

BRIDGE

by James Blish

A SCREECHING tomado was rocking the Bridge when the alarm sounded; it was making the whole structure shudder and sway. This was normal and Robert Helmuth barely noticed it. There was always a tornado shaking the Bridge. The whole planet was enswathed in tornadoes, and worse.

The scanner on the foreman's board had given 114 as the sector of the trouble. That was at the northwestern end of the Bridge, where it broke off, leaving nothing but the raging clouds of ammonia crystals and methane, and a sheer drop thirty miles to the invisible surface. There were no ultraphone "eyes" at that end which gave a general view of the area in so far as any general view was possible because both ends of the Bridge were incomplete.

With a sigh Helmuth put the beetle into motion. The little car, as flat-bottomed and thin through as a bed-bug, got slowly under way on its ball-bearing races, guided and held firmly to the surface of the Bridge by ten close-set flanged rails. Even so, the hydrogen gales made a terrific siren-like shrieking between the edge of the vehicle and the deck, and the impact of the falling drops of ammonia upon the curved roof was as heavy and deafening as a rain of cannon balls. As a matter of fact, they weighed almost as much as cannon balls here, though they were not much bigger than ordinary raindrops. Every so often, too, there was a blast, accompanied by a dull orange glare, which made the car, the deck, and the Bridge itself buck savagely.

These blasts were below, however, on the surface. While they shook the structure of the Bridge heavily, they almost never interfered with its functioning, and could not, in the very nature of things, do Helmuth any harm.

Had any real damage ever been done, it would never have been repaired. There was no one on Jupiter to repair it.

The Bridge, actually, was building itself. Massive, alone, and lifeless, it grew in the black depths of Jupiter.

The Bridge had been well-planned. From Helmuth's point of view almost nothing could be seen of it, for the beetle tracks ran down the center of the deck, and in the darkness and perpetual storm even ultrawave-assisted vision could not penetrate more than a few hundred yards at the most. The width of the Bridge was eleven miles; its height, thirty miles; its length, deliberately unspecified in the plans, fifty-four miles at the momenta squat, colossal structure, built with engineering principles, methods, materials and tools never touched before

For the very good reason that they would have been impossible anywhere else. Most of the Bridge, for instance, was made of ice: a marvellous structural material under a pressure of a million atmospheres, at a temperature of 94C. Under such conditions, the best structural steel is a friable, talc-like powder, and aluminum becomes a peculiar, transparent substance that splits at a tap.

Back home, Helmuth remembered, there had been talk of starting another Bridge on Saturn, and perhaps still later, on Uranus, too. But that had been politicians' talk. The Bridge was almost five thousand miles below the visible surface of Jupiter's atmosphere, and its mechanisms were just barely manageable. The bottom of Saturn's atmosphere had been

sounded at sixteen thousand eight hundred and seventy-eight miles, and the temperature there was below 150C. There even pressure-ice would be immovable, and could not be worked with anything except itself. And as for Uranus . . .

As far as Helmuth was concerned, Jupiter was quite bad enough.

The beetle crept within sight of the end of the Bridge and stopped automatically. Helmuth set the vehicle's eyes for highest penetration, and examined the nearby beams.

The great bars were as close-set as screening. They had to be, in order to support even their own weight, let alone the weight of the components of the Bridge. The whole web-work was flexing and fluctuating to the harpist-fingered gale, but it had been designed to do that. Helmuth could never help being alarmed by the movement, but habit assured him that he had nothing to fear from it.

He took the automatics out of the circuit and inched the beetle forward manually. This was only Sector 113, and the Bridge's own Wheatstone-bridge scanning system there was no electronic device anywhere on the Bridge, since it was impossible to maintain a vacuum on Jupiter said that the trouble was in Sector 114. The boundary of Sector 114 was still fully fifty feet away.

It was a bad sign. Helmuth scratched nervously in his red beard. Evidently there was really cause for alarm real alarm, not just the deep, grinding depression which he always felt while working on the Bridge. Any damage serious enough to halt the beetle a full sector short of the trouble area was bound to be major. ~

It might even turn out to be the disaster which he had felt lurking ahead of him ever since he had been made foreman of the Bridge that disaster which the Bridge itself could not repair, sending man reeling home from Jupiter in defeat.

The secondaries cut in and the beetle stopped again. Grimly, Helmuth opened the switch and sent the beetle creeping across the invisible danger line. Almost at once, the car tilted just perceptibly to the left, and the screaming of the winds between its edges and the deck shot up the scale, sirening in and out of the soundless-dogwhistle range with an eeriness that set Helmuth's teeth on edge. The beetle itself fluttered and chattered like an alarm-clock hammer between the surface of the deck and the flanges of the tracks.

Ahead there was still nothing to be seen but the horizontal driving of the clouds and the hail, roaring along the length of the Bridge, out of the blackness into the beetle's fanlights, and onward into blackness again towards the horizon no eye would ever see.

Thirty miles below, the fusillade of hydrogen explosions continued. Evidently something really wild was going on on the surface. Helmuth could not remember having heard so much activity in years.

There was a flat, especially heavy crash, and a long line of fuming orange fire came pouring down the seething atmosphere into the depths, feathering horizontally like the mane of a Lipizzan horse, directly in front of Helmuth. Instinctively, he winced and drew back from the board, although that stream of flame actually was only a little less cold than the rest of the streaming gases, far too cold to injure the Bridge.

In the momentary glare, however, he saw something—an upward twisting of shadows, patterned but obviously unfinished, fluttering in silhouette against the hydrogen cata-

tract's lurid light.
The end of the Bridge.

Wrecked.
Helmuth grunted involuntarily and backed the beetle away. The flare dimmed; the light poured down the sky and fell away into the raging sea below. The scanner clucked with satisfaction as the beetle recrossed the line into Zone 113.

He turned the body of the vehicle 180, presenting its back to the dying torrent. There was nothing further that he could do at the moment on the Bridge. He scanned his control board a ghost image of which was cast across the scene on the Bridge for the blue button marked *Garage*, punched it savagely, and tore off his helmet.

Obediently, the Bridge vanished.

Dillon was looking at him.
"Well?" the civil engineer said. "What's the matter, Bob? Is it bad?"

