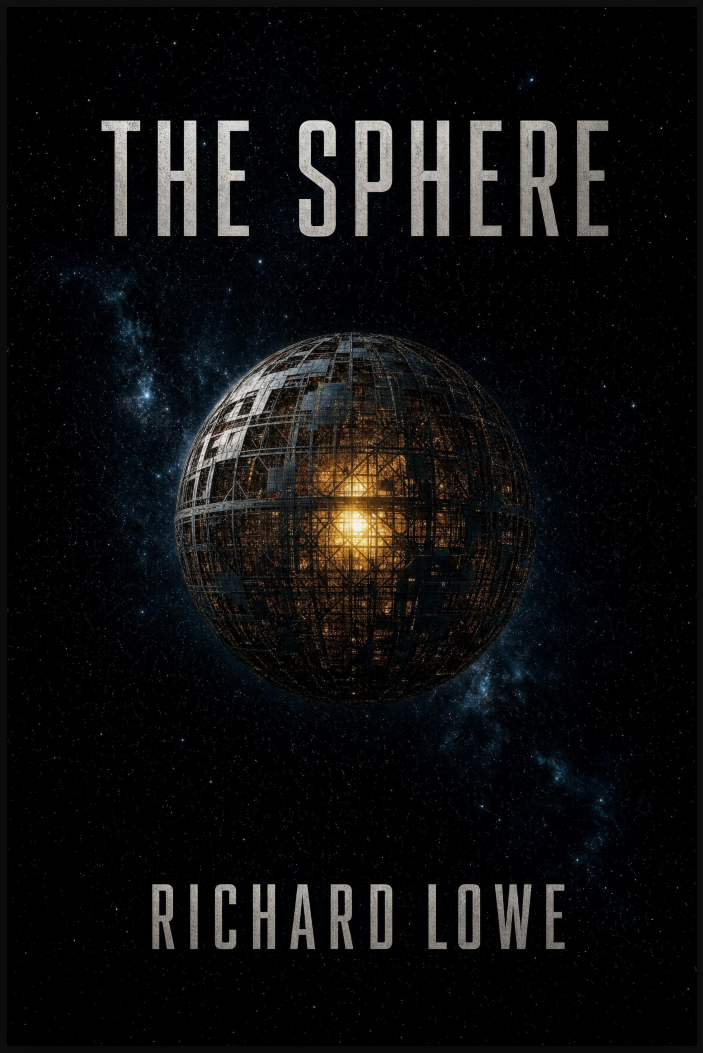
A FREE COMPANION TO THE SPHERE

Construction Light

Before the first mini-sun was lit, a seeding worker had nineteen days to make the grass hold the ground.



RICHARD LOWE

Construction Light

The seed heads were closed again.

Hessa knelt in the strip with her face a hand's width from the grass and counted them the way she counted them every shift. Forty stems in the marked square, thirty-one with heads, thirty-one heads shut tight as fists. She pinched one open with her thumbnail and the little green chambers inside were full and dry and had no intention of doing anything at all.

"Same as yesterday," Hollis said from the next square. "Same as the day before that. Thirty-one of forty in mine."

"Thirty-one in mine."

"Then that's sixty-two of eighty." Hollis wrote it down. She was nineteen and had come down from the cylinders eight months earlier, and in eight months Hessa had heard her say perhaps four sentences that did not have a number in them.

The strip ran two miles along the foot of the eastern ridge, a band of new soil a hundred yards wide laid down over the old rock in the last year of the platform work. The binding grass had gone in eleven months ago. It had come up thick and fast, which was what binding grass did, and it had sent its runners out sideways under the surface, which was also what it did, and it had grown seed heads on schedule and then stopped, which nobody's model said it would do.

The smell of the seeding compounds sat on everything. It was sharp and green and mineral at once, like cut stems and a struck match, and it was in Hessa's hair and her sleeves and the creases of her knuckles. She had stopped noticing it in her second year on the surface and noticed it again every time she went up to the cylinders on leave, where it came off her clothes in the transit lounge and made strangers look around.

Above them the sky was the color of weak tea poured over milk. It was the light everyone on the surface called construction light, the light of the sun coming in sideways off the mirror array that was still being built, bounced and bounced again until it arrived from no direction at all. It lit the grass and the ridge and Hollis's notebook evenly, without a single shadow, and it had been doing that for every hour of Hessa's working life.

High overhead a platform crawled across the dimness on its slow track, its work lamps a cluster of hard white points. As it passed, the shadow of Hessa's hand slid out from under her palm and crept a few inches across the soil and slid back. Work-light shadows moved when the platforms moved, and they belonged to nobody.

"Grid nine," Hollis said, standing. "Then lunch. Then grid ten."

Hessa let go of the seed head. It did not stay open. It folded back over its chambers like a hand closing on a coin, and she sat back on her heels and watched it do that for longer than she needed to.

* * *

The platform man came down on the noon transport with his duffel over one shoulder and a set of calipers in his breast pocket.

Ottilie Brand brought him out to the strip herself. Ottilie was the chief of the southern seeding teams and had been seeding since before the soil in this section was laid, back when the crews worked the bare rock with sealed suits and called it gardening as a joke. She was eighty, small and brown and creased as a walnut, and she moved across the grass in the careful way of a woman who knew exactly how much she weighed.

