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FIASCO

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STANISLAW LEM

FIASCO

Translated from the Polish by
MICHAEL KANDEL

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A B C D E F G H I J

Contents

FIASCO

1

Birnam Wood

"Nice landing."

The man who said this was no longer looking at the pilot in the spacesuit with the helmet under his arm. In the circular control room—horseshoe console in the middle—he went to the wall of glass and looked out at the ship, a large even though distant cylinder, charred around its jets. A blackish fluid still spilled from the jets onto the concrete. The second controller, big in the shoulders, a beret tight on his bald skull, put the tapes on rewind and, like an unblinking bird, regarded the newcomer out of the corner of his eye. He wore headphones, and in front of him was a bank of flickering monitors.

"We managed," said the pilot. Pretending that he needed support to remove his heavy, double-buckled gloves, he leaned slightly against the jutting edge of the console. After that landing he was wobbly in the knees.

"What *was* it?"

The smaller one, by the glass, in a worn leather jacket, with a mousy, unshaven face, clapped his pockets until he found his cigarettes.

"Deflection in the thrust," murmured the pilot, a little surprised by the coolness of the welcome.

The man by the glass, a cigarette already in his mouth, inhaled and asked through the smoke:

"But why? You don't know?"

"No," the pilot wanted to reply—but he remained silent, because it seemed to him that he ought to have known. The tape ended. It fluttered on the reel. The larger man got up, took off the headphones, only now nodded to him, and said hoarsely:

"I'm London. And that's Goss. Welcome to Titan. What would you like to drink? We have coffee and whiskey."

The young pilot was flustered. He knew the names of these men but had not met them before. He had assumed, for no reason, that the larger would be the chief, Goss, but it was the other way around. Getting this straight in his head, he chose coffee.

"What's the cargo? Carborundum bits?" asked London when all three of them were seated at the little table that came out of the wall. The steaming coffee was in glasses that resembled laboratory beakers.

Goss took a yellow pill with his coffee, sighed, coughed, and blew his nose until tears came to his eyes.

"And you brought radiators, too, right?" he asked the pilot.

The pilot, again surprised, expecting greater interest in his feat, only nodded. It was not every day that an engine stalled in the middle of a landing. He was full of words not about freight but about how, instead of attempting to blow out the jets or increase the main power, he had immediately cut the auto and went down on only the boosters, a trick that he had never tried outside the simulator. And *that* had been ages ago. So he had to collect his thoughts again.

"I brought radiators, too," he said finally, and was even pleased at how it sounded: the laconic type, emerging from danger.

"But not to the right place," smiled the smaller man, Goss.

The pilot didn't know whether or not this was a joke.

"What do you mean? You received me—you called me," he corrected himself.

"We had to."

"I don't understand."

"You were supposed to land at Grail."

"Then why did you pull me off course?"

He felt hot. The call had sounded imperative. True, while losing speed he had caught a radio announcement from Grail about some accident, but couldn't make out much through all the static. He had been flying to Titan via Saturn, using the planet's gravity to decelerate and thus save fuel, so his ship had brushed the giant's magnetosphere until there was crackling on all the wavelengths. Immediately afterward he received the call from this spaceport. A navigator had to do what flight control said. And here, before he was out of his suit, they were cross-examining him. Mentally he was still at the helm, with the straps digging into his shoulders and chest as the rocket hit the concrete with its arms spread. The boosters, still firing and rumbling, made the whole hull shudder.

"Where was I supposed to put down?"

"Your cargo belongs to Grail," explained the smaller man, wiping his red nose. He had a cold. "But we intercepted you above orbit and called you here, because we need Killian. Your passenger."

"Killian?" the young pilot said with surprise. "He's not on board. Besides me there's only Sinko, the copilot."

The others were dumbfounded.

"Where is Killian?"

"By now, in Montreal. His wife is having a baby. He left before me, on a shuttle. Before I took off."

"From Mars?"

"Of course, from where else? What's all this about?"

"The mess that obtains in space equals that on Earth," remarked London. He stuffed tobacco in his pipe as if he wanted to break it. He was angry. The pilot, too.

"You should have asked."

"We were positive he was with you. That's what the last radiogram said." Goss blew his nose again and sighed. "You can't take off now in any case," he said finally. "And Marlin couldn't wait to get the radiators. Now he'll put all the blame on me."

"But they're there." The pilot indicated with his head. In the mist stood the dark, slender spindle of his ship. "Six of them, I think. And two in gigajoules. They'll disperse any mist or cloud."

"I can't very well put them on my back and carry them to Marlin," returned Goss, in worse and worse humor.

The carelessness, the irresponsibility of the subordinate spaceport, which, as its chief admitted, had intercepted him after three weeks of flight without verifying that he had the passenger they expected, shocked the pilot. He did not say to them that the cargo was their problem now. Until the damage was repaired, he could do nothing, even if he wanted to. He kept silent.

"You'll stay with us, of course." With these words London finished his coffee and rose from the aluminum chair. He was huge, like a heavyweight wrestler. He went over to the glass wall. The Titan landscape, a lifeless fury of mountains of unearthly color in the rusty dimness, with clouds of bronze thick at their peaks, made a perfect background for his figure. The floor of the tower vibrated slightly. An old transformer, thought the pilot. He also got up, to look at his ship. Like an ocean lighthouse it stood vertically out of the low, rushing mist. A gust blew away the wisps, but the marks of overheating on the jets were no longer visible, perhaps because of the distance and the half-light. Or else they had simply cooled.

"You have gamma defect scopes here?"

The ship mattered more to him than their trouble. They had brought the trouble on themselves.

"We do, but I won't permit anyone to approach the rocket in an ordinary suit," replied Goss.

"You think it's the pile?" the pilot blurted.

"You don't?"

The small chief got up and walked over. From the floor registers along the convex glass came a pleasant warmth.

"The temperature did jump above normal during the descent, but the Geigers were quiet. It was probably only a jet. A ceramic might have been flushed from the combustion chamber. I had the feeling that I was losing something."

"A ceramic, fine, but there was a leak," Goss said firmly. "Ceramics don't melt."

"That puddle?" The pilot was surprised. They stood at the double glass. Indeed, beneath the bottom fins lay a black puddle. Mist, wind-driven, intermittently swept the hull of the ship.

"What do you have in the pile? Heavy water or sodium?" asked London. He was a head taller than the pilot.

Squeaking sounds came from the radio. Goss hurried over, put on a headset, and spoke quietly with someone.

"It can't be from the pile . . ." the pilot said, at a loss. "I have heavy water. The solution is pure. Crystal-clear. But that is black as tar."

"Well, then, the refrigerant in the jets bled out," agreed London. "Which cracked the ceramic."

It was as if he were talking about fuses. He was not in the least bothered by the accident that had stuck the pilot and his ship in this hole.

"Yes," said the young man. "The greatest pressure is in the funnels when braking. If the ceramic cracks in one place, the main thrust will clean out the rest. Everything was flushed from the starboard jet."

London said nothing.

The pilot added hesitantly:

"I might have landed a little too close. . . ."

"Nonsense. It was good that you even landed straight."

The pilot waited for more words bordering on praise, but London turned to him and looked him over: from the tousled fair hair to the white boots of the suit.

"Tomorrow I'll send a technician with a defect scope. . . . Did you put the pile in neutral?" he added suddenly.

"No, I shut the whole thing off. As if docking."

"Good."

The pilot saw by now that no one was interested in the details of his struggle with the rocket right above the port. Coffee was fine—but shouldn't his hosts, who had imposed so much on him, provide a room and a bath? He longed for a hot shower. Goss kept whispering into the microphone. London stood leaning over him. The situation was unclear but full of tension. The pilot was beginning to feel that these two had something on their minds more important than his adventure, something that involved the signals from Grail. In flight, he had caught fragments—about machines that hadn't made it, about the search for them.

Goss turned with his chair, so that the taut line to his headset pulled the phones off his ears onto his neck.

"Where is this Sinko of yours?"

"On board. I told him to check the reactor."

London looked questioningly at the chief. The latter shook his head slightly and muttered, "Nothing."

"And their copters?"

"They returned. Visibility zero."

"You asked about the maximum load?"

"There's nothing they can do. What does a gigajoule radiator weigh?" he turned to the pilot, who was listening.

"I don't know exactly. Under a hundred tons."