Helmuth did not reply for a moment. The abrupt transition from the storm-ravaged deck of the Bridge to the quiet, placid air of the control shack on Jupiter V was always a shock. He had never been able to anticipate it, let alone become accustomed to it; it was worse each time, not better.

He put the helmet down carefully in front of him and got up, moving carefully upon shaky legs; feeling implicit in his own body the enormous pressures and weights his guiding intelligence had just quitted. The fact that the gravity on the foreman's deck was as weak as that of most of the habitable asteroids only made the contrast greater, and his need for caution in walking more extreme.

He went to the big porthole and looked out. The unworn, tumbled, monotonous surface of airless Jupiter V looked almost homey after the perpetual holocaust of Jupiter itself. But there was an overpowering reminder of that holocaust for through the thick quartz the face of the giant planet stared at him, across only one hundred and twelve thousand and six hundred miles: a sphere-section occupying almost all of the sky except the near horizon. It was crawling with colour, striped and blotched with the eternal, frigid, poisonous storming of its atmosphere, spotted with the deep planet-sized shadows of farther moons.

Somewhere down there, six thousand miles below the clouds that boiled in his face, was the Bridge. The Bridge was thirty miles high and eleven miles wide and fifty-four miles long but it was only a sliver, an intricate and fragile arrangement of ice-crystals beneath the bulging, racing tornadoes.

On Earth, even in the West, the Bridge would have been the mightiest engineering achievement of all history, could the Earth have borne its weight at all. But on Jupiter, the Bridge was as precarious and perishable as a snowflake.

"Bob?" Dillon's voice asked. "You seem more upset than usual. Is it serious?" Helmuth turned. His superior's worn young face, lantern-jawed and crowned by black hair already beginning to grey at the temples, was alight both with love for the Bridge and the consuming ardour of the responsibility he had to bear. As always, it touched Helmuth, and reminded him that the implacable universe bed, after all, provided one warm corner in which human beings might huddle together.

"Serious enough," he said, forming the words with dif-

difficulty against the frozen inarticulateness Jupiter forced upon him. "But not fatal, as far as I could see. There's a lot of hydrogen vulcanism on the surface, especially at the north-west end, and it looks like there must have been a big blast under the cliffs. I saw what looked like the last of a series of fireballs."

Dillon's face relaxed while Helmuth was talking, slowly, line by engraved line. "Oh. Just a flying chunk, then."

"I'm almost sure that's what it was. The cross-draughts are heavy now. The Spot and the STD are due to pass each other some time next week, aren't they? I haven't checked, but I can feel the difference in the storms."

"So the chunk got picked up and thrown through the end of the Bridge. A big piece?"

Helmuth shrugged. "That end is all twisted away to the left, and the deck is burst to splinters. The scaffolding is all gone, too, of course. A pretty big piece, all right, Charitytwo miles through at a minimum."

DiUon sighed. He, too, went to the window, and looked out. Helmuth did not need to be a mind reader to know what he was looking at. Out there, across the stony waste of Jupiter V plus one hundred and twelve thousand and six hundred miles of space, the South Tropical Disturbance was streaming towards the great Red Spot, and would soon overtake it.

When the whirling funnel of the STD more than big enough to suck three Earths into deep-freeze passed the planetary island of sodium-tainted ice which was the Red Spot, the Spot would follow it for a few thousand miles, at the same time rising closer to the surface of the atmosphere.

Then the Spot would sink again, drifting back towards the incredible jet of stress-fluid which kept it in being a jet fed by no one knew what forces at Jupiter's hot, rocky, twenty-two-thousand-mile core, under sixteen thousand miles of eternal ice. During the entire passage, the storms all over Jupiter became especially violent; and the Bridge had been forced to locate in anything but the calmest spot on the planet, thanks to the uneven distribution of the few permanent land-masses.

Helmuth watched Dillon with a certain compassion, tempered with mild envy. Charity Dillon's unfortunate given name betrayed him as the son of a hangover, the only male child of a Witness family which dated back to the great Witness Revival of 2003. He was one of the hundreds of government-drafted experts who had planned the Bridge, and he was as obsessed by the Bridge as Helmuth was but for different reasons.

Helmuth moved back to the port, dropping his hand gently upon Dillon's shoulder. Together they looked at the screaming straw yellows, brick reds, pinks, oranges, browns, even blues and greens that Jupiter threw across the ruined stone of its innermost satellite. On Jupiter V, even the shadows had colour.

Dillon did not move. He said at last: "Are you pleased, Bob?"

"Pleased?" Helmuth said in astonishment. "No. It scares me white; you know that. I'm just glad that the whole Bridge didn't go."

"You're quite sure?" Dillon said quietly.

Helmuth took his hand from Dillon's shoulder and returned to his seat at the central desk. "You've no right to needle me for something I can't help," he said, his voice even lower than Dillon's. "I work on Jupiter four hours a day not

actually, because we can't keep a man alive for more than a split second down there but my eyes and my ears and my mind are there, on the Bridge, four hours a day. Jupiter is not a nice place. I don't like it. I won't pretend I do.

"Spending four hours a day in an environment like that over a period of years well, the human mind instinctively tries to adapt, even to the unthinkable. Sometimes I wonder how I'll behave when I'm put back in Chicago again. Sometimes I can't remember anything about Chicago except vague generalities, sometimes I can't even believe there is such a place as Earth how could there be, when the rest of the universe is like Jupiter, or worse?"

"I know," Dillon said. "I've tried several times to show you that isn't a very reasonable frame of mind."

"I know it isn't. But I can't help how I feel. No, I don't think the Bridge will last. It can't last; it's all wrong. But I don't *want* to see it go. I've just got sense enough to know that one of these days Jupiter is going to sweep it away."

He wiped an open palm across the control boards, snapping all the toggles "Off" with a sound like the fall of a double-handful of marbles on a pane of glass. "Like that. Charity! And I work four hours a day, every day, on the Bridge. One of these days, Jupiter is going to destroy the Bridge. It'll go flying away in little flinders into the storms. My mind will be there, supervising some puny job, and my mind will go flying away along with my mechanical eyes and ears still trying to adapt to the unthinkable, tumbling away into the winds and the flames and the rains and the darkness and the pressure and the cold."