“This is Joss, out of Platform 4,107,” Ottilie said. “They're breaking his platform up for road bed in the north sections, and he asked for ground work.”

“I asked for this ground,” Joss said.

He was tall and thin and about forty, with a platform worker's pallor and a platform worker's way of standing, his weight forward, his hands ready for a rail that was not there. He looked at the strip. He looked at it the way Hessa had seen surveyors look at a load diagram, his eyes going along it in sections, and then he crouched without being asked and put his flat palm on the soil between two grass clumps.

“We laid this,” he said. “Forty-one tons a linear yard. Placed to a millimeter.”

“It's moved since,” Hessa said.

He looked up at her. He had pale eyes and a sunburn line across the bridge of his nose from the platform's ultraviolet lamps, and he looked at her as if she had said the ridge behind her was walking off.

“It's soil,” she said. “It moves.”

“It was placed to a millimeter.”

“Then it was placed to a millimeter, and now it's soil.” She held out a trowel. “Start on grid ten with Hollis, and she'll tell you the numbers.”

Ottilie went back to the settlement. Joss took the trowel and turned it over in his hands, and Hessa saw him find the place where the handle had worn smooth under somebody else's grip and run his thumb along it.

Hollis came over with her notebook and her clipboard and a spare pair of knee pads.

“Grid ten,” Hollis said. “Forty stems a square, and you count stems, heads and open heads.”

“How many open heads have you counted so far?”

“None.”

“In how long?”

“Four months.” Hollis handed him the knee pads. “You'll count none too, and it's still a number.”

* * *

The settlement was eleven buildings on a low rise above the creek. Two of them were barracks, and one was the seed store, and one was the kitchen that also served as the meeting hall and the clinic and, on the nights when Ottilie felt generous, the bar. The rest were family houses with sod roofs, because sod was the one building material the seeding teams had more of than they could use.

Hessa had a room at the end of the second barracks with a window that looked east at the ridge. It had a bed and a shelf and a desk made of a packing crate, and on the desk was her mother's last letter, which she had read twice and not answered.

Her mother wrote from the cylinder every forty days, on the transport schedule, in a cramped upright hand on thin cylinder paper that let the light through. The letters were about the farm rings and the price of beans and who had married whom on the third deck. They ended, every one, with a sentence that was not quite a question.

You could always come back up, this one ended. The beans don't care what the sky looks like.

Hessa had grown up on those farm rings. She had grown up under a sky that was the other side of the cylinder, fields and roofs and canals hanging overhead and curving around her in a long tube, a world you could see entire from any point in it. Her mother had worked the bean rows for sixty years and had never once wanted to stand somewhere she could not see the end of.

On the surface you could not see the end of anything. The ground went away in every direction and kept going, and the far arc of the ring hung overhead so distant that it was only a paler band in the tea-colored haze, and somewhere up there across two hundred million miles of air and dark other crews were kneeling in other strips. The first week Hessa came down, she had lain on her back in the grass and been sick twice.

She put the letter face down on the desk. She went to dinner.

* * *

Joss sat across from her at the long table in the kitchen and ate the stew as if it were a puzzle. He separated the pieces with his fork. He ate the roots, then the beans, then the greens, then the broth, in that order.

"They grow all this here?" he said.

"The roots and the greens. The beans come down from the cylinders."

"And the grass out there. You grew that."

"I planted it. It grew itself."

He thought about that. He had a habit of thinking about a thing with his whole face, his brows coming down and his mouth going flat, and it made him look angry when he was nothing of the kind.

"On the platform," he said, "if a thing did what the spec said, we signed it off, and if it didn't, we pulled it and found out why. Your grass grew heads and the heads don't open. That's out of spec."

"So pull it."

"Can you?"

She broke her bread. "No. It's there to hold the soil, and it does that with the runners, under the ground, and the seed is for later, for spreading."

"Then why count the heads?"

"Because they're supposed to open." She did not like the sound of it in her own mouth. "The archive says that species flowers in a hundred and ten days, ours are at three hundred and thirty, and I want to know why."

Hollis, at the end of the table, said without looking up from her bowl, "Three hundred and thirty-four."

Joss put his fork down. He looked at Hessa for a while with his angry thinking face.

"Then I'll count them," he said.

* * *

He was bad at it for a week.

He counted the stems in grid ten four times each and got four different answers and could not stand it. He measured the distance between clumps with his calipers, and the height of the heads.

On the third day Hessa came down the strip and found him lying on his stomach with his eye an inch from the soil, watching a runner where it went under the surface, and when she asked what he was doing he said he was trying to see it move.

"It doesn't move while you watch it."

"Everything moves while you watch it. You need a fine enough gauge."

"Get up. You're crushing grid eleven."

He got up. He had a print of grass on his cheek, a long green stripe of it, and he did not know it was there, and Hollis looked at it and wrote a number down and did not say what the number was.