"What are they doing?" insisted London. "What are they waiting for?"

"For Killian—" replied Goss and cursed.

From a compartment in the wall London took out a bottle of White Horse, shook it as if debating whether it would be suitable for the situation, and placed it back on the shelf. The pilot stood, waiting. He no longer felt the heaviness of his suit.

"We lost two men," said Goss. "They didn't reach Grail."

"Three, not two," London corrected him gloomily.

"A month ago," Goss went on, "we received a shipment of new Diglas. Six, for Grail. Grail couldn't accommodate the carrier; the spaceport was still being reconcreted, and when the first freighter set down there—the *Achilles*, ninety-nine thousand tons—the whole reinforced slab, guaranteed by the government, cracked. We were lucky the ship didn't fall over. It was pulled out of its hole and kept in dock for two days. They did some quick first aid on the concrete, put down a fireproof cover, and opened the port again. But the Diglas stayed with us. The experts decided that hauling them by rocket wouldn't pay. Besides, the captain of the *Achilles* was Ter Leoni. He wasn't about to take a ninety-nine-thousand-ton craft a measly hundred and eighty miles, from Grail to here, for such peanuts. Marlin sent two of his best operators. Last week they took two machines to Grail. The machines are working there now. The day before yesterday the same two men returned by copter, to take two more. They set out at dawn and by noon had passed the Promontory. When they began to descend, we lost contact with them. A lot of time was lost because beyond the Promontory Grail itself does the guiding. We thought they weren't answering because they were in our radio shadow."

Goss spoke in a calm monotone. London stood at the glass, his back to them. The pilot listened.

"In the same copter, with the operators, came Pirx. He had landed his *Cuivier* at Grail and wanted to see me. We've known each other for years. The copter was supposed to take him back in the evening. It didn't arrive, because Marlin had sent out everything available in the search. Pirx didn't want to wait. Or he couldn't. He was supposed to take off the next day and wanted to be on hand for the clearance of the ship. Well, he pressed me to let him return to Grail using one of the Diglas. I made him give me his word that he would take the southern trail, which was longer but avoided the Depression. He gave me his word—and broke it. I saw him, on the patsat, descending into the Depression."

"The patsat?" asked the pilot. He was pale. Sweat beaded on his brow, but he waited for the explanation.

"Our patrol satellite. It passes overhead every eight hours. It gave me a clear picture. Pirx went down and disappeared."

"*Commander* Pirx?" asked the pilot, his face changing.

"Yes. You know him?"

"Know him!" cried the pilot. "I served under him as an intern. He signed my diploma. . . . Pirx? For so many years he managed to extricate himself from the worst—"

He stopped. There was a pounding in his ears. He lifted the helmet with both hands, as if to hurl it at Goss.

"So you let him go alone in the Digla? How could you? The man's a commander of a fleet, not a truck driver."

"He knew these machines when you were still in diapers," replied Goss. It was obvious that he was trying to defend himself. London, stony-faced, went to the monitors, where Goss sat with the earphones around his neck. In front of Goss's nose, he knocked the ashes from his pipe into an empty aluminum drum. London examined the pipe, as if not knowing what it was, then took it in both hands. The pipe snapped. He threw away the pieces, returned to the window, and stood motionless, clenched fists held together behind his back.

"I couldn't refuse him."

Goss turned to London, who, as if not listening, looked through the glass at the shifting skeins of red mist. Now only the prow of the rocket occasionally emerged from them.

"Goss," said the pilot suddenly, "give me a machine."

"No."

"I have a license to operate thousand-ton striders."

There was a brief glitter in Goss's eyes, but he repeated:

"No. You never operated one on Titan."

Saying nothing, the pilot began to take off his suit. He unscrewed the wide metal collar, unfastened the shoulder clasps, the zipper underneath, then reached deep inside and brought out a folder bent from being carried so long under the heavy padding of the suit. Its flaps opened as if ripped. He went to Goss and placed papers before him, one by one. "That's from Mercury. I had a Bigant there. A Japanese model. Eighteen hundred tons. And here's my license. I drilled a glacier in Antarctica, with a Swedish ice-strider, a cryopter. Here's a photocopy of my second-place in the Greenland competition, and this is from Venus."

He slapped down the photographs as if playing trumps.

"I was there with Holley's expedition. That's my thermoped, and that's my colleague's. He was my alternate. Both models were prototypes, not bad. Except that the air conditioning leaked."

Goss looked up at him.

"But aren't you a pilot?"

"I transferred, got my qualification, with Commander Pirx. I served on his *Cuivier*. My first command was a tug. . . ."

"How old are you?"

"Twenty-nine."

"You were able to switch like that?"

"If you want to, it's possible. Besides, an operator of planetary machines can master any new type in an hour. It's like going from a moped to a motorcycle."

He broke off. He had another packet of pictures, but didn't produce them. He gathered the ones tossed on the console, put them in the worn leather folder, and returned them to his inside pocket. In the opened suit, a little red in the face, he stood near Goss. Across the monitors ran the same streaks of light, indicating nothing. London, sitting on the handrail by the glass, watched this scene in silence.

"Suppose I were to give you a Digla. Let us suppose. What would you do?"

The pilot smiled. Drops of sweat glistened on his forehead. The fair hair bore the mark of the helmet's pads on top.

"I would take a radiator with me. A gigajoule, from the ship's bay. The helicopters at Grail could never lift that, but for the Digla even a hundred tons is nothing. I would go and have a look around. . . . Marlin's wasting his time searching from the air. I know there's a lot of hematite there. And mist. From the copters you can't see a thing."

"And you'll take the machine straight to the bottom."

The pilot's smile widened, showing his white teeth. Goss noticed that this kid—because it was practically a kid, only the size of the suit had added a few years—had the same eyes as Pirx. A little lighter perhaps, but with the exact same wrinkles at the corners of the eyes. When he squinted, he had the look of a large cat in the sun—both innocent and crafty.

"He wants to enter the Depression and 'have a look around,' " Goss said to London, half as a question, half ridiculing the audacity of the volunteer. London didn't blink. Goss stood, removed the earphones, went to the cartograph, and pulled down, like a blind, a large map of the northern hemisphere of Titan.

He pointed to two thick lines that curved on a yellow-purple field cut with contour lines.

"We are here. As the crow flies, it's 110 miles to Grail. By this route, the black, it's 146. We lost four people on it when the concrete was being poured for Grail and ours was the only landing field. At that time, pedipulators on diesels were used, powered by hypergols. For local conditions, the weather was perfect. Two teams of machines reached

Grail without a hitch. And then, in a single day, four striders disappeared. In the Depression. In this circle. Without a trace."

"I know," said the pilot. "I learned that in school. I know the names of those people."

Goss put a finger on the place where, along the black trail north, a red circle had been drawn.

"The road was lengthened, but no one knew how far the treacherous terrain extended. Geologists were called in. It would have made just as much sense to call in dentists—they're experts on holes, too. No planet has traveling geysers—but we have them here. The blue in the north is the Mare Hynicum. We and Grail are deep inland. Except that this is not land—it's a sponge. The Mare Hynicum does not flood the depression between us and Grail, because the entire coastline is plateau. The geologists said that this so-called continent resembled the Baltic plate of Finno-Scandinavia."

"They were wrong," the pilot put in. This was beginning to sound like a lecture. He set his helmet down in a corner, sat back in the chair, and folded his hands like an attentive student. He did not know whether Goss intended to acquaint him with the route or scare him away from it, but the whole situation was to his liking.

"Of course. Beneath the rocks lies a slush of frozen hydrocarbons. An abomination discovered by the drills. A permanent ice, treacherous, made of polymers. The stuff doesn't melt even at zero Celsius, and the temperature here never gets higher than ninety below. Inside the Depression, there are hundreds of old calderas and extinct geysers. The experts said that these were the remnants of volcanic activity. When the geysers came back to life, we received visitors with higher degrees. Seismoacoustics discovered, far beneath the rocks, a network of caves that branched to an extent never before seen. There was speleological research—people perished, and the insurance companies paid. Finally the Consortium, too, opened its pocket book. Then the astronomers said: When Saturn's other moons are between Titan and the Sun, and the gravitational pull reaches its maximum, the continental plate crumples and the fire beneath the mantle expels magma. Titan still has a hot core. The magma cools before it rises from the depths in vents, but, cooling, it heats all of Orlandia. The Mare Hynicum is like water, and the bedrock of Orlandia is like a sponge. The plugged subterranean channels soften and open. Hence the geysers. The pressure reaches a thousand atmospheres. One never knows where the damned thing will erupt next. But you have your heart set on going there?"