"Bob, you're deliberately running away with yourself. Cut it out. Cut it out, I say!"

Helmuth shrugged, putting a trembling hand on the edge of the board to steady himself. "All right. I'm all right, Charity. I'm here, aren't I? Right here on Jupiter V, in no danger, in no danger at all. The Bridge is one hundred and twelve thousand and six hundred miles away from here. But when the day comes that the Bridge is swept away

"Charity, sometimes I imagine you ferrying my body back to the cosy nook it came from, while my soul goes tumbling and tumbling through millions of cubic miles of poison. All right. Charity, I'll be good. I won't think about it out loud; but you can't expect me to forget it. It's on my mind; I can't help it, and you should know that."

"I do," Dillon said, with a kind of eagerness. "I do, Bob. I'm only trying to help, to make you see the problem as it is. The Bridge isn't really that awful, it isn't worth a single nightmare."

"Oh, it isn't the Bridge that makes me yell out when I'm sleeping," Helmuth said, smiling bitterly. "I'm not that ridden by it yet. It's while I'm awake that I'm afraid the Bridge will be swept away. What I sleep with is a fear of myself."

"That's a sane fear. You're as sane as any of us," Dillon insisted, fiercely solemn. "Look, Bob. The Bridge isn't a monster. It's a way we've developed for studying the behaviour of materials under specific conditions of temperament, pressure, and gravity. Jupiter isn't Hell, either; it's a set of conditions. The Bridge is the laboratory we set up to work with those conditions."

"It isn't going anywhere. It's a bridge to no place."

"There aren't many *places* on Jupiter," Dillon said, missing Helmuth's meaning entirely. "We put the Bridge on an island in the local sea because we needed solid ice we could sink

the caissons in. Otherwise, it wouldn't have mattered where we put it. We could have floated it on the sea itself, if we hadn't wanted to fix it in order to measure storm velocities and such things."

"I know that," Helmuth said.

"But, Bob, you don't show any signs of understanding it. Why, for instance, should the Bridge *go* any place? It isn't even, properly speaking, a bridge at all. We only call it that because we used some bridge engineering principles in building it. Actually, it's much more like a travelling cranean extremely heavy-duty overhead rail line. It isn't going anywhere because it hasn't any place interesting to go, that's all. We're extending it to cover as much territory as possible, and to increase its stability, not to span the distance between places. There's no point to reproaching it because it doesn't span a real gapbetween, say, Dover and Calais. It's a bridge to knowledge, and that's far more important. Why can't you see that?"

"I can see that; that's what I was talking about," Helmuth said, trying to control his impatience. "I have as much common sense as the average child. What I was trying to point out is that meeting colossalness with colossalnessout hereis a mug's game. It's a game Jupiter will always win, without the slightest effort. What if the engineers who built the Dover-Calais bridge had been limited to broomstraws for their structural members? They could have got the bridge up somehow, sure, and made it strong enough to carry light traffic on a fair day. But what would you have had left of it after the first winter storm came down the Channel from the North Sea? The whole approach is idiotic!"

"All right," Dillon said reasonably. "You have a point. Now you're being reasonable. What better approach have you to suggest? Should we abandon Jupiter entirely because it's too big for us?"

"No," Helmuth said. "Or maybe, yes. I don't know. I don't have any easy answer. I just know that this one is no answer at allit's just a cumbersome evasion."

Dillon smiled. "You're depressed, and no wonder. Sleep it off, Bob, if you canyou might even come up with that answer. In the meantime, when you stop to think about it, the surface of Jupiter isn't any more hostile, inherently, than the surface of Jupiter V, except in degree. If you stepped out of this building naked, you'd die just as fast as you would on Jupiter. Try to look at it that way."

Helmuth, looking forward into another night of dreams, said: "That's the way I look at it now."

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There were three yellow "Critical" signals lit on the long gang board when Helmuth passed through the gang deck on the way back to duty. All of them, as usual, were concentrated on Panel 9, where Eva Chavez worked.

Eva, despite her Latin namesuch once-valid tickets no longer meant anything among Earth's uniformly mixed-race populationwas a big girl, vaguely blonde, who cherished a passion for the Bridge. Unfortunately, she was apt to become enthralled by the sheer Cosmicness of it all, precisely at the moments when cold analysis and split-second decisions were most crucial.

Helmuth reached over her shoulder, cut her out of the circuit except as an observer, and donned the co-operator's helmet. The incomplete new shoals caisson sprang into being around

the caisson.

The nearest truss bent upward in the wind. It fluttered for a moment, trying to resist. It bent farther.

Deprived of its major attachment, it tore free suddenly, and went whirling away into the blackness. A sudden flash of lightning picked it out for a moment, and Helmuth saw it dwindling like a bat with torn wings being borne away by a cyclone.

The scraper scuttled down into the pit and began to fill it with ice from the bottom. Helmuth ordered down a new truss and a squad of scaffolders. Damage of this order took time to repair. He watched the tornado tearing ragged chunks from the edges of the pit until he was sure that the catalysis had stopped. Then, suddenly, prematurely, dismally tired, he took off the helmet.

He was astounded by the white fury that masked Eva's big-boned, mildly pretty face.

"You'll blow the Bridge up yet, won't you?" she said, evenly, without preamble. "Any pretext will do!"

Baffled, Helmuth turned his head helplessly away; but that was no better. The suffused face of Jupiter peered swollenly through the picture-port, just as it did on the foreman's desk.

He and Eva and Charity and the gang and the whole of satellite V were falling forward towards Jupiter; their uneventful cooped-up lives on Jupiter V were utterly unreal compared to the four hours of each changeless day spent on Jupiter's everchanging surface. Every new day brought their minds, like ships out of control, closer and closer to that gaudy inferno.

There was no other way for a man or a woman on Jupiter V to look at the giant planet. It was simple experience, shared by all of them, that planets do not occupy four-fifths of the whole sky, unless the observer is himself up there on that planet's sky, falling, falling faster and faster.

"I have no intention," he said tiredly, "of blowing up the Bridge. I wish you could get it through your head that I want the Bridge to stay *up* even though I'm not starry-eyed to the point of incompetence about the project. Did you think that rotten spot was going to go away by itself when you'd painted it over? Didn't you know that?"