By the second week he had stopped measuring the heads. By the third week he had stopped counting the stems four times. He still put his palm flat on the soil before he started each square, the way he must have put it on a section of shell before he signed it off, and Hessa did not ask him why because she thought she knew.

He talked while he worked. That was a platform habit too. On the platforms the crews talked constantly on the open channel because a silent man in a suit might be a dead man in a suit.

He talked about the platform. He talked about the fabrication bay, which smelled of hot metal and the dust off cut tensium and coffee from the upper level. He talked about the twelve years he had spent placing ground, flying the slow passes along the inner surface with the hoppers open, laying rock and then gravel and then soil a layer at a time over the shell, under the work lamps, in the dim.

"I've never stood on any of it," he said. "Twelve years. I laid a hundred and ninety miles of this ridge."

"How does it feel?"

He put his palm on the soil.

"Soft," he said, as if he were reporting a fault.

* * *

The insect crew came through in the fourth week.

There were six of them in a ground truck with a trailer of sealed crates, and they set up at the north end of the strip at the start of the morning shift and began opening the crates one by one. Hessa had known they were coming. The release schedule was posted in the kitchen, and the seeding crews had been grumbling about it for a month in the way people grumble about weather.

The first crates were bees. They came out slow and cold and clumsy into the dim air and crawled on the crate lids before they lifted, and then the air over the strip was full of a low hum that Hessa felt in her teeth. After the bees came the ground beetles, which went straight down into the grass and were gone, and then the moths, which went up and drifted east toward the creek like ash.

Then the crates with the red bands on them.

"What's in those?" Joss said.

"Everything else."

He watched the insect crew open the red crates. The release was quieter. Gnats rose in a thin gray plume and broke apart over the grass, and midges, and things Hessa had no name for that the archive had names for, and then a smaller cloud that held together longer than the rest and drifted toward the settlement on the slight wind off the ridge.

Joss slapped his neck. He looked at his palm. There was a small black smear on it and a spot of red.

"That bit me," he said.

"Yes."

"Someone put that in a crate." He held the palm out as if she might want to inspect the evidence. "Someone grew that in a vat in a cylinder for forty thousand years and then drove it here in a truck so it could bite me."

"It's a mosquito."

"I know what it is. We had a file on them. They kill people."

"Not these, they've been fixed for that." She went back to her square. "They still bite."

He stood there with his hand out. Down the strip Hollis was laughing, a sound Hessa had never heard from her, short and surprised, and she cut it off and wrote a line in her notebook and went on

counting.

"Why?" Joss said. "Why bring them?"

"Because the birds that come later eat them, and the fish in the creek eat the larvae, and the bats eat them at night when there is a night." She pressed her fingers into the soil and felt the runners under it, tough as wire. "You bring all of it or you've built a garden, and a garden dies the first time a thing it wasn't built for shows up."

He thought about it with his face.

"That's Ottilie's line," he said.

"It's everybody's line, on the wall in the seed store." She looked up at him. "It's still true."

He slapped his neck again. Then he knelt and got back to work, and for the rest of the shift he swore at every whine near his ear in a platform dialect Hessa did not know, long fluent sentences of it, and she understood none of the words and all of the meaning.

* * *

The trouble came in on the comm on a Thursday.

Ottilie read it out at dinner, standing at the head of the long table with the printout held at arm's length because she would not get her eyes done. The atmospheric team for the section was moving the weather program to its next stage.

They had been running light rain on a fixed cycle for three years, a mist in the morning shift, a soft drizzle twice a week, enough to keep the new soil damp and no more. Now they wanted to run a storm.

"Full cycle," Ottilie read. "Forty hours of build, then twelve hours of heavy rain over the southern grassland and the eastern ridge, because calibration of the high-altitude systems requires a representative load event."

She lowered the paper. "That means they want to see if the clouds work."

"When?" Hessa said.

"Nineteen days."

The kitchen went quiet. The seeding crews were not engineers but they knew water, and they knew the eastern ridge, and they knew what twelve hours of heavy rain would do to two miles of soil that had been on the ground for less than a year.

"The strip won't hold," Hessa said.

"The runners are down," said Abel Rusk from the north crew. "You said yourself they're down."

"They're down a few inches, and they need a full season to mat." She put her hands flat on the table. "Twelve hours of heavy rain and the slope under the ridge goes into the creek, and the creek is our water, so ask them to wait a season."

"I asked." Ottilie set the printout down. "The weather team has a schedule from the regional office, the regional office has one from the array crews, and the array crews say the mini-sun comes up in a few years and the weather has to be ready for it, because a mini-sun over a sky that can't make a storm cooks the ground."

She looked down the table at Hessa. "They gave us nineteen days."

Hessa sat back. Across the table Joss had stopped eating.

"Nineteen days," Hollis said, to nobody. "Four hundred and fifty-six hours."

* * *

Hessa walked the strip that night under the clock dark.

There had never been a real night on the surface.

At the end of the evening shift the settlement turned its lights down and people went to bed by the clock, and the construction light stayed exactly as it was, tea over milk, everywhere and from nowhere, as it had been all day and would be all night. The crews called it clock dark. The cylinder children who came down with their families cried about it for weeks, and then stopped, and then forgot that there had ever been anything else.