"I do," replied the pilot in a studied manner. He would have liked to cross his legs, but could not in the suit. He remembered how a colleague of his once tried that and fell over, taking the stool with him. "You mean Birnam Wood?" he added. "Am I supposed to flee now, or can we talk seriously?"

Goss, ignoring this, continued:

"The new trail cost a fortune. One had to nibble away, with successive charges, at that ridge of lava—the main flow from the Gorgon. Even the Mons Olympus of Mars can't compare with the Gorgon. Dynamite proved too weak. There was a guy with us, Hornstein—you may have heard of him—who proposed that instead of breaking through the ridge they should cut steps in it, make stairs. Because that would be cheaper. In the U.N. Convention there ought to be a rule barring idiots from going into astronautics. The Typhon Ridge, anyway, they breached with special thermonuclear bombs, after digging a tunnel. Gorgon, Typhon—we're lucky the Greeks have so many monsters in their mythology for us to borrow. The new trail was opened a year ago. It intersects only the southernmost extension of the Depression. The experts pronounced it safe.

"Meanwhile, the migration of underground caverns is everywhere—beneath all of Orlandia. Three-quarters of Africa! When Titan cooled, its orbit was highly elliptical. It approached the Roche Zone, into which a multitude of smaller moons had fallen. Saturn ground them up to make its rings. So Titan cooled while boiling; great bubbles were created in the perisaturnium of the orbit, and they froze in the aposaturnium; then came sedimentation, glaciations, and this bubble-ridden, sponge-like, amorphous rock was covered and pushed underneath. It's not true that the Mare Hynicum flows in only during the ascension of all the moons of Saturn. The invasions and eruptions of geysers cannot be predicted. Everyone who works here knows this, and the carriers, too, including pilots like yourself. The trail cost billions, but it ought to be closed to heavy machines. All of us keep to the sky. We're in heaven here. Look at the name of the mine: Grail. Except that heaven has turned out to be damned expensive. The whole thing could have been set up better. The bookkeeping is a nightmare. Payments for those who die are hefty, but less money than it would take to reduce the danger. That's about all I have to say.

"It's possible for the men to crawl out, even if they're submerged. The tide is receding, and the armor on a Digla can take a hundred atmospheres per square inch. They have oxygen for three hundred hours. Marlin sent out robot hovercraft and is having two superheavies repaired. No matter what you can accomplish, it's not worth it. It's not worth risking your neck. The Digla is one of the heaviest—"

"You said you were finished," interrupted the pilot. "I have only one question, all right? What about Killian?"

Goss opened his mouth, coughed, and sat down.

"It was for this, wasn't it, that I was supposed to bring him?" added the pilot.

Goss tugged on the bottom edge of the map, which made it roll up with a flutter, then took a cigarette and said over the flame of his lighter:

"That's his specialty. He knew the terrain. Also, he had a contract. I can't forbid operators to do business with Grail. I can hand in my resignation, and I will. Meanwhile, I can send any hero packing."

"You'll give me the machine," the pilot said quietly. "I can talk with Grail right now. Marlin will jump at the offer, give me the job, and that'll be that. You'll get an official pat on the back. Marlin doesn't care whether it's Killian or me. And the instructions I've memorized. We're wasting time, Mr. Goss. Give me something to eat, please. I'll wash up, and then we can go over the details."

Goss looked to London for support, but found none in that quarter.

"He'll go," said the assistant. "I heard about him from that speleologist who was at Grail last summer. This one's cut from the same cloth as your Pirx. Still waters. Go and wash, hero. The showers are below. And come right back up, or the soup will get cold."

The pilot left, giving London a grin of gratitude. On his way out, he lifted his white helmet with such energy that the tubes slapped the sides of his suit.

As soon as the door was closed, London began clattering pots and pans by the hot plate.

“What good will this do?” Goss threw the question angrily at his back. “You’re a big help!”

“And you’re spineless. Why did you give Pirx the machine?”

“I had to. I gave my word.”

London turned to him, a pot in his hand.

“Your word! You’re the kind of friend that if you give your word that you’ll jump in after me, you keep it. And if you swear that you’ll stand there and watch me drown, you jump in anyway. Am I right?”

“Who knows what’s right?” Goss said, defending himself halfheartedly. “How will *he* be able to help them?”

“Maybe he’ll find tracks. He’ll be taking a radiator—”

“Stop! Let me listen to Grail. There might be some news.”

Dusk was still far off, although the clouds settling around the illuminated mushroom tower made everything dark. London set the table while Goss, smoking cigarette after cigarette, his earphones on, picked up the small talk between the base at Grail and the tractors that had been sent out after the copters returned. At the same time, he thought about the pilot. Hadn’t the pilot changed course too readily, without questions, to land here? A twenty-nine-year-old captain of a ship, licensed to operate long-range spacecraft, had to be tough, hot-blooded. Otherwise he would not have risen so quickly. Danger was a lure to plucky youth. If he, Goss, was to blame, it was for an oversight. Had he asked about Killian, he would have sent the ship on to Grail. Chief Goss, after twenty hours without sleep, was unaware that in his thoughts he had already laid the newcomer to rest. And what was the kid’s name? He’d forgotten it, and took this as a sign of advancing age.

He touched the left monitor. In green rows the letters went:

SHIP: HELIOS GENERAL CARGO II CLASS
HOME PORT: SYRTIS MAJOR
PILOT: ANGUS PARVIS
COPILOT: ROMAN SINKO
FREIGHT: ITEM LIST
???

He turned off the screen. They came in wearing sweatsuits. Sinko—thin, curly-haired—greeted them with embarrassment, because the pile turned out to have a leak after all. They sat down to canned soup. The thought occurred to Goss that this daredevil who would be taking the machine out had a jumbled name. He should have been not Parvis but PARSIFAL, which went with Grail. Not in the mood for jokes, however, Goss kept the anagram to himself.

After a short discussion on the subject of whether they were eating lunch or supper—unresolvable because of the difference in times: the ship's time, Earth time, Titan time—Sinko went down to talk with the technician about the defect scope, which was being set up for the end of the week, when the pile would be cool and the cracks in the housing could be temporarily sealed. The pilot, London, and Goss meanwhile viewed a diorama of Titan in an empty part of the hall. The image—created by holographic projectors, three-dimensional, in color, with the routes drawn in—went from the northern pole to the tropic parallel of latitude. It could be reduced or enlarged. Parvis studied the region that separated them from Grail.

The room that he was given was small but cozy, with a bunk bed, a little desk that slanted, an armchair, a cabinet, and a shower so narrow that when he soaped himself he kept banging his elbows into the walls. He stretched out on the blanket and opened the thick handbook of Titanography he had borrowed from London. First he looked in the index for BIRNAM WOOD, then WOOD, BIRNAM. It was not there; science had not taken cognizance of the name. He leafed through until he came to the geysers. The author's account of them was not exactly what Goss had said. Titan, solidifying more rapidly than Earth and the other inner planets, locked in its depths enormous masses of compressed gases. These gases, at the folds in Titan's crust, pressed against the bases of old volcanoes and against the subterranean veins of magma that formed a network of roots for hundreds of kilometers; at certain configurations of synclines or anticlines they could break into the atmosphere in fountains of high-pressure, volatile compounds. The mixture, chemically complex, contained carbon dioxide, which froze immediately into snow. Carried by strong winds, the snow covered the plains and mountain slopes with a thick layer. Parvis grew annoyed with the dry tone of the text. He turned out the light, got into bed, was surprised that both the blanket and the pillow stayed in place—accustomed as he was, after nearly a month, to weightlessness—and fell asleep in an instant.