Several helmeted, masked heads nearby turned blindly towards the sound of his voice. Helmuth shut up. Any distracting conversation or activity was taboo, down here in the gang room. He motioned Eva back to duty.

The girl donned her helmet obediently enough, but it was plain from the way her normally full lips were thinned that she thought Helmuth had ended the argument only in order to have the last word.

Helmuth strode to the thick pillar which ran down the central axis of the shack, and mounted the spiralling cleats towards his own foreman's cubicle. Already he felt in anticipation the weight of the helmet upon his own head.

Charity Dillon, however, was already wearing the helmet; he was sitting in Helmuth's chair.

Charity was characteristically oblivious of Helmuth's entrance. The Bridge operator must learn to ignore, to be utterly unconscious of anything happening around his body except the inhuman sounds of signals; must learn to heed only those senses which report something going on thousands of miles away.

Helmuth knew better than to interrupt him. Instead, he watched Dillon's white, blade-like fingers roving with blind

sureness over the controls.

Dillon, evidently, was making a complete tour of the Bridge not only from end to end, but up and down, too. The tally board showed that he had already activated nearly two-thirds of the ultraphone eyes. That meant that he had been up all night at the job; had begun it immediately after last talking to Helmuth.

Why?

With a thrill of unfocused apprehension, Helmuth looked at the foreman's jack, which allowed the operator here in the cubicle to communicate with the gang when necessary, and which kept him aware of anything said or done at gang boards.

It was plugged in.

Dillon sighed "suddenly, took the helmet off, and turned.

"Hello, Bob," he said. "Funny about this job. You can't see, you can't hear, but when somebody's watching you, you feel a sort of pressure on the back of your neck. ESP, maybe. Ever felt it?"

"Pretty often, lately. Why the grand tour, Charity?"

"There's to be an inspection," Dillon said. His eyes met Helmuth's. They were frank and transparent. "A mob of Western officials, coming to see that their eight billion dollars isn't being wasted. Naturally, I'm a little anxious to see that they find everything in order."

"I see," Helmuth said. "First time in five years, isn't it?"

"Just about. What was that dust-up down below just now? Somebody you. I'm sure, from the drastic handiwork involved bailed Eva out of a mess, and then I heard her talk about your wanting to blow up the Bridge. I checked the area when I heard the fracas start, and it did seem as if she had let things go rather far, but What was it all about?"

Dillon ordinarily hadn't the guile for cat-and-mouse games, and he had never looked less guileful now. Helmuth said carefully, "Eva was upset, I suppose. On the subject of Jupiter we're all of us cracked by now, in our different ways. The way she was dealing with the catalysis didn't look to me to be suitable a difference of opinion, resolved in my favour because I had the authority, Eva didn't. That's all."

"Kind of an expensive difference, Bob. I'm not niggling by nature, you know that. But an incident like that while the commission is here"

"The point is," Helmuth said, "are we to spend an extra ten thousand, or whatever it costs to replace a truss and reinforce a caisson, or are we to lose the whole caisson and as much as a third of the whole Bridge along with it?"

"Yes, you're right there, of course. That could be explained, even to a pack of senators. But it would be difficult to have to explain it very often. Well, the board's yours, Bob. You could continue my spot-check, if you've time."

Dillon got up. Then he added suddenly, as if it were forced out of him:

"Bob, I'm trying to understand your state of mind. From what Eva said, I gather that you've made it fairly public. I . . . I don't think it's a good idea to infect your fellow workers with your own pessimism. It leads to sloppy work. I know that regardless of your own feelings you won't countenance sloppy work, but one foreman can do only so much. And you're making extra work for yourself not for me, but for yourself by being openly gloomy about the Bridge.

"You're the best man on the Bridge, Bob, for all your grouching about the job, and your assorted misgivings. I'd hate to

see you replaced."

"A threat, Charity?" Helmuth said softly.

"Wo. I wouldn't replace you unless you actually went nuts, and I firmly believe that your fears in that respect are groundless. It's a commonplace that only sane men suspect their own sanity, isn't it?"

"It's a common misconception. Most psychopathic obsessions begin with a mild worry."

Dillon made as if to brush that subject away. "Anyhow, I'm not threatening; I'd fight to keep you here. But my say-so only covers Jupiter V; there are people higher up on Ganymede, and people higher yet back in Washington and in this inspecting commission.

"Why don't you try to look on the bright side for a change? Obviously the Bridge isn't ever going to inspire you. But you might at least try thinking about all those dollars piling up in your account every hour you're on this job, and about the bridges and ships and who knows what-all that you'll be building, at any fee you ask, when you get back down to Earth. All under the magic words, 'One of the men who built the Bridge on Jupiter!'"

Charity was bright red with embarrassment and enthusiasm. Helmuth smiled.

"I'll try to bear it in mind, Charity," he said. "When is this gaggle of senators due to arrive?"

"They're on Ganymede now, taking a breather. They came directly from Washington without any routing. I suppose they'll make a stop at Callisto before they come here. They've something new on their ship, I'm told, that lets them flit about more freely than the usual uphill transport can."

An icy lizard suddenly was nesting in Helmuth's stomach, coiling and coiling but never settling itself. The room blurred. The persistent nightmare was suddenly almost upon him already.

"Something. . . new?" he echoed, his voice as flat and non-committal as he could make it. "Do you know what it is?"

"Well, yes. But I think I'd better keep quiet about it until"

"Charity, nobody on this deserted rock-heap could possibly be a Soviet spy. The whole habit of 'security' is idiotic out here. Tell me now and save me the trouble of dealing with senators; or tell me at least that you know I know. *They have antigravity!* Isn't that it?"

One word from DiUon, and the nightmare would be real.

"Yes," Dillon said. "How did you know? Of course, it couldn't be a complete gravity screen by any means. But it seems to be a good long step towards it. We've waited a long time to see that dream come true. But you're the last man in the world to take pride in the achievement, so there's no sense exulting about it to you. I'll let you know when I get a definite arrival date. In the meantime, will you think about what I said before?"

"Yes, I will." Helmuth took the seat before the board.