She went to the foot of the ridge where the slope was steepest. The soil there was dry on top and damp an inch down. She dug her fingers in and found the runners and followed one of them along under the surface with her hand, a pale cord of root as thick as a bootlace, and it ran a foot and a half and stopped.

A foot and a half. In a season it would be four feet, and branching, and the branches would cross other branches and knit, and the whole slope would be one mat, one living cloth with soil caught in its weave. In nineteen days it would be a foot and a half and a little more.

Behind her the grass made a dry whispering in the slight wind. Platform lamps crawled across the haze overhead. She sat in the strip with her hand in the soil and the closed seed heads nodding all around her, thirty-one of every forty, waiting for whatever they were waiting for, and she felt the slope under her as if it were already sliding.

She heard him before she saw him. He walked like a man on a deck, heel down hard, testing.

“You can't sleep either,” Joss said.

“I can sleep. I'm choosing not to.”

He sat down a few feet away. He did not ask if he could. He put his palm on the soil, and then, after a moment, he dug his fingers in the way she had, and she watched him find a runner and follow it, and stop where it stopped.

“That's it?” he said.

“That's it.”

“That's what's holding the ground?”

“That's what's going to hold the ground. It isn't holding much yet.”

He pulled his hand out and looked at the dirt on it in the flat light.

“I laid this slope to a millimeter, rock and gravel and fines and soil, and I can give you the load on every square yard,” he said. “I never once thought about water.”

He turned his hand over. “The spec was where the ground went, not whether it stayed.”

“It wasn't your job.”

“It was my ground.”

She did not say anything to that. A mosquito found her wrist and she let it, out of a stubbornness she could not have explained, and then slapped it.

“Tell me what happens,” he said. “When the rain comes. Tell me how it fails.”

She told him. She told him how the rain would hit the bare spaces between clumps first and loosen the top inch, how the water would run off the ridge face and gather in the low lines of the slope and start to move, how a moving sheet of water picked up soil and became heavier and faster and picked up more. She told him about rills, the little channels that formed first, as thin as a finger, and how the rills joined and deepened and became gullies, and how a gully cut back uphill into the slope from its head like a crack running through glass.

He listened with his angry thinking face. When she stopped, he sat without speaking while a platform crossed half the sky.

“It fails at the heads,” he said.

“What?”

“The gullies fail backward, from the top of the cut, uphill, like you said, like a crack.” He was drawing in the dirt with one finger, short lines, branching. “On the platform a crack in a section failed at the tip, because all the load ran to the tip, so you drilled out the tip and put a plate across it.”

Hessa looked at the lines in the dirt.

“You can't drill out a gully,” she said.

“No, but you know where they'll start.” He looked up at the slope. “Water gathers in the low lines, and I know every low line on this slope because I laid it.”

* * *

They had nineteen days, and Ottilie gave them the whole southern crew for sixteen of them.

Joss walked the slope with a grade rod and a can of marking paint, and he did not need the rod. He went along the foot of the ridge with his eyes half shut, and he stopped and said here, and the rod said he was right to the inch. He sprayed a white line on the grass at every low place, every hollow where water would gather and start to run, and by the end of the second day the slope under the ridge was striped like a road map.

“How do you know?” Hollis asked him.

“I flew it a hundred times, and the hopper skipped here.” He tapped a hollow with his boot. “Gearing fault, year nine, and we never fixed it, so every pass laid two inches thin over six hundred yards.”

Hollis wrote it down. She looked at him a while and then said, “Six hundred yards, two inches low, and that's where all the water goes.”

“That's right.”

“That's a number,” Hollis said, and it was the warmest Hessa had ever heard her.

Across each white line the crews laid a strip of coarse mesh, the brown fiber matting the seed store kept for steep plantings, and staked it down with pegs cut from the scrub willow along the creek. Where the white lines met in the worst hollows they built low check walls out of turf, cut in blocks from the meadow behind the settlement and stacked a foot high across the line of the slope, so that water coming down would hit the wall and spread and slow instead of gathering. Joss showed them how to set the blocks staggered, like brick, like shell sections, so no seam ran through.

Hessa worked the runners.

She went along behind the mesh crews on her knees with a hand fork and a sack of cuttings from the nursery beds, and wherever the matting went down she lifted the edge and pinned new runners under it, lengths of the binding grass a foot long, laid in the soil sideways so they would root along their whole length. She pinned them in a lattice, each one crossing two others. It was slow and it hurt her knees and her back and it made her hands green to the wrist, and she did twelve hundred of them in sixteen days.

On the eleventh day she ran out of cuttings from the nursery beds and started taking them from the strip itself, from the flat ground at the top where the slope was gentle and the soil would hold without help. She stood at the top of the strip with the knife in her hand and did not cut.

“It's yours,” Joss said. He was beside her with a sack of pegs. “You can take it.”

“It's the best stand I've got.”

“Then it's the best cuttings you've got.” He waited. “On the platform we stripped good sections to fix bad ones, and nobody liked it, because the good section only has to hold itself and the bad one has to hold everything below it.”

She made the cut.