Some internal impulse brought him out of unconsciousness so suddenly that he was sitting when he opened his eyes, ready to jump out of bed. Blankly he looked around, rubbing his jaw. The jaw reminded him of his dream. Boxing. He had been in the ring against a professional, knew the blow was coming, and fell like a ton of bricks, kayoed. When he opened his eyes wide, the whole room reeled like a cockpit in a sharp turn. He woke completely. In a flash everything returned to him—yesterday's landing, the malfunction, the argument with Goss, and the council of war around the diorama. The room was as cramped as a cabin in a freighter, which brought to mind Goss's parting words: that in his youth he had served on board a whaler. Shaving, Parvis reviewed his decision. If it hadn't been for the name Pirx, he would have thought twice before insisting on this excursion. Under the rush of hot, then ice-cold water, he tried singing, but it lacked conviction. He was not himself. He felt that the thing he had asked for was not merely risky but bordered on stupidity. With the stream in his raised face, blinded, he considered for a moment the idea of backing out. But he knew that that was out of the question. Only a kid would do such a thing. He toweled himself vigorously, made the bed, dressed, and went to look for Goss. Now he was beginning to hurry. He still had to acquaint himself with an unknown model, practice a little, recall the right movements.

Goss was nowhere. At the base of the control tower there were two buildings, one in either direction, connected to the tower by tunnels. The location of the spaceport was the result of an oversight or an outright mistake. According to unmanned soundings, mineral deposits were supposed to lie beneath this once-volcanic valley, while actually it was an old crater whose basin had been pushed up by the seismic contractions of Titan. So straightaway machines and people were thrown in, and they began to assemble the barrellike conduit of living quarters for the mining crews—when the news came that a few hundred miles farther on was an incredibly rich and easily accessible lode of uranium.

The project administration, at that point, underwent a split. One group wanted to abandon this spaceport and start all over again to the northeast; the other group insisted on remaining, arguing that, yes, beyond the Depression there were surface deposits, but they were shallow and therefore would yield little. Those in favor of dismantling the first bridgehead were called, by someone, Seekers of the Holy Grail, and the name of Grail stuck to that area of opencast mining. The first spaceport was not abandoned, but neither was it expanded. A weak compromise was struck, necessitated by the lack of capital. Thus, although the economists calculated *x* times that in the long run it would pay to close the landing field in the old crater and concentrate all the activity in a single place—Grail—the ad hoc logic of meeting the demands of the moment prevailed. Grail was unable to receive the larger ships for a long time; but, then, the Roembden Crater (named after the geologist who discovered it) did not have its own repair docks, loading derricks, up-to-date equipment. And there was the constant debate over who served whom and who got what out of the arrangement. Some of the top brass still seemed to believe that there was uranium under the crater. Some drilling was done. But the drilling went slowly, because as soon as a few people and a little power were allocated here, Grail immediately expropriated them, intervening at headquarters, and once again construction halted and the machines stood idle by the darkening walls of the Roembden.

Parvis, like the other transporters, did not participate in these frictions and conflicts, though he had to have a passing knowledge of them; that was required by the delicate position of everyone in transport. Grail still wanted—by dint of the de facto situation—to dismantle the spaceport, particularly after the expansion of its own landing field, but Roembden thwarted Grail. Or, whether it thwarted Grail or not, it demonstrated its usefulness when the excellent concrete at Grail began to sink. Personally, Parvis was of the opinion that at the root of this chronic schism lay psychology and not money: that two local and therefore mutually antagonistic patriotisms—of the Roembden Crater and of Grail—had arisen, and everything else was a rationalization favoring one side or the other. But this was best left unsaid to anyone working on Titan.

The passageways beneath the control tower brought to mind an abandoned subterranean city, and it was painful to see how many supplies were piled up, untouched. He had landed at Roembden once before, as assistant navigator, but they were in such a hurry at the time that he did not even leave the ship during the unloading, to supervise it. Now he looked upon the unpacked—still sealed, even—containers with disgust, especially since he recognized among them the ones that he had brought then. Annoyed by the silence, he began yelling as in a forest, but only an echo boomed dully down the corridors of this storage section.

He took an elevator up. He found London in the flight-control room, but London had no idea where Goss was, either. No new communiqués had come in from Grail. The monitors flickered. The smell of bacon filled the air; London was making scrambled eggs in bacon fat. The shells he threw in the sink.

"You have *eggs* here?" The pilot was amazed.

"Oh, plenty."

London now spoke to him as one of the crew.

"There was an electronics guy, with ulcers. He brought a whole chicken coop with him—watching his diet. Well, there were protests at first: people complained that he was stinking up the place, and what would he feed the chickens with, etc. But he left a couple of hens and a rooster, and now we love them. Fresh eggs are a delicacy in these parts. Have a seat. Goss will turn up."

Parvis felt hungry. Stuffing his mouth with unaesthetically large pieces of scrambled egg, he justified this to himself: in the face of what awaited him, he ought to stock up on calories. The telephone buzzed; Goss wanted to talk to him. Parvis thanked London for the feast, bolted the rest of his coffee, and took the elevator down a floor.

The chief was in the corridor, already in coveralls. The hour had struck. Parvis ran to the supply room for his spacesuit. He got into it efficiently, connected the oxygen tank to the hose, but did not open the valve or put on the helmet, not sure that they would be leaving immediately. They took a different elevator—for freight—to the basement. There was storage there, too, piles of containers resembling artillery caissons, with oxygen cylinders jutting from them, five apiece, like heavy-caliber shells. The storeroom was large but packed; one walked between walls of boxes pasted with labels in different languages. Here was cargo from manufacturers on every continent on Earth. The pilot waited quite a while for Goss, who went to put on his suit, and then did not recognize him at first: the suit was the heavy kind that a mechanic wore, smeared with grease and having a night visor drawn over the glass of the helmet.

They went outside through a pressure chamber. The underside of the building hung above them, the whole resembling a giant mushroom with a glass cap. At the top, London was already busy at his station, his silhouette against the green glow of the monitors. They went around the base of the tower—circular, windowless, like a lighthouse raised against the sea—and Goss opened wide the gate of a garage made of corrugated metal. Fluorescent lights fluttered. The garage was empty except for a lift truck by the back wall and a jeep similar to the old lunar vehicles of the Americans. An open chassis, seats with footrests, nothing but a frame, tires, a steering wheel, and a storage battery in the rear. Goss drove it out onto the uneven rubble that covered the ground near the tower and stopped so that the pilot could get on. They moved through red-brown mist toward an indistinct, low structure, blocklike, with a flat roof. In the distance, behind a mountain ridge, were dull columns of illumination, like antiaircraft searchlights. They had nothing in common, however, with such antiquated nonsense.

Titan's sun, on cloudy days, provided little light; therefore, giant mirrors were put into stationary orbit over Grail during the working of the uranium ore. Called "solectors," they concentrated the Sun's rays on the mining area. Their usefulness proved problematic. Saturn and its moons constituted a region of the interaction of many masses, setting up perturbations impossible to calculate. Thus, despite the efforts of the astrophysicists, the columns of light underwent deviations, often wandering as far afield as the Roembden Crater. The solitary souls of Roembden took pleasure—a pleasure not merely sardonic—in these solar visitations, since, especially at night, the whole basin of the crater emerged suddenly from darkness and showed its grim, fascinating beauty.

Goss, taking the jeep around obstacles—cylindrical blocks that resembled misshapen vats, plugs from small volcanic fumaroles—also noticed the brightness cold as northern lights, and muttered, half to himself:

"Heading our way. Good. In a minute or two we'll be able to see everything like on a stage."

And he added, with obvious malice:

"Nice of Marlin to share with us."

Parvis understood the joke, because the illumination of Roembden meant that it would be pitch-black at Grail, and therefore Marlin and his dispatcher were now getting the solector maintenance crew out of bed, to man the engines that would put the space mirrors back where they belonged. But the two columns of light came closer, and under one of them flashed an ice-covered peak on the eastern ridge. An additional benefit for the Roembdenites was the remarkable clarity of the atmosphere (considering Titan) in their crater. It allowed them for weeks at a time to admire, against the starry firmament, the yellow, flat-ringed disk of Saturn. Though it was at a distance five times greater than the Moon was from the Earth, the ascending planet's size always shocked novices. With the naked eye one could see the many-colored stripes on the surface as well as the black dots that were shadows cast by Saturn's nearer moons. Such views were made possible by the northern wind that drove through the gorges and chasms with such force that it produced a foehn effect. Nowhere else on Titan was it as warm as at Roembden.