"Good. With you, I have to be grateful for small victories. Good trick, Bob."

"Good trick, Charity."

iv

Instead of sleeping for now he knew that he was really afraid he sat up in the reading chair in his cabin. The illuminated microfilm pages of a book flipped by across the surface of the wall opposite him, timed precisely to the reading rate most comfortable for him, and he had several weeks'

worry-conserved alcohol and smoke rations for ready consumption.

But Helmuth let his mix go flat, and did not notice the book, which had turned itself on, at the page where he had abandoned it last, when he had fitted himself into the chair. Instead, he listened to the radio.

"There was always a great deal of ham radio activity in the Jovian system. The conditions were good for it, since there was plenty of power available, few impeding atmosphere layers, and those thin, no Heaviside layers, and few official and no commercial channels with which the hams could interfere.

And there were plenty of people scattered about the satellites who needed the sound of a voice.

". . . anybody know whether the senators are coming here? Doc Barth put in a report a while back on a fossil plant he found here, at least he thinks it was a plant. Maybe they'd like a look at it."

"They're supposed to hit the Bridge team next." A strong voice, and the impression of a strong transmitter wavering in and out; that would be Sweeney, on Ganymede. "Sorry to throw the wet blanket, boys, but I don't think the senators are interested in our rock-balls for their own lumpy selves. We could only hold them here three days."

Helmuth thought greyly: *Then they've already left Callisto.*

"It that you, Sweeney? Where's the Bridge tonight?"

"Dillon's on duty," a very distant transmitter said. "Try to raise Helmuth, Sweeney."

"Helmuth, Helmuth, you gloomy beetle-gooser! Come in, Helmuth!"

"Sure, Bob, come in and dampen us."

Sluggishly, Helmuth reached out to take the mike, where it lay clipped to one arm of the chair. But the door to his room opened before he had completed the gesture.

Eva came in.

She said, "Bob, I want to tell you something."

"His voice is changing!" the voice of the Callisto operator said. "Ask him what he's drinking, Sweeney!"

Helmuth cut the radio out. The girl was freshly dressed in so far as anybody dressed in anything on Jupiter Vand Helmuth wondered why she was prowling the decks at this hour, half-way between her sleep period and her trick. Her hair was hazy against the light from the corridor, and she looked less mannish than usual. She reminded him a little of the way she had looked when they first met.

"All right," he said. "I owe you a mix, I guess. Citric, sugar and the other stuff is in the locker. . . you know where it is. Shot-cans are there, too."

The girl shut the door and sat down on the bunk, with a free liveness that was almost grace, but with a determination which Helmuth knew meant that she had just decided to do something silly for all the right reasons.

"I don't need a drink," she said. "As a matter of fact, lately I've been turning my lux-R's back to the common pool. I suppose you did that for meby showing me what a mind looked like that is hiding from itself."

"Eva, stop sounding like a tract. Obviously, you've advanced to a higher, more Jovian plane of existence, but won't you still need your metabolism? Or have you decided that vitamins are all-in-the-mind?"

"Now you're being superior. Anyhow, alcohol isn't a vitamin. And I didn't come to talk about that. I came to

tell you something I *think* you ought to know."

"Which is?"

She said, "Bob, I mean to have a child here."

A bark of laughter, part sheer hysteria and part exasperation, jack-knifed Helmuth into a sitting position. A red arrow bloomed on the far wall, obediently marking the paragraph which, supposedly, he had reached in his reading, and the page vanished.

"*Women!*" he said, when he could get his breath back.

"Really, Evita, you make me feel much better. No environment can change a human being much, after all."

"Why should it?" she said suspiciously. "I don't see the joke. Shouldn't a woman want to have a child?"

"Of course she should," he said, settling back. The flipping pages began again. "It's quite ordinary. All women want to have children. All women dream of the day they can turn a child out to play in an airless rock-garden, to pluck fossils and get quaintly star-burned. How cosy to tuck the little blue body back into its corner that night, promptly at the sound of the trick-change bell! Why, it's as natural as Jupiter-light as Earthian as vacuum-frozen apple pie."

He turned his head casually away. "As for me, though, Eva, I'd much prefer that you take your ghostly little pretext out of here."

Eva surged to her feet in one furious motion. Her fingers grasped him by the beard and jerked his head painfully around again.

"You reedy male platitude!" she said, in a low grinding voice. "How you could see almost the whole point and make so little of it *Women*, is it? So you think I came creeping in here, full of humbleness, to settle our technical differences."

He closed his hand on her wrist and twisted it away. "What else?" he demanded, trying to imagine how it would feel to stay reasonable for five minutes at a time with these Bridge-robots. "None of us need bother with games and excuses. We're here, we're isolated, we were all chosen because, among other things, we were judged incapable of forming permanent emotional attachments, and capable of such alliances as we found attractive without going unbalanced when the attraction diminished and the alliance came unstuck. None of us have to pretend that our living arrangements would keep us out of jail in Boston, or that they have to involve any Earth-normal excuses."

She said nothing. After a while he asked, gently, "Isn't that so?"

"Of course it's so. Also it has nothing to do with the matter."

"It doesn't? How stupid do you think I am? / don't care whether or not you've decided to have a child here, if you really mean what you say."

She was trembling with rage. "You really don't, too. The decision means nothing to you."

"Well, if I liked children, I'd be sorry for the child. But as it happens, I can't stand children. In short, Eva, as far as I'm concerned you can have as many as you want, and to me you'll *still* be the worst operator on the Bridge."

"I'll bear that in mind," she said. At this moment she seemed to have been cut from pressure-ice. "I'll leave you something to charge your mind with, too, Robert Helmuth. I'll leave you sprawled here under your precious book... what is *Madame Bovary* to you, anyhow, you unadventurous turtle?... to think about a man who believes that children

must always be born into warm cradles a man who thinks that men have to huddle on warm worlds, or they won't survive. A man with no ears, no eyes, scarcely any head. A man in terror, a man crying Mamma! *Mamma!* all the stellar days and nights long!"

"Parlour diagnosis!"

"Parlour labelling. Good trick, Bob. Draw your warm woolly blanket in tight about your brains, or some little sneeze of sense might creep in, and impair your efficiency!"