* * *

Her mother's next letter came down on the transport on the fourteenth day. Hessa read it that night with her green hands on the desk, too tired to wash them.

The letter was about the bean harvest on the second ring, which had come in heavy, and about a leak in the canal on the fourth deck that the maintenance crew had taken nine days to find. It said the cylinder was getting quieter now that so many families had gone down. It said the school on the third deck had closed one of its classrooms.

At the end, in the same cramped upright hand, it said: I saw a picture of your grass on the bulletin feed, the one where it goes all the way to the mountains. I couldn't see you in it, and I looked for a long time.

Hessa put the letter down. She sat with it in the clock dark, the construction light lying flat across the desk, and then she took a sheet of paper from the shelf and wrote her mother a letter for the first time in four months.

She wrote about the strip and the closed seed heads and the storm coming in five days. She wrote about the platform man who laid the slope to a millimeter and had never once thought about water, and about the mosquito, and about Hollis laughing. She did not write that she was afraid, and she did not write that she was coming home, and she did not end it with a sentence that was not quite a question.

At the bottom she wrote: The ground goes all the way to the mountains. I'm in there. You have to look low.

* * *

The weather came in as the schedule said it would.

On the seventeenth day the air over the southern grassland went heavy and still, and the construction light took on a greenish cast as the cloud built at altitude, a great dark lid spreading across the haze from the west. The creek went quiet and the bees stayed in their boxes.

Down at the foot of the ridge the closed seed heads stood motionless on their stems, every one of them, as if they were listening.

Ottilie came out to the strip in the afternoon of the eighteenth day and walked the whole length of it with Hessa, slowly, looking at the mesh lines and the turf walls and the lattice of pinned runners. She did not say anything for two miles. At the far end she stopped and looked up at the ridge with her creased face tipped back.

“I seeded the rock on the other side of that ridge sixty years ago, before there was any soil on it,” she said. “We sprayed lichen spores on bare stone in sealed suits, in this same light, and it took on about one rock in forty.”

She looked at Hessa. “I sprayed the other thirty-nine every year for twenty years.”

“Did they take?”

“Most of them.” She turned back toward the settlement. “Whatever happens tonight, you'll be out here in the morning counting heads, so don't stand in the rain all night like an idiot.”

Hessa stood in the rain all night like an idiot.

* * *

It started a little before the evening shift ended, and it did not start gently.

The first drops were the size of thumbnails and fell straight down out of the green-black lid and hit the grass with a sound like a hand slapping a table. Then the sound was everywhere, and it was no longer drops but a sheet of falling water so thick Hessa could not see the settlement lights from the foot of the ridge.

The air turned cold. The smell of the seeding compounds came up off the wet soil all at once, sharp enough to sting her eyes, and under it a smell she had never smelled before in her life, the smell of a lot of rain on new ground.

Joss was beside her in an oilskin coat with a headlamp. Hollis was farther along the slope with a second lamp and her notebook in a plastic bag, which she would not give up, and Abel Rusk had the north crew at the far end.

There were twelve of them on two miles of slope, and in the rain and the dim they could not see each other.

The water came off the ridge face in the second hour.

Hessa saw it in Joss's headlamp. It came down the rock in a thin moving skin, catching the light, and when it hit the top of the strip it slowed and spread into the grass and vanished.

The top of the strip was the gentle ground, the old stand, the part she had cut her runners from, and it drank the water and held it and nothing moved.

Then it reached the slope.

Down on the steep ground the water gathered in the low lines exactly where Joss had painted them, and it ran. It ran into the first turf wall and pooled behind it and spread sideways along it in a broad flat sheet, slowing, slowing, and slid over the top of the wall and down onto the mesh and into the grass, a shallow film instead of a rope. Joss made a sound beside her she had never heard a man make, low in his chest, and put his hand on her arm and kept it there.

The first wall held. The second held. Along the whole length of the painted slope the water hit the walls and spread and slowed, and the mesh caught what it carried, and the runners underneath pinned the mesh down.

At the fourth hour the lower slope went.

It was the hollow Joss had shown Hollis, the six hundred yards where the hopper skipped. The water from three low lines came together above it and was too much for the turf walls, and Hessa heard the third wall go before she saw it, a heavy wet thump in the dark and then a different sound, a rushing, and she ran down the slope toward it with her lamp swinging.

The wall had broken in the middle. Water was coming through the break in a brown rope as thick as her leg, and below the break the mesh had torn loose from its pegs and the bare soil under it was moving.

A rill opened in her lamp light like a mouth. It was a finger wide and then a hand wide and the soil at the top of it crumbled into the brown water and was gone, and the cut ran uphill toward her, toward the break, toward the slope above.

“The head!” Joss was beside her, shouting over the rain. “Get the head!”

He meant the tip. The gully was failing at its tip, uphill, toward the break in the wall, the way a crack failed. If it reached the wall and cut back past it, all the water above would come through, and the slope above would go too.

She went down on her knees above the cut with the rain hammering her back and began cutting turf from the grass beside her with her knife, ripping up blocks with her hands, and Joss took them from her and laid them across the head of the cut, across the tip, staggered, a plate across a crack. The water came through the first blocks and he laid more. Hollis came out of the rain with a sack of pegs and drove them through the blocks into the slope with the heel of her hand, one after another, her notebook still under her arm in its bag.