Whether the maintenance crew had not yet managed to regain control of their solectors, or whether because of the emergency there was no one around to do this, the beam of sunlight was already moving across the bottom of the basin. The basin became as bright as day. The jeep didn't even need its headlights. The pilot saw the stained gray concrete around his *Helios*. And beyond that, in the place where they were heading, there stood, like petrified stumps of unbelievable trees, volcanic plugs that had been ejected from seismic blowholes millions of years ago and congealed. In foreshortened perspective, these looked like the colonnade of a ruined temple; their moving shadows were pointers on a row of sundials that indicated an alien, galloping time. The jeep passed this irregular palisade. It rolled, lurching; its electric motor whined. The flat building still lay in darkness, but they could now see two black silhouettes looming behind it—like Gothic cathedrals.

The pilot appreciated their true size when he and Goss got off and approached them on foot.

Such giants he had never seen before. (And had never operated a Digla, either, which he hadn't admitted.) Put one of these machines in a fur suit and you had King Kong. The proportions were more anthropoid than human. The legs, made of bridge trusswork, descended vertically to feet as mighty as tanks, embedded in the rubble and motionless. The towerlike thighs rose to a pelvic girdle, in which, like a flat-bottomed boat, rested the iron trunk. The hands of the upper limbs could be seen only by throwing one's head back. They hung alongside the torso like useless, lowered derrick cranes with fists of steel. Both colossi were headless. What at a distance he had taken for turrets turned out to be, against the sky, antennas atop the shoulders of each.

Behind the first Digla, practically touching its armor plate with an arm bent at the elbow joint—as if, intending to poke the thing in the side, it had frozen in place—stood a second, identical. Because it was a little farther off, one could see in its chest the gleam of a glass window: the driver's cabin.

"This is Castor, and this is Pollux," Goss made the introduction. He played a hand-held floodlight on the giants. The beam brought out, from the semidarkness, the plate metal of the shin guards, the shields protecting the knees, and the trunk that was as smooth and black as the carcass of a whale.

"Hartz, that blockhead, couldn't even put them in the hangar," said Goss. He groped on his chest for a knob: his breath was fogging the glass of the helmet. "He barely braked in time, before that slope. . . ."

The pilot understood why Hartz had packed both colossi into this gap in the rock and why he had chosen to leave them there. It was the inertia. Just like a seagoing vessel, a walking machine responded more sluggishly to the helmsman the greater its mass. He was about to ask how much a Digla weighed, but, not wanting to show his ignorance, instead took the light from Goss and proceeded along the foot of the giant. Running the light over the steel, he found, as he expected, a name plate riveted at eye level. Maximum operating power 14,000 kw; overload limit 19,000 kw; rest mass 1680 tons; reactor multishielded

Tokamak with Foucault converter; hydraulic drive, main transmission, and gears by Rolls-Royce; chassis made in Sweden.

He directed the cone of light upward, along the beams and girders of the leg, but couldn't take in the entire frame at once. The light barely showed the contours of the black, headless shoulders. When he returned, Goss was gone—probably to switch on the heating system of the landing field. Indeed, the pipes that ran along the ground were beginning to dispel the thin, low-flowing mist. The wandering column of sunlight moved across the basin like a slow drunkard, tearing the darkness from the blocks that were storehouses, or from the mushroom of the control tower with the green band of its own light, or it made flashes that faded instantly, touching the ice patches on more distant cliffs, as if trying to waken the dead landscape by giving it motion. Suddenly the column swerved, rushed across the wide concrete, jumped the mushroom tower, the palisade of magma stumps, the hangar, and hit the pilot, who raised a protecting glove and quickly craned his neck as much as possible in his helmet, taking this opportunity to see the whole Digla at once.

Coated with a black anticorrosive enamel, it gleamed above him like a two-legged battleship rearing. Holding a pose for a flash camera. The tempered breastplates, the circular undercarriage of the hips, the beams and drive shafts of the thighs, the shielding on the knee joints, the ribwork of the shins—everything shone, spotless, indicating that the giant had as yet done no work. Parvis experienced both joy and butterflies in the stomach. He swallowed with difficulty. As the light moved off, he walked around behind the Digla. Its foot, as he approached it, bore less and less of a resemblance to a human foot of steel; it became a caricature, and then, near the sole sunken in the dust, bore no resemblance at all. Parvis stood as if at the base of a dock derrick that nothing could budge. The armored heel could have served as the support of a hydraulic press. The ankle had cotter pins like screw propellers, and the knee, bulging halfway up the leg, at a height of at least two stories, was like the drum of a steam roller. The hands of the giant, larger than power-shovel dippers, hung motionless, frozen at attention.

Though Goss had gone off somewhere, the pilot did not intend to wait. He saw the steps that jutted from the back edge of the heel, and the grip bars, so he began to ascend. The ankle was encircled by a small platform from which rose, now inside the trusswork of the calf, a vertical ladder. It was not difficult so much as strange to climb its rungs. The ladder led him to a hatch that was situated not too conveniently above the right thigh—for the reason that the original, most logical place (for the builders) had become the butt of endless jokes. The designers of the first striders ignored this low humor, of course, but later they had to take it into account. It came to light that operators were reluctant to sign up for these Atlases, teased by their colleagues about *how* one got inside them.

Unbolting the hatch activated a garland of tiny lights. He took a spiral staircase to the cabin. The cabin was like a great glass barrel or section of pipe transfixing the chest of the Digla—not in the center but on the left, as if the engineers had wanted to put a man in the place the heart would be if the giant were living.

He cast his eyes around the interior, now also lit, and with considerable relief saw that the control systems were familiar. He felt at home. Quickly removing his helmet and getting out of his suit, he turned up the heat: all he was wearing was a jersey and tights, and to move the giant he would need to strip completely. Warm air filled the cabin. At the convex front pane, he gazed into the distance. It was daybreak, and gloomy as usual; on Titan a storm always seemed to be brewing. In the dim light he observed the scattered rocks of a region far beyond the landing field. He was eight stories up, and it was like looking from the window of an office building. He could even look down on the mushroom of the control tower. Except for the mountain peaks at the horizon, only the prow of the *Helios* stood above him. Through the side walls of glass, also curved, he could see into the dark shafts, poorly illuminated, full of machinery that slowly, steadily sighed, as if awakened from a trance or sleep. The cabin contained no control consoles, no steering wheels, no viewscreens; there was nothing but a piece of clothing, crumpled on the floor like an empty, metallically glittering skin, and two mosaics of black cubes fastened to the front glass. The cubes were like blocks in a child's playpen, because their surfaces held silhouettes of tiny arms and legs—the right on the right mosaic, the left on the left. When the colossus walked and everything in it functioned smoothly, each little picture glowed a peaceful willow-green. In the event of a disturbance, the color changed to brown if the problem was minor, and purple for emergencies.

This was a segmented image of the entire machine projected onto the black mosaic. The young man, in a current of heated air, removed the rest of his clothes; he tossed the jersey in a corner and began pulling on the operator's suit. The elastic material, yielding, clung to his bare feet, his thighs, belly, shoulders. Aglitter to his neck in the electronic snakeskin, he eased his hands carefully, finger by finger, inside the gloves. Then, when he pulled the zipper up past his chest in a single movement, the black mosaic burst into colored lights. A glance verified that this system was the same as in the ordinary ice striders that he had handled in Antarctica, though those didn't compare with the Digla in mass. He reached to the ceiling for a strap, a kind of harness, and put it around him, buckled it tight across his chest. When the buckle clicked shut, the harness lifted him gently, resiliently, so that, supported from under the arms, as in a well-padded corset, he was suspended and could move either leg freely. Checking that the arms were just as free, he felt for the main switch at the neck, found the lever, and threw it all the way. The lights on the cubes doubled in intensity, and at the same time he heard, deep beneath him, the engines of all the limbs. They idled in neutral, making soft sucking noises because there was excess grease on the connecting rods, from the rotary bearings, which had been packed at the Earth shipyard to protect against corrosion.