The door closed sharply after her.

A million pounds of fatigue crashed down without warning on Helmuth's brain, and he fell back into the reading chair with a gasp. The roots of his beard ached, and Jupiter's bloomed and wavered away before his closed eyes.

He struggled once, and fell asleep.

Instantly he was in the grip of the dream.

It started, as always, with commonplaces, almost realistic enough to be a documentary film-strip except for the appalling sense of pressure, and the distorted emotional significance with which the least word, the smallest movement was invested.

It was the sinking of the first caisson of the Bridge. The actual event had been bad enough. The job demanded enough exactness of placement to require that manned ships enter Jupiter's atmosphere itself: a squadron of twenty of the most powerful ships ever built, with the five-million-ton asteroid, trimmed and shaped in space, slung beneath them in an immense cat's cradle.

Four times that squadron had disappeared beneath the clouds; four times the tense voices of pilots and engineers had muttered in Helmuth's ears; four times there were shouts and futile orders and the snapping of cables and someone screaming endlessly against the eternal howl of the Jovian sky.

It had cost, altogether, nine ships and two hundred and thirty-one men, to get one of five laboriously shaped asteroids planted in the shifting slush that was Jupiter's surface. Helmuth had helped to supervise all five operations, counting the successful one, from his desk on Jupiter V; but in the dream he was not in the control shack, but instead on ship-board, in one of the ships that was never to come back.

Then, without transition, but without any sense of discontinuity either, he was on the Bridge itself. Not *in absentia*, as the remote guiding intelligence of a beetle, but in person, in an ovular, tank-like suit the details of which would never come clear. The high brass had discovered antigravity, and had asked for volunteers to man the Bridge. Helmuth had volunteered.

Looking back on it in the dream, he did not understand why he had volunteered. It had simply seemed expected of him, and he had not been able to help it, even though he had known what it would be like. He belonged on the Bridge, though he hated it he had been doomed to go there, from the first.

And there was . . . something wrong. . . with the antigravity. The high brass had asked for its volunteers before the scientific work had been completed. The present antigravity fields were weak, and there was some basic flaw in the theory. Generators broke down after only short periods of use, burned out, unpredictably, sometimes only moments after testing up without a flawlike vacuum tubes in waking life.

That was what Helmuth's set was about to do. He crouched inside his personal womb, above the boiling sea, the clouds

raging about him, lit by a plume of hydrogen flame, and waited to feel his weight suddenly become eight times greater than normal. He knew what would happen to him then. It happened.

Helmuth greeted morning on Jupiter V with his customary scream.

V

The ship that landed as he was going on duty did nothing to lighten the load on his heart. In shape it was not distinguishable from any of the long-range cruisers which ran the legs of the Moon-Mars-Belt-Ganymede trip. But it grounded its huge bulk with less visible expenditures of power than one of the little intersatellary boats.

That landing told Helmuth that his dream was well on its way to coming true. If the high brass had had a real anti-gravity, there would have been no reason why the main jets should have been necessary at all. Obviously, what had been discovered was some sort of partial screen, which allowed a ship to operate with far less jet action than was normal, but which still left it subject to a sizeable fraction of the universal stress of space.

Nothing less than complete and completely controllable antigravity would do on Jupiter.

He worked mechanically, noting that Charity was not in evidence. Probably he was conferring with the senators, receiving what would be for him the glad news.

Helmuth realized suddenly that there was nothing left for him to do now but to cut and run.

There could certainly be no reason why he should have to re-enact the entire dream, helplessly, event for event, like an actor committed to a play. He was awake now, in full control of his own senses, and still at least partially sane. The man in the dream had volunteered but that man would not be Robert Helmuth. Not any longer.

While the senators were here, he would turn in his resignation. Direct, over Charity's head.

"Wake up, Helmuth," a voice from the gang deck snapped suddenly. "If it hadn't been for me, you'd have run yourself off the end of the Bridge. You had all the automatic stops on that beetle cut out."

Helmuth reached guiltily and more than a little too late for the controls. Eva had already run his beetle back beyond the danger line.

"Sorry," he mumbled. "Thanks, Eva."
"Don't thank me. If you'd actually been in it, I'd have let it go. Less reading and more sleep is what I recommend for you, Helmuth."

"Keep your recommendations to yourself," he snapped.

The incident started a new and even more disturbing chain of thought. If he were to resign now, it would be nearly a year before he could get back to Chicago. Antigravity or no antigravity, the senators' ship would have no room for unexpected passengers. Shipping a man back home had to be arranged far in advance. Space had to be provided, and a cargo equivalent of the weight and space requirements he would take up on the return trip had to be deadheaded out to Jupiter.

A year of living in the station on Jupiter V without any function as a man whose drain on the station's supplies no longer could be justified in terms of what he did. A year of living under the eyes of Eva Chavez and Charity Dillon and the other men and women who still remained Bridge opera-

tors, men and women who would not hesitate to let him know what they thought of his quitting.

A year of living as a bystander in the feverish excitement of direct, personal exploration of Jupiter. A year of watching and hearing the inevitable deaths while he alone stood aloof, privileged and useless. A year during which Robert Helmuth would become the most hated living entity in the Jovian system.

And, when he got back to Chicago and went looking for a job for his resignation from the Bridge gang would automatically take him out of government service he would be asked why he left the Bridge at the moment when work on the Bridge was just reaching its culmination.

He began to understand why the man in the dream had volunteered.

When the trick-change bell rang, he was still determined to resign, but he had already concluded bitterly that there were, after all, other kinds of hells besides the one on Jupiter.

He was returning the board to neutral as Charity came up the cleats. Charity's eyes were snapping like a skyful of comets. Helmuth had known that they would be.

"Senator Wagoner wants to speak to you, if you're not too tired, Bob," he said. "Go ahead; I'll finish up there."

"He does?" Helmuth frowned. The dream surged back upon him. *NO*. "They would not rush him any faster than he wanted to go. "What about, Charity? Am I suspected of un-Western activities? I suppose you've told them how I feel." "I have," Dillon said, unruffled. "But we're agreed that you may not feel the same after you've talked to Wagoner. He's in the ship, of course. I've put out a suit for you at the lock."

