Metric

$t_0 - 2 \times 10^8$

They crawled over and through the corpse of the city, following Flyma, the ghost in Flyma's armor picking out their path. The air seemed thinner. Piper had a headache, and Petal was breathing in shallow gasps. It was hot in the sunlight, hotter still where the mirrors shone, but the shadows were cold. The trembling of the ground had grown so constant that Piper hardly noticed it any more, or the sound, a rumbling and creaking that seemed to come from everywhere and nowhere.

Flyma paused, at the edge of what had probably been a park, a wide burnt-over swath interrupted by intersecting ridges of debris, remains of structures fallen from overhead. There was a space beyond, ash and brown dirt, clear of rubble, and in its center something glittered.

"The sacellum is there," Flyma said. "I can go no farther." And to Gauge, "Nor can you."

"The defenses," Gauge said. "I understand."

"Like it matters," Petal said. There were towers still standing to the north and west, blocking sunlight and mirror-light, and Petal was shivering. Piper took Hare's jacket and draped it across Petal's shoulders.

"Go," Piper said to Gauge. "We might be wrong."

Gauge hesitated.

"Go," Piper said again. And to Flyma, "I'm sorry. There's no time."

"There isn't," Petal said and started out across the park. Piper followed, not waiting to see what Gauge and Flyma did.

"Goodbye," Gauge called; and Piper thought about looking back, but there seemed no point. And then they were past the first stretch of debris, and the motile would have been out of sight anyway.

They caught up with Tirah in the shadow of a fallen causeway. The sacellum was

where Flyma had said it would be, at the bottom of a shallow depression just half a cable away: a circle of coppery polished metal, perfectly clean, hardly broader than the span of Piper's outstretched arms, in the multiplied light of the mirrors almost too bright to bear looking at. Tirah was standing in the shade, looking down at the circle, seeming to study it, as if it lay at the center of a maze and Tirah was looking for the solution.

"Tirah," Petal said.

"Only the living may approach the sacellum," Tirah said. "And yet it must be done."

"Tirah, look at me," Petal said. "Tell me it was all worth something. Tell me"—Petal was crying now—"tell me Cutter and Swan didn't die for nothing."

"It must be done," Tirah said again, still looking at the circle, not looking at Petal. "The metric must be destroyed. The old universe must pass away. The new universe must be allowed to begin."

Tears were streaming down Petal's face. "I never so much as held your hand," Petal said. "I thought I loved you. But Piper was right. That wasn't real. That was just something you put in my head. To get me to help you."

"I didn't mean that," Piper said. "I shouldn't have said it."

"A year, I thought I loved you," Petal said to Tirah, ignoring Piper. "A year, on the ice. And it was all a lie, wasn't it? It was all in my head." Petal reached out and took Tirah's hand now, pulling. "Look at me."

But Tirah was immovable.

"It must be done," Tirah said a third time, as if Petal had never spoken, and coming loose from Petal's weakened grip, stepped out of the shade into the doubled sunlight. All around them the rubble was creaking, the still-standing structures were shivering like live things, shedding motes of scintillating dust that fell slowly, so slowly, as if there was all of forever left to do it in. And Tirah walked out, barefoot in the red dirt, so apparently human, so intent and so vulnerable; and Piper saw a little of what Petal must have seen.

And then, just short of the circle, Tirah seemed to cross an invisible line, and the body the Archive had made began to dissolve in violet-white light, just a little at first and then all at once, as Tirah pushed on. For a moment Piper thought there might be a small circular shadow in the midst of the glare, falling: the little globe that had been Tirah's true body, the true vessel of the message from Hoddmimis Holt. But then the light flared brighter yet so that Piper turned away in reflex, and there were only afterimages darting purple and yellow behind closed eyelids.

"Wait," Petal said then, and reached out.

But it was already over.

Petal slumped to the ground. Piper slid down to sit beside Petal, their shoulders touching, Petal's bony and thin under the patched City Response jacket. Piper felt lightheaded. Was that exhaustion, dehydration, lack of sleep, some collateral effect of being too close to the circle's defense system? Or was it the quintessence pulling at the atoms of Piper's body, fraying the bonds that held Piper and Petal to the earth? How much time was left, anyway? Maybe it was already too late.

Maybe it wasn't the quintessence, maybe it was just doing too much, seeing too much, knowing too much, being asked to face such an enormity, the end of everything; what human being could be expected to comprehend that? Piper could feel it, not the weight of deep time, but the mass of it, the mass of a universe multiplied by the billions of years of its existence and the infinity of possible histories pruned down now to this one inevitability. And embedded somewhere in it the infinitesimal braid that was two sixteen-year-old lives about to be cut short. The injustice of that, the injustice of the lives Piper and Petal could have had and never would. Of the year, even, that they could have had, if only Tirah had never come. That Cutter could

have had, and Swan. Maybe a world that could do that needed to be destroyed, never to be created anew.

Piper imagined that, an empty, angry darkness strung with grim tight knots, the quintessence and the metric locked in final stalemate. How much time was left? A year, a day, an hour? Maybe they could lie down, now, here, and soon it would be over.

Piper looked at Petal. Petal looked back. Piper knew they were thinking the same thing.

"Tirah said, once," said Petal, "that in Hoddmímis Holt they could fit eternity in an instant. That that was something they could do, that we couldn't. But that's not right, is it."

"No," agreed Piper.

"Even one more day is an infinity," Petal said. "Or would be, if we could have it back."

"If we could have it again," Piper said.

"Yes," Petal said. "I'm sorry, Piper."

"So am I," Piper said.

The doubled sun was broiling hot. Red spots floated before Piper's eyes. The air was quivering over the bare earth, and in the shimmer the circle seemed to bob like a bit of flotsam on the waves.

"It was real," Piper said.

"What was?" asked Petal.

"What you felt," Piper said. "It was real. Even if Tirah wasn't."

"It was stupid," said Petal.

"It wasn't wrong," said Piper.

The twins looked at each other.

Then Piper got up, hauled Petal upright, and together they started down toward the circle.

They went down, following Tirah's footprints before them in the dirt; they passed the point where the prints ended and there was nothing there to show that Hoddmímis Holt's message had ever been. Piper was sweating and chilled at the same time; Petal's hand was cold in Piper's, and both of them were shivering as with fever.

A cold wind swept across them, the doubled sunlight dimming. Piper looked up and saw one of the visible mirrors spinning out of control, the bright circle reduced to an oval and then a line, as in slow silence another nearby shattered into a hundred tumbling fragments. The true sun low in the northern sky seemed dimmer as well, redder, or was that Piper's imagination?

As they approached the coppery circle of the sacellum there was a feeling of presence, invisible, incorporeal, the sense of being observed that sometimes came in a building that housed a ghost. Something ancient, older than Meridion, older than Septentrion, older perhaps than this instantiation of the Earth. Tirah's old machines. Waiting, all this time, for someone, anyone really, to tell them their long duty was done.

"We have to do it," Petal said. "Don't we?"

"We have to," Piper said. "Together."

Hand in hand, they stepped into the circle.