Looking down with care, so as not to hit the side of the storage building, he made his first, tentative, small step. In the lining of his suit were thousands of electrodes, sewn in supple spirals. Pressed against the naked body, they gathered the impulses from the nerves and muscles and transmitted them to the Goliath. Just as to each of the skeletal joints of the man there corresponded, in the machine, a magnified, hermetically sealed joint of metal, so for each group of muscles that flexed or straightened a limb there were cannonlike cylinders in which pistons moved, pushed by pumped oil. But the operator did not need to think or even know about all this. He merely moved as if walking, as if treading the ground with his feet, or as if bending his torso to pick up, with outstretched hand, a desired object. There were only two significant differences. First, that of size, since a single human footfall equaled a twelve-meter step by the machine. It was the same with every movement. Thanks to the extraordinary precision of the relays, the machine was able, if the operator wished to demonstrate his skill, to lift a full liqueur glass from a table and raise it to a height of twelve stories without spilling a drop or crushing the crystal stem in the great tongs of its grip. But the colossus was made to lift not little glasses or pebbles but multiton pipes, beams, and boulders. With the appropriate tools put in its hands, it became a drilling rig, a bulldozer, a crane—but always a mighty union of virtually inexhaustible force with human dexterity.

The giant striders were an extension of the concept of the exoskeleton, which, as an external amplifier of the human body, had been applied in many twentieth-century prototypes. The invention languished, because on Earth no immediate practical use was found for it. What revived the idea was the exploitation of the solar system. Planetary machines arose, adapted to the globes on which they were to work, to the local tasks and conditions. In weight the machines varied, but in inertial mass they were the same everywhere, and therein lay the second important difference between them and people.

Both strength of construction material and engine power had their limits. The limits were imposed, even at a distance from all gravitational bodies, by the machine's inertial mass. One could not make sudden movements in a strider, just as one could not stop an ocean liner on a dime or spin the arm of a crane like a propeller. Trying that in a Digla would break its girdered limbs. To protect against any such self-destructive maneuver, therefore, the engineers had installed safety cutoffs in each of the branching drive units. The operator, however, could override any or all of these neutralizers if he found himself in dire straits. He might be able, at the cost of ruining the machine, to save his own neck—to emerge from a cave-in, for example. And if that did not save him, he had one last resort, an ultimate refuge: the vitrifax.

The man was protected by the outer armor of the strider and by the inner shields of its cabin—but inside, above the operator, in the shape of a bell, was the open mouth of the vitrifax. The device could freeze a man in the blink of an eye. Granted, medicine still lacked the means to restore the frozen one to life. Victims of catastrophes, preserved in cylinders of liquid nitrogen, lay waiting, unchanged, for the advent of a resurrection technology in the next century.

This medical passing of the buck to an indefinite future seemed, to many people, a gruesome desertion of duty, a promise of rescue with no guarantee of its fulfillment. There was, however, more than one precedent in medicine of such extreme, terminal measures. The first transplants of ape hearts in dying patients evoked similar reactions of indignation and horror. Still, polling the operators themselves revealed how little hope they placed in the vitrifax apparatus. Their profession may have been brand-new, but the death that lurked in it was as old as any human enterprise. Therefore Angus Parvis, treading the ground of Titan with heavy steps, gave no thought to the black shaft above his head, or to the pushbutton glowing like a ruby within its transparent little bubble-case.

With exaggerated caution he moved out onto the concrete slab of the spaceport, to test-walk the Digla. Instantly the old feeling came back to him, that he was both incredibly light and incredibly heavy, free and constrained, swift and slow. The closest analogy might have been the sensation of a diver, whose weight was lessened by the buoyancy of the water, but who found greater resistance in the medium the faster he tried to go. The first prototypes of the planetary machines, after a few hours of operation, ended up on the scrap heap, lacking motion neutralizers. The novice who took a few steps in an early strider got the impression that there was nothing to it, and thus, when he went to execute a simple task—say, setting a row of crossbeams on the walls of a house under construction—he would demolish the wall and bend the pipes before he knew what was happening. But a machine with neutralizers could also be treacherous for an unskilled operator. Reading numbers of maximum loads was as easy as reading a book on skiing, but no one ever mastered the slalom from a book. Parvis, well acquainted with thousand-ton craft, judged, from the small acceleration of the steps at first, that the giant under his control had almost double that mass. Suspended in his glass cabin like a spider in a strange net, he immediately moderated the movements of his legs, and even stopped, in order to begin—very slowly—exercises in place. He shifted from foot to foot, bending the trunk to either side, and only then walked several times around his ship.

His heart was beating more heavily than usual, but everything went without a hitch. He saw the barren basin, dark gray in the low mist, the distant rows of lights that marked the borders of the landing field, and, at the base of the control tower, the tiny form of Goss, a veritable ant. Parvis was surrounded by a pleasant, not insistent sound; his ears, able more and more to distinguish the different noises, recognized the background bass of the main engines, which sometimes built up to a muffled singing and sometimes grumbled a mild reproach when the hundred-ton legs, thrusting forward, were halted too abruptly. He was now able to pick out the choral call of the hydraulics, whose oil coursed through thousands of ducts and cylinders, setting up a steady beat of pistons that bent and extended each limb as the tank-clad feet walked the concrete. He could even hear the delicate whine of the gyroscopes that autonomously assisted him in maintaining balance. When he tried a sharper turn, the massive structure that he occupied proved to be not so maneuverable, and although the engines obediently roared full-force, the giant began to sway—but did not go out of control, because Parvis instantly eased up, increasing the radius of the curve.

Then he began to play with lifting the multiton boulders that lay beyond the edge of the concrete field. Sparks flew and there was a shrill grating sound when the pincers grasped and bit into the stone. Before an hour went by, he felt sure of his Digla. He had achieved, again, the familiar state that veterans called "fusion of man and strider." The boundary between himself and the machine had disappeared; its movements were now his movements. To complete his preparation, he climbed quite high up a debris-covered slope, and had become so proficient that he could tell, from the rumble of the rocks as they began to slip from under his crushing feet, exactly how much he could demand of his colossus. Already he was fond of it.

It was only when he went back down to the hazily lit lines of the landing field that his satisfaction with himself got punctured by the needle-reminder of the excursion before him—and the knowledge that Pirx and two other people, encased in the very same giants, had become trapped in the Depression of Titan. Whether it was for additional practice or to say good-bye, he could not say, but he circled the ship in which he had landed, then held a brief conversation with Goss. The chief was now standing beside London, behind the glass of the tower. Parvis saw them, heard from them that there was still no news about the missing men. Leaving, he lifted high an iron hand. Someone might have thought the gesture melodramatic or even clownish, but he preferred it to any words. He did a steady about-face, put a holographic of the terrain to be crossed on the single, ceiling-high monitor, switched on the azimuth finder and the projection of the path to Grail, and set out, a twelve-meter step at a time.

There were two kinds of landscape characteristic of the inner planets of the Sun: the purposeful and the desolate. Purpose informed every scene on Earth, the planet that produced life, because every detail there had its "benefit," its teleology. True, it did not always—but billions of years of organic labor had accomplished much: thus flowers possessed color for the purpose of attracting insects, and clouds existed for the purpose of dropping rain on pastures and forests. Every form and thing was explained by some benefit, whereas what was clearly devoid of any benefit, like the icebergs of Antarctica or the mountain chains, constituted an enclave of desolation, an exception to the rule, a wild though possibly attractive waste. But even this was not certain, because man—undertaking the deflection of the course of rivers to irrigate areas of drought, or warming the polar regions—paid for the improvement of some territories with the abandonment of others, thereby upsetting the climatic equilibrium of the biosphere, which had been adjusted so painstakingly (though with seeming indifference) by the efforts of natural evolution. It was not that the ocean depths served the creatures there with darkness, to protect them from attack—a darkness they could light, as they needed, with luminescence—but vice versa: the darkness gave rise precisely to those that were pressure-resistant and could illuminate themselves.

On planets overgrown with life it was only in the depths, in caves and grottoes, that the creative power of nature could timidly express itself, a power that, not harnessed to any adaptational requirement, or hemmed in, in the struggle for survival, by the competition of its own results, could create—over billions of years, with infinite patience, in droplets of hardening salt solutions—phantasmagoric forests of stalactites and stalagmites. But on such globes this was a deviation from the planetary labors, a deviation locked away in vaults of rock and therefore unable to reveal its vigor. Hence the impression that such places were not usual in nature but, rather, spawning grounds for monstrosities only on the fringe of things. Infrequent exceptions to the statistical rule of chaos.