Charity put the helmet over his head, effectively cutting himself off from further conversation, or from any further consciousness of Helmuth at all.

Helmuth stood looking at him a moment. Then, with a convulsive shrug, he went down the cleats.

Three minutes later, he was plodding in a spacesuit across the surface of Jupiter V, with the vivid bulk of Jupiter splashing his shoulders with colour.

A courteous Marine let him through the ship's air lock and deftly peeled him out of the suit. Despite a grim determination to be uninterested in the new antigravity and any possible consequence of it, he looked curiously about as he was conducted up towards the bow.

But the ship was like the ones that had brought him from Chicago to Jupiter V it was like any spaceship: there was nothing in it to see but corridor walls and stairwells, until you arrived at the cabin where you were needed.

Senator Wagoner was a surprise. He was a young man, no more than sixty-five at most, not at all portly, and he had the keenest pair of blue eyes that Helmuth had ever seen. He received Helmuth alone, in his own comfortable cabin as spaceship accommodations go, but neither roomy nor luxurious. He was hard to match up with the stories Helmuth had been hearing about the current Senate, which had been involved in scandal after scandal of more than Roman proportions.

Helmuth looked around. "I thought there were several of you," he said.

"There are, but I didn't want to give you the idea that you were facing a panel," Wagoner said, smiling. "I've been forced to sit in on most of these endless loyalty investigations back home, but I can't see any point in exporting such

religious ceremonies to deep space. Do sit down, Mr. Helmuth. There are drinks coming. We have a lot to talk about."

Stiffly, Helmuth sat down.

"Dillon tells me," Wagoner said, leaning back comfortably in his own chair, "that your usefulness to the Bridge is about at an end. In a way. I'm sorry to hear that, for you've been one of the best men we've had on any of our planetary projects. But, in another way, I'm glad. It makes you available for something much bigger, where we need you much more."

"What do you mean by that?"

"I'll explain in a moment. First, I'd like to talk a little about the Bridge. Please don't feel that I'm quizzing you, by the way. You're at perfect liberty to say that any given question is none of my business, and I'll take no offence and hold no grudge. Also, I hereby disavow the authenticity of any tape or other tapping of which this statement may be a part.' In short, our conversation is unofficial, highly so."

"Thank you."

"It's to my interest; I'm hoping that you'll talk freely to me. Of course my disavowal means nothing, since such formal statements can always be excised from a tape; but later on I'm going to tell you some things you're not supposed to know, and you'll be able to judge by what I say then that anything you say to me is privileged. Okay?"

A steward came in silently with the drinks, and left again. Helmuth tasted his. As far as he could tell, it was exactly like many he had mixed for himself back in the control shack, from standard space rations. The only difference was that it was cold, which Helmuth found startling, but not unpleasant after the first sip. He tried to relax. "I'll do my best," he said.

"Good enough. Now: Dillon says that you regard the Bridge as a monster. I've examined your dossier pretty closely, and I think perhaps Dillon hasn't quite the gist of your meaning. I'd like to hear it straight from you."

"I don't think the Bridge is a monster," Helmuth said slowly. "You see, Charity is on the defensive. He takes the Bridge to be conclusive evidence that no possible set of adverse conditions ever will stop man for long, and there I'm in agreement with him. But he also thinks of it as Progress, personified. He can't admit you asked me to speak my mind, senator that the West is a decadent and dying culture. All the other evidence that's available shows that it is. Charity likes to think of the Bridge as giving the lie to that evidence."

"The West hasn't many more years," Wagoner agreed, astonishingly. "Still and all, the West has been responsible for some really towering achievements in its time. Perhaps the Bridge could be considered as the last and the mightiest of them all."

"Not by me," Helmuth said. "The building of gigantic projects for ritual purposes doing a thing for the sake of doing it is the last act of an already dead culture. Look at the pyramids in Egypt for an example. Or an even more idiotic and more enormous example, bigger than anything human beings have accomplished yet, the laying out of the 'Diagram of Power' over the whole face of Mars. If the Martians had put all that energy into survival instead, they'd probably be alive yet."

"Agreed," Wagoner said.

"All right. Then maybe you'll also agree that the essence of a vital culture is its ability to defend itself. The West has

beaten off the Soviets for a century now but as far as I can see, the Bridge is the West's 'Diagram of Power', its pyramids, or what have you. All the money and the resources that went into the Bridge are going to be badly needed, *and won't be there*, when the next Soviet attack comes."

"Which will be very shortly, I'm told," Wagoner said, with complete calm. "Furthermore, it will be successful, and in part it will be successful for the very reasons you've outlined. For a man who's been cut off from the Earth for years, Helmuth, you seem to know more about what's going on down there than most of the general populace does."

"Nothing promotes an interest in Earth like being off it," Helmuth said. "And there's plenty of time to read out here." Either the drink was stronger than he had expected, or the senator's calm concurrence in the collapse of Helmuth's entire world had given him another shove towards nothingness; his head was spinning.

Wagoner saw it. He leaned forward suddenly, catching Helmuth flat-footed. "*However*," he said, "it's difficult for me to agree that the Bridge serves, or ever did serve, a ritual purpose. The Bridge served a huge practical purpose which is now fulfilled by the Bridge, as such, is now a defunct project."

"Defunct?" Helmuth repeated faintly.

"Quite. Of course we'll continue to operate it for a while, simply because you can't stop a process of that size on a dime, and that's just as well for people like Dillon who are emotionally tied up in it. You're the one person with any authority in the whole station who has already lost enough interest in the Bridge to make it safe for me to tell you that it's being abandoned."

"But why?"

"Because," Wagoner went on quietly, "the Bridge has now given us confirmation of a theory of stupendous importance so important, in my opinion, that the imminent fall of the West seems like a puny event in comparison. A confirmation, incidentally, which contains in it the seeds of ultimate destruction for the Soviets, whatever they may win for themselves in the next fifty years or so."

"I suppose," Helmuth said, puzzled, "that you mean anti-gravity?"

For the first time, it was Wagoner's turn to be taken aback. "Man," he said at last, "do you know *everything* I want to tell you? I hope not, or my conclusions will be mighty suspicious. Surely Charity didn't tell you we had anti-gravity; I strictly enjoined him not to mention it."