The water hit the plate of turf and went sideways. It found the low ground beside the cut and ran down that instead, and that ground had runners in it, Hessa's lattice, pinned under the mesh, and it held.

The cut stopped growing. It stayed a gully, a raw brown trench six feet deep with water roaring through it, but it did not move uphill.

They stayed on it till the rain stopped. Hessa did not know how long that was. At some point Hollis said, “Seven hours,” and at some point after that the roar in the gully dropped to a rush and then a trickle, and the sound of the rain on the grass went from a hammering to a patter to nothing.

She was lying on her back in the mud. She did not remember lying down.

Above her the green-black lid was breaking up. Through the tears in it the construction light came down the same as always, tea over milk, no direction, and a platform crawled across one of the gaps with its lamps lit.

Water dripped off the grass stems around her face, and the closed seed heads were bowed heavy with it, and not one of them had opened.

Joss lay next to her in the mud. He was breathing hard. His headlamp had gone out and he had not noticed.

“How much did we lose?” he said.

“I don't know yet.”

“Guess.”

“I don't guess, I count.” She turned her head. He had mud in his eyebrows and across his mouth and in the sunburn line on his nose, and he was looking at her, and he did not look angry at all.

“Then count,” he said.

* * *

They lost the bottom of the hopper hollow.

Four hundred yards of the lower slope, below the broken wall, had gone into the creek in the minutes before they reached it. The soil there was gone down to the gravel, gone down in places to the rock, a long brown scar fanned out at the foot of the ridge with the gully running through the middle of it.

The creek ran brown for six days. The settlement drank from the tank for those six days and nobody complained, much.

The rest held.

Hessa walked the two miles of slope the next morning with Hollis and the notebook. Of the forty-one low lines Joss had painted, thirty-eight had held behind their walls. The mesh was matted flat and brown with silt, and the grass under it was flattened and filthy and lying all one way like hair, and when Hessa dug her hand into the soil under the mesh at the foot of the worst wall, it came up full of root.

She held it up in the flat light. It was a clot of soil the size of her two fists, and it did not fall apart but hung in her hand like cloth.

Runners went through it in every direction, the cut ones she had pinned and the old ones from the original planting, white and tough and crossing, and every place two of them crossed, the soil was caught between them in a knot.

“That's eighteen days,” Hollis said, looking at it.

“Eighteen days.”

Hollis wrote it down. Then she did a thing Hessa had never seen her do. She closed the notebook and put it under her arm and crouched beside Hessa in the mud and put out one finger and touched the clot of root, the way a person might touch a sleeping animal.

“I'm going to do this,” Hollis said. “For a long time. Count what it does.”

“You already do.”

“I mean for a long time.” She stood up and opened the notebook again. “Thirty-eight of forty-one.”

* * *

Joss found her at the top of the ridge in the evening.

She had climbed it after the shift because she wanted to see the whole strip at once, and from the top you could. The ridge was not high, a fold in the ground with a long gentle back, but it was high enough that the grassland opened out below it in every direction farther than she could see, green and gray in the construction light, and the strip ran along the foot of it like a seam. The brown scar at the hopper hollow was the only wound in it.

There was a marker at the summit, a stake of gray composite with a survey number stamped on it, leaning badly where the rain had loosened it. Joss had brought a fence post up from the settlement on his shoulder, a length of scrub willow with the bark still on, and a mallet, and without saying anything he dug out the old stake and set the post in its place and drove it, and stamped the earth around it, and put his palm flat on top of it to see if it moved.

It did not move. He looked satisfied.

“The marker's supposed to be composite,” Hessa said.

“It's supposed to stand up.” He stepped back from it. “Wood moves, so I'll come up and set it again when it needs it.”

She sat down in the grass beside the post. After a while he sat down too.

Below them the settlement was turning its lights down for clock dark, building by building, a scatter of small yellow squares going out one at a time. A child was shouting somewhere near the creek, a long happy meaningless shout, and a door banged. Overhead and far off, a platform drifted across the haze and its work lamps threw a moving shadow off the fence post that slid across Hessa's knees and up the slope and away.

“The array crews say a few years for the mini-sun,” Joss said. “Then real light, and shadows that stay put, and real night.”

“That's what they say.”

“Are you going to be here?”

She did not answer right away. She pulled a grass stem from the clump beside her and held it up. The seed head on it was closed, the way they were all closed, thirty-one of every forty from here to the mountains, tight green fists that had been full and ready for months and would not open for anything she knew how to do.

“I don't know what they're waiting for,” she said. “They've got the water now, and the soil's right, and the temperature's right, and everything's in spec.”

He took the stem from her and turned it over in his long fingers and frowned at it as if it had failed an inspection.

“Then it's waiting for a thing that isn't here yet,” he said.

“That's not a reason.”

“It's what I've got.” He handed the stem back to her. “On the platforms we set the bolts for a section a year before the section came, and the crew that set them never knew what they were for, and a year later a section came down out of the dark and dropped onto them and fit.”

He looked out at the grassland.