In turn, on globes parched like Mars or, like Mercury, immersed in a violent solar wind, the surfaces, due to that rarefied but incessant exhalation from the mother star, were lifeless wastes, since all raised forms were eroded by the fiery heat and reduced to dust that filled the crater basins. It was only in places where eternal, still death reigned, where neither the sieves nor the mills of natural selection were at work, shaping every creature to fit the rigors of survival, that an amazing realm opened up—of compositions of matter that did not imitate anything, that were not controlled by anything, and that went beyond the framework of the human imagination.

For this reason, the fantastic landscapes of Titan were a shock to the first explorers. People equated order with life, and chaos with a dreary inanimateness. One had to stand on the outer planets—on Titan, the greatest of their moons—to appreciate the full error of this dichotomy-dogma. The strange formations of Titan, whether relatively safe or treacherous, were ordinary rubble heaps of chaos when viewed from a distance and a height. But they did not appear so when one set foot on the soil of this moon. The intense cold of this whole sector of space, in which the Sun shone but gave no heat, proved to be not a throttle but a spur to the creativity of matter. The cold, indeed, slowed the creativity, but in that very slowing gave it an opportunity to display its talent, providing a dimension that was indispensable to a nature untouched by life and unwarmed by sun: time—time on a scale where one million centuries, or two million, was of no significance.

The raw materials here were the same chemical elements as on Earth. But on Earth they had entered the servitude, so to speak, of biological evolution and only in *that* context amazed man with subtlety—the subtlety of the complex bondings that combined to form organisms and the interdependent hierarchies of species. It was therefore thought that high complexity was a property not of all matter but only of living matter, and that chaos in the inorganic state produced nothing more than haphazard volcanic spasms, lava flows, rains of sulfurous ash.

The Roembden Crater had cracked, once, at the northeast on its large circle. Then a glacier of frozen gas crept through the gap. In the following millennia, the glacier retreated, leaving on that furrowed terrain mineral deposits—the delight and vexation of the crystallographers and other, no less dumbfounded scientists. It was indeed a sight to see. The pilot (now operator of a strider) faced a sloping plain ringed by distant mountains and strewn with . . . with what, exactly? It was as if the gates of unearthly museums had been flung open and the remains of decrepit monsters had been dumped in a cascade of bones. Or were these the aborted, insane blueprints for monsters, each one more fantastic than the last? The shattered fragments of creatures that only some accident had kept from participating in the cycles of life? He saw enormous ribs, or they could have been the skeletons of spiders whose tibiae eagerly gripped blood-speckled, bulbous eggs; mandibles that clung to each other with crystal fangs; the platelike vertebrae of spinal columns, as if spilled out in coin rolls from the bodies of prehistoric reptiles after their decay.

This eerie scene was best viewed, in all its wealth, from the height of the Digla. The area near Roembden was called, by the people there, the Cemetery—and in fact the landscape seemed a battlefield of ancient struggles, a burial ground that was an exuberant tangle of rotting skeletons. Parvis saw the smooth surfaces of joints that could have emerged from the carcass of some mountainous monstrosity. One could even make out on them the reddish, bloodclotted places where the tendons had been attached. Nearby were draped skin coverings, with bits of hair that the wind gently combed and lay in changing waves. Through the mist loomed more many-storied arthropods, gnawing through one another even in death. From faceted, mirrorlike blocks thrusted antlers, also gleaming, among a spill of femurs and skulls of a dirty-white color. He saw this, realizing that the images that arose in his brain, the macabre associations, were only an illusion, a trick of the eyes shocked by the strangeness. If he dug methodically in his memory, he would probably remember which compounds yielded—in a billion-year chemistry—precisely these forms that, stained with hematites, impersonated bloody bones, or that went beyond the modest accomplishments of terrestrial asbestos to create an iridescent fluff as of the most delicate fleece. But such sober analysis would have no effect on what the eyes saw.

For the very reason that here nothing served a purpose—not ever, not to anyone—and that here no guillotine of evolution was in play, amputating from every genotype whatever did not contribute to survival, nature, constrained neither by the life she bore nor by the death she inflicted, could achieve liberation, displaying a prodigality characteristic of herself, a limitless wastefulness, a brute magnificence that was useless, an eternal power of creation without a goal, without a need, without a meaning. This truth, gradually penetrating the observer, was more unsettling than the impression that he was witness to a cosmic mimicry of death, or that these were in fact the mortal remains of unknown beings that lay beneath the stormy horizon. So one had to turn upside down one's natural way of thinking, which was capable of going only in one direction: these shapes were similar to bones, ribs, skulls, and fangs not because they had once served life—they never had—but only because the skeletons of terrestrial vertebrates, and their fur, and the chitinous armor of the insects, and the shells of the mollusks all possessed the same architectonics, the same symmetry and grace, since Nature could produce this just as well where neither life nor life's purposefulness had ever existed, or ever would.

Fallen into such philosophical reverie, the young pilot gave a start, remembering how he had come here, and his vehicle, and his mission. Obediently, the iron strider magnified that waver and jerk a thousandfold, bringing him back to reality with the howl of its drive transmission and the trembling of its entire mass. The pilot blushed. Collecting himself, he moved on. At first he was reluctant to set his feet, which landed like steam hammers, on the pseudo-skeletons, but sidestepping them proved as futile as it was troublesome. Therefore he hesitated only on occasion, when his way was blocked by a particularly remarkable structure, and even then he walked around it only if plowing through the high heap and crushing it presented any difficulty to his servant-giant. Also, from up close the impression that he was tramping through endless bones—smashing craniums, branched phalanges of wings, zygomatic arches that had separated from the frontals, plus various horns—dwindled to nothing. Sometimes it was as if he were walking on the remains of organic machines—hybrid beings, half-animal, arisen from the union of the living and the nonliving, of reason and unreason—and sometimes it was as if he were bringing his iridium boots down on weirdly spreading gems, precious and impure, partially clouded due to interpenetrations and metamorphoses. Because from his height he had to watch constantly where and at what angle he was placing the towerlike legs, and because this march of the first stage was taking more than an hour—it was necessary to go slow—he laughed at the mighty efforts made by the artists of Earth to reach beyond the boundary of human imagination (which must visualize everything); at how the poor devils beat against the walls in their minds; and at how little, really, they departed from platitude, though straining to the utmost to depart—while here, in a single acre, there was more proud originality than in a hundred of their anxious, anguished art shows.

There being no stimulus to which a man did not soon become accustomed, before long he was marching through the cemeteries of chalcocites, spinels, amethysts, plagioclases—or, rather, their distant, nonterrestrial relatives—as if this were ordinary rock debris underfoot. In an instant he shattered a branch that had taken millions of years to crystallize into unique, unrepeatable forkings, not wanting to but forced to reduce it to powdered glass. Although from time to time he regretted the loss of the more splendid of these works of eons, they crowded each other so much, eclipsed each other in such extreme profusion, that finally only one thing impressed him.

Namely, the extent to which this region seemed to him—and not to him alone!—a dream, a kingdom of phantoms, and of a beauty afflicted by madness. This was a realm—he said to himself, almost aloud—where nature slept, incarnating her magnificent grimness, her unfettered nightmares, directly somehow, without the mediation of any psyche, into the solid hardness of material forms. Just as in a dream, whatever he saw was both totally alien and extremely familiar, reminding him continually of something that in the next minute would always elude him, and he would remain with a senselessness that concealed some subtle deceit—because here things seemed definite-defined only in their ancient origins; they could never complete themselves, never achieve full realization, never decide on a conclusion, on a destiny.

Thus he mused, dazed by both the surroundings and his own reflections, since he was not in the habit of philosophizing. He had the risen sun behind him now, so his shadow preceded him, and it was strange to see, in the movements of that long, sharp-cornered, forward-rushing silhouette, its machine nature and his own, human, nature combined. The shape was that of a headless robot swaying, as it went, like a boat, but it had at the same time movements peculiar only to him, displaying them as if with a perverse ostentation since they were magnified, exaggerated. True, he had noticed this before, but the nearly two-hour march in this enchanted place somehow charged or sharpened the imagination. And it did not bother him when, turning more to the west from Roembden, he lost radio contact with the Roembdenites. He would be emerging from the radio shadow at mile thirty—not that far ahead—but for now he wanted to be by himself, free of the stock questions and the reports in reply.