"No, the subject's been on my mind," Helmuth said. "But I certainly don't see why it should be so world-shaking, any more than I see how the Bridge helped to bring it about. I thought it had been developed independently, for the further exploitation of the Bridge, and would step up Bridge operation, not discontinue it."

"Not at all. Of course, the Bridge has given us information in thousands of different categories, much of it very valuable indeed. But the one job that *only* the Bridge could do was that of confirming, or throwing out, the Blackett-Dirac equations."

"Which are?"

"A relationship between magnetism and the spinning of a massive body that much is the Dirac part of it. The Blackett Equation seemed to show that the same formula also applied to gravity. If the figures we collected on the magnetic field strength of Jupiter forced us to retire the Dirac equations,

then none of the rest of the information we've gotten from the Bridge would have been worth the money we spent to get it. On the other hand, Jupiter was the only body in the solar system available to us which was big enough in all relevant respects to make it possible for us to test those equations at all. They involve quantities of enormous orders of magnitudes.

"And the figures show that Dirac was right. *They also show that Blackett was right.* Both magnetism *and* gravity are phenomena of rotation.

"I won't bother to trace the succeeding steps, because I think you can work them out for yourself. It's enough to say that there's a drive-generator on board this ship which is the complete and final justification of all the hell you people on the Bridge gang have been put through. The gadget has a long technical name, but the technicians who tend it have already nicknamed it the spindizzy, because of what it does to the magnetic moment of any *atomy* atomwithin its field.

"While it's in operation, it absolutely refuses to notice any atom outside its own influence. Furthermore, it will notice no other strain or influence which holds good beyond the borders of that field. It's so snooty that it has to be stopped down to almost nothing when it's brought close to a planet, or it won't let you land. But in deep space... well, it's impervious to meteors and such trash, of course; it's impervious to gravity; and it hasn't the faintest interest in any legislation about top speed limits."

"You're kidding," Helmuth said.

"Am I, now? This ship came to Ganymede directly from Earth. It did it in a little under two hours, counting manuevering time."

Helmuth took a defiant pull at his drink. "This thing really has no top speed at all?" he said. "How can you be sure of that?"

"Well, we can't," Wagoner admitted. "After all, one of the unfortunate things about general mathematical formulas is that they don't contain cut-off points to warn you of areas where they don't apply. Even quantum mechanics is somewhat subject to that criticism. However, we expect to know pretty soon just how fast the spindizzy can drive an object, if there is any limit. We expect you to tell us."

"I?"

"Yes, Helmuth, you. The coming debUcle on Earth makes it absolutely imperative for us to get interstellar expeditions started at once. Richardson Observatory, on the Moon, has two likely-looking systems picked out already one at Wolf 359, another at 61 Cygni and there are sure to be hundreds of others where Earth-like planets are highly probable. We want to scatter adventurous people, people with a thoroughly indoctrinated love of being free, all over this part of the galaxy, if it can be done.

"Once they're out there, they'll be free to flourish, with no interference from Earth. The Soviets haven't the spindizzy yet, and even after they steal it from us, they won't dare allow it to be used. It's too good and too final an escape route.

"What we want you to do. . . now I'm getting to the point, you see... *is* to direct this exodus. You've the intelligence and the cast of mind for it. Your analysis of the situation on Earth confirms that, if any more confirmation were needed. And there's no future for you on Earth now."

"You'll have to excuse me," Helmuth said, firmly. "I'm

in no condition to be reasonable now; it's been more than I could digest in a few moments. And the decision doesn't entirely rest with me, either. If I could give you an answer in . . . let me see . . . about three hours. Will that be soon enough?"

"That'll be fine," the senator said.

"And so, that's the story," Helmuth said.

Eva remained silent in her chair for a long time.

"One thing I don't understand," she said at last. "Why did you come to me? I'd have thought that you'd find the whole thing terrifying."

"Oh, it's terrifying, all right," Helmuth said, with quiet exultation. "But terror and fright are two different things, as I've just discovered. We were both wrong, Evita. I was wrong in thinking that the Bridge was a dead end. You were wrong in thinking of it as an end in itself."

"I don't understand you."

"All right, let's put it this way: The work the Bridge was doing was worth-while, as I know now so I was wrong in being frightened of it, in calling it a bridge to nowhere.

"But you no more saw where it was going than I, and you made the Bridge the be-all and end-all of your existence.

"Now, there's a place to go to; in fact there are places hundreds of places. They'll be Earth-like places. Since the Soviets are about to win Earth, those places will be more Earth-like than Earth itself, for the next century or so at least!"

She said, "Why are you telling me this? Just to make peace between us?"

"I'm going to take on this job, Evita, if you'll go along?"

She turned swiftly, rising out of the chair with a marvellous fluidity of motion. At the same instant, all the alarm bells in the station went off at once, filling every metal cranny with a jangle of pure horror.

"Posts!" the speaker above Eva's bed roared, in a distorted, gigantic version of Charity Dillon's voice. *"Peak storm overload! The STD is now passing the Spot. Wind velocity has already topped all previous records, and part of the land mass has begun to settle. This is an A-1 overload emergency."*

Behind Charity's bellow, the winds of Jupiter made a spectrum of continuous, insane shrieking. The Bridge was responding with monstrous groans of agony. There was another sound, too, an almost musical cacophony of sharp, percussive tones, such as a dinosaur might make pushing its way through a forest of huge steel tuning-forks. Helmuth had never heard that sound before, but he knew what it was.

The deck of the Bridge was splitting up the middle.

After a moment more, the uproar dimmed, and the speaker said, in Charity's normal voice, "Eva, you too, please. Acknowledge, please. This is it unless everybody comes on duty at once, the Bridge may go down within the next hour."

"Let it," Eva responded quietly.

There was a brief, startled silence, and then a ghost of a human sound. The voice was Senator Wagoner's, and the sound just might have been a chuckle.

Charity's circuit clicked out.

The mighty death of the Bridge continued to resound in the little room.

After a while, the man and the woman went to the window, and looked past the discarded bulk of Jupiter at the near horizon, where there had always been visible a few stars,