“Maybe your grass is the bolts.”

She held the stem. The construction light lay over the ridge and the strip and the settlement without a shadow anywhere in it, and the grass went on in every direction, and under all of it, under her and under him and under the fence post, the runners were knitting in the dark at the speed they had always knitted, without anyone watching.

“I'm going to be here,” she said.

He did not say anything. He put his palm flat on the ground between them and left it there.

In the morning she went back down to the strip with her knee pads and her hand fork, and she knelt in grid one with her face a hand's width from the grass, and she began to count.

The World of The Sphere

Who's Who

The people of the novel, as you first meet them. Nothing here gives away how anything ends.

NAME	WHO THEY ARE
Orin	The narrator. Born in the eighth year of the surface on a settlement that no longer exists, a surface ecologist who presses his hands into things and writes them down. He sets this account down hundreds of thousands of years later, and he was there for most of it.
Hessa	Orin's mother. She grew up in a cylinder habitat and came down to the surface ecological teams. She grew the grass that bound the soil that held what came next.
Orin's father	A man from a construction platform who came down to the surface in the construction light years and learned to work the ground.
Hollis	The survey team leader on Orin's first posting, who talks in data first, short sentences second and almost nothing else.
Moira	An atmospheric engineer who reads the surface from the air down. She works at a desk in the corner of the kitchen on a project she will not talk about.
Sonya	A plant ecologist who came down from the cylinders and still glances at the ceiling when she walks into a room.
Cassian Moru	Born in Kinshasa six years before the exchange. At fourteen he decides that a species that could do this to itself needs to leave, and he spends his life making it happen.
Amara Diarra	Born in Bamako the same year as Moru. His communications director, the first person to read the speech.
Zoya Burkova	The Russian general who holds the Ural line, and who walks into Moru's lines on a written guarantee.
Pell Okafor	An engineer in Lagos, twenty-five, working on the foundation and on the problem of how a world inside a star gets its night.
Sev Rao	The man who wrote “she is wrong about the boundary condition” in a margin at twenty-nine, and spent nineteen years finding out if he was right.
Yusuf Vasq the Fourteenth	Platform supervisor at the end of the build, keeper of a wooden box with thirteen locks of hair in it.
Morrow	Commander at Command Center Seven, two miles down, watching the stars go out through a window the size of a dinner plate. Lieutenant Fraser is his aide.
Maris Renk	Commander of Battery 7,441,882, where the air always smells of hot metal and ozone.

Beth Nalor	Head of an intelligence office three levels below the administrative district, with no window and a long method for tea.
Saul	President of the Council in the war years.
Prun-Soleth and Ott-Vael	Delegates to the first great conference of the coalition. One speaks in scents, the other in formal statements numbered in order.
Sel-Veth	The Thenari ambassador, who carries a strand of silver grass from home in a sealed glass vial and stands at a scratched window watching the Sphere.
Keth	A coalition admiral aboard the Ardavan, who keeps a bowl of seed pods from the coast where he grew up.

In this story only: Joss, Ottilie Brand, Abel Rusk and the southern seeding crews. Hollis appears in the novel years later, older, and still counting.

Timeline

From the burning of the cities to the morning the others came. Construction Light takes place in the dim years before First Light.

WHEN	WHAT HAPPENS
November	An eleven-day nuclear exchange. Three billion, two hundred million people die out of eleven billion, and the planet, already in trouble, starts dying fast enough to watch.
The consolidation	Cassian Moru brings the surviving nations into one project, a checkpoint and a farmhouse and a ridge at a time. The terms are always the same terms.
Twenty years after the exchange	The Announcement. Moru tells four thousand leaders and nearly eight billion viewers that Earth is dying, and that the answer is a sphere around the sun. How long? Forty thousand years.
The early years	The first cylinder habitats go up in Earth orbit, ten thousand people each. In Bangalore the materials division makes forty grams of the foundation material. Sev Rao's test shows point-three percent variance, and tensium works.
Year 1,840	Jupiter's atmosphere goes into the construction stream.
Year 2,000	The Sphere is five percent done.
Six thousand years of lifting	The Earth is taken apart: oceans first, in columns, then the crust in panels a hundred kilometers on a side, then the mantle, then the iron core, which becomes the spine sections everything else hangs from. Nothing is wasted.
Year 5,000	The first Shadow Shell panel goes up and a shadow crosses the inner shell like a slow eclipse.
Year 20,000	The halfway review: nine hundred pages and no ceremony.

Year 38,000	The last section is placed and the shell is closed. Four million construction ships come to rest on the outer face.
Construction light	Four thousand years of dim, sourceless light while the ground is laid and seeded. The first families come down from the cylinders and platforms. *Construction Light* takes place here.
First Light	The first mini-sun is lit. That evening the Shadow Shell runs its first full dusk, and the surface has its first real night.
The Last Sunset	The inner mirror array is sealed and the sun is inside the machine.
The eighth year of the surface	Orin is born.
Thousands of years after the star went dark	The first ships appear at 0400, station time. By 0800 the tactical AI has stopped trying to count them. The novel opens.

The Sphere by the Numbers

A walk from the center of the world to the outside of it, using the novel's own figures.

WHERE	WHAT IS THERE
The center	The sun, still burning where it always was, wrapped in the inner mirror array. Every bit of light on the surface is routed through the mirrors.
About 36 million miles out	The Shadow Shell, at roughly Mercury's old distance: a light structural shell of rotating panels, the first one three hundred kilometers across. As the panels sweep between the sun and the mirror array, the mini-suns dim and the surface gets its night. Panel density sets each section's day length, and the panels fade in stages, so there is a dawn and a dusk.
Across the interior	Air over the ring, and past it the dark. Look up at night from the inhabited band and the far arc of the same band hangs overhead two astronomical units away, its settlement lights about eighteen minutes old.
100 million miles out	The inner surface. Each hexagonal section has its own mini-sun on a track across its sky. Section boundaries weather into wrong-angled ridges, and crossing one can feel, for half a second, like stepping into a different world.
The inhabited band	The Sphere spins, and only the band around its equator spins fast enough for weight to stand on. That ring is five million miles wide, with a surface equal to some sixteen million Earths. A tensium layer evens the weight to Earth standard. Toward the poles weight falls off to nothing, and that part of the shell holds the structure together and carries the machinery.
Underfoot	A mile of soil and rock, laid from above in layers. Under that, a mile of engineered tensium shell.
The outer face	The dark side that faces the stars, where nobody lives. Four hundred million weapons batteries are set into it, with ports, transparent galleries, and Command Center Seven two

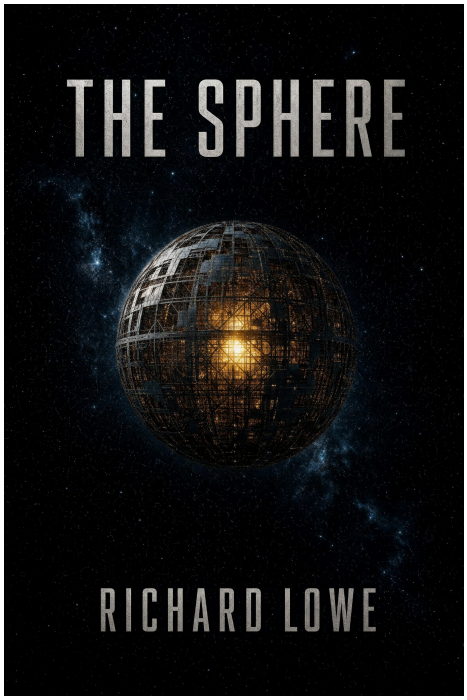
	miles down. The ships are docked out here, the four million of the construction fleet laid in rows like grit on an enormous smooth thing.
From outside	The shell is two hundred million miles across, about two astronomical units. From three light-hours away it is a dark coin about six degrees wide, a coin held at arm's length. Total surface: about one hundred and twenty-five quadrillion square miles, around two billion times the land area of Earth.
Inside it all	Twenty billion people, under a sky that curves away in every direction.

Glossary

- **The exchange.** The eleven days of November. Everyone alive afterward lives in the world that remained.
- **The Announcement.** Moru's forty-seven-minute speech. “We begin tomorrow.”
- **Tensium.** An engineered composite with extreme mass and a gravitational field its crystal structure can orient. The shell is made of it.
- **Cylinder habitats.** The orbital cylinders where most of humanity lives during the build. The sky in a cylinder is the other side of the cylinder.
- **Construction platforms.** The great working stations of the build, each with its fabrication bay, its residential ring and its own smells. When a platform is finished, it becomes road and building and foundation.
- **The fleet.** Four million heavy movers, haulers and placement tenders that carried the Earth across the void and set it down to the millimeter. Crews named their ships, like the Patient Margaret, and repainted the names by hand.
- **Construction light.** The dim, diffuse light of the surface before the mini-suns, bounced through the half-built mirror array from no direction. Platform work lights add moving shadows that belong to nobody.
- **First Light.** The day the first mini-sun is lit and the surface casts its first shadows from below.
- **Mini-sun.** The light source above each hexagonal section, fed by the mirror array and dimmed at night by the Shadow Shell.
- **Shadow Shell.** The inner sphere of rotating panels that makes the night.
- **Seeding compounds.** The sharp green and mineral smell of the early surface. Orin's first memory.
- **The full complement.** The ecological teams bring all of it, mosquitoes included, on the grounds that a complete ecosystem is complete.
- **Pressure variant.** A seeded species drifting into a form the archive has no classification for, partway to becoming new.
- **The coalition.** The alliance of hundreds of species that, seeing twelve stripped star systems and a dark sphere where a star had been, convened and voted.
- **The archive.** The records of everything, which Orin has spent more years inside than most lives last.
- **The silence of the name.** A mourning custom older than the Sphere. The name of the dead is said once, said back, and not said again for thirty days.

Read the Novel

Construction Light happens in the dim years before the first mini-sun, when the grass would not seed and the weather team wanted a storm. The Sphere tells the whole story: forty thousand years of building, the fleets that came to break it, and what keeping it safe finally cost, from the one man who lived through nearly all of it.



The Sphere

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