On the horizon there were dark shapes, he could not tell whether of clouds or mountains. Angus Parvis, on his way to Grail, not once in the whole rambling sequence of his ruminations connected his name with Parsifal. It was always difficult for a man to step out of his mental identity—it was like jumping out of one's skin—let alone into mythology. His attention wandered from the immediate surroundings of his route, particularly as the scenery of counterfeit death, the anatomical theater of planetary minerals, was thinning out. He passed places that gleamed with such deception, as if arranged mysteriously for his eyes alone—he passed them now with true indifference. (From the moment he made his decision, he refused to think about what had prompted that decision. This was not a problem for him. As an astronaut, alone for long periods, he had learned how not to argue with himself.) He marched on in the swaying Digla: the colossus had to tilt from side to side, but he was well acquainted with that. The tachometer indicated about thirty miles an hour.

The grisly reptilian-amphibian dances of death gave way to gentle folds of rock covered with a volcanic tuff finer and lighter than sand. Though he could accelerate, he knew that the sensations experienced at full speed were hard to take for long, and he had a march of several hours ahead of him, in much more difficult terrain, before he reached the Depression. The flat, toothed contours on the horizon no longer looked like clouds. As he walked toward them, his shadow swept before him, misshapen. Because of the strider's great mass, the legs were only a third the length of the trunk. Pressed to increase its speed, it had to lengthen its steps, throwing each limb forward in turn with the hip. The hip could move because the circular mounting of the legs (more precisely, their undercarriage) was an enormous bearing plate into which the trunk fitted. The problem was that to the lateral tilting was then added the up-and-down motion of the giant, making the landscape reel before the operator like a drunkard. Such heavy machines were not built for running. Even a jump from a height of two meters was unwise on Titan. On lesser spheres, and on the Earth's Moon, there was more freedom of movement. But the constructors had not concerned themselves about the speed of these machines, whose walking was not to serve as a means of transportation but, rather, to perform heavy tasks. The ability to cover a distance was a plus, making the industrious colossi more self-sufficient.

For an hour or more, it seemed to Parvis alternately that 1) any second he would become stuck in a chaos of rock, and that 2) the azimuth line had been drawn by a genius, because each time Parvis approached a pile of rubble—slabs of stone balanced so precariously that it looked as if the least breeze would start a thundering avalanche—at the last moment there would always be a convenient way through, so he never needed to circle around or backtrack out of cul-de-sacs. Before long, he concluded that on Titan the best operator would be cross-eyed, since one had to watch the terrain in front of the machine, from a height, and at the same time the glowing directional indicator, which quivered like the needle of an ordinary compass on a semi-transparent map. Somehow he managed, doing not badly at all, relying on his eyes and on the needle. Cut off from the world by the roar of the power units and the overall rumble of resonance in the frame, he still could see Titan through the nonreflecting glass of his compartment. No matter where he turned his head—and he did so whenever more level terrain permitted—he saw, above a sea of mist, mountain ridges split by volcanoes that had been dead for centuries. Proceeding along the ragged ice, he noticed, sunken deep within it, the shadows of volcanic bombs and darker, unidentifiable shapes—as of starfish or octopuses set like insects in amber.

Then the land changed. It was still forbidding, but in a different way. The planet had gone through a period of bombardments and eruptions, sending blind bursts of lava and basalt skyward, to freeze in wild, alien immobility. He entered these volcanic defiles. The overhangs farther on were unbelievable. The nonliving dynamism of these seismic congealings—inexpressible in the language of beings raised on a tamer planet—was accentuated by a gravitation no greater than that of Mars. To a man lost in this labyrinth, his striding vehicle ceased to seem a giant. It dwindled, insignificant among the crags of lava, which once, in kilometer-long cascades of fire, had been transfixed by the cosmic cold. The cold cut short their flow, and before they froze, falling in the precipices, it drew them out into gigantic, vertical icicles—monstrous colonnades—a sight that was one of a kind. It made of the Digla a microscopic bug that inched past towering pillars—pillars of a building abandoned, after construction as careless as it was mighty, by the true giants of the planet. Or: a thick syrup flowing from the lip of some vessel and hardening into stalactites—as witnessed by an ant from its crack in the floor. The scale, however, was more awesome than that. It was in this wilderness, in this order-disorder so foreign to the human eye, bearing no similarity to any mountains on Earth, that the cruel beauty of the place showed itself, of a waste vomited from the planet's depths and turned, beneath a remote sun, from fire to stone. Remote—because the sun here was no flaming disk as on the Moon or Earth; it was a coldly glowing nail hammered into a dun sky, giving little light and even less heat. Outside, it was 90 below, the temperature of an exceptionally mild summer for this year. At the mouth of the gorge Parvis observed a glow in the sky. The glow rose higher and higher until it took up a quarter of the firmament. He did not realize at first that this was neither dawn nor the illumination of a solector, but the mother and ruler of Titan, great-ringed, yellow as honey: Saturn.

A sharp lurch, the reeling of the cabin, the sudden bellow of the engines—countered more swiftly by the reflex of the gyroscopes than by his maneuver—reminded him that now was not the time for astronomical or philosophical contemplation. Humbly he returned his eyes to the ground. Curiously, it was only then that he became aware of the ludicrousness of his movements. Hanging in the harness, he trod the air like a child playing on a swing, yet felt each thunderous step. The gorge grew steep. Although he shortened his stride, the engine room filled with the howl of the turbines. He found himself in deep shadow before he had time to switch on the headlights, and in the next second was walking into a bulge of rock larger than the Digla. The tendency of his pendular, driven mass—obeying Newton's first law—to continue its straight trajectory, when he forced it to turn, threw the engines into overload. All the dials, until now a peaceful green, flared purple. The turbines bellowed with despair, giving everything they had. The RPM indicator for the main gyroscope began to flash, which meant that the fuse was overheating. The cabin dipped, as if the Digla would fall any moment. Parvis broke into a cold sweat. To destroy, in such an insanely stupid way, the machine entrusted to him! But only the left elbow scraped the rock, with a grating sound as of a ship pushed up onto a reef. Smoke, dust, a shaft of sparks sprayed from under the steel, and the giant, shaking, regained its balance.

The pilot pulled himself together. He was glad that in the gorge he had lost radio contact with Goss: the automatic transmitter would have put this little incident on the monitor. Emerging from the shadow, he doubled his vigilance. He still felt shame, because it was an elementary thing, as old as the world. Any engineer knew from long experience, without thinking, that to start a locomotive by itself and to start it when it pulled a string of cars were two entirely different matters. So he advanced as if on inspection, and the colossus was again wonderfully obedient. Through the glass he saw how a small motion of his hand instantly became the sweep of a mighty tongs-shaped paw, and when he extended a leg, a tower moved forward, its knee shield gleaming.

He was now fifty-eight miles from the spaceport. Going by the map, by the satellite photographs that he had studied the previous evening, and by the diorama, which had a scale of 1:800, he knew that the way to Grail basically was divided into three parts. The first comprised the so-called Cemetery and the volcanic gorge he had just left. The second he could now see: a gap in the massif of frozen lava made with a series of detonated thermonuclear charges. This massif, the greatest of the flows from the Orlandian volcano, could not have been dealt with in any other way, on account of the bulwark steepness of its slopes. The nuclear blasts had chewed through the formation that blocked passage, had cut it in two, as a heated knife bisects a lump of butter. The pass, on the cabin's diagram of Titan, was circled with exclamation points, a reminder that here under no circumstance should one leave one's vehicle.

The residual radiation from the thermonuclears was still unsafe for a man outside the armor of his strider. Between the exit and entrance to the defile lay a mile-long plain, black, as if blanketed with soot. On it, he could hear Goss again. Parvis said nothing about his collision with the rock. Goss told him that after the defile, at the Promontory, the halfway point, Grail would take over on the radio to guide him. There, also, would begin the third, final stretch of the trail, through the Depression.

The black powder filling the plain between the two bulges of the formation covered the legs of the Digla above its knees. Parvis walked through the low puffs quickly and easily, toward the nearly perpendicular walls of the corridor. He reached a wall, stepping on rubble that was vitreous: smooth surfaces fractured by the solar heat of the explosions. These pieces, hard as diamonds, made sounds like gunfire when ground beneath the iridium heels of the Digla. But the bottom of the defile was as flat as a table. He walked between the blackened walls, in the rumbling echo of steps, steps that were his own: he had joined with the machine, it was his magnified body. Then he found himself in darkness so sudden, so thick, that he had to turn on the headlights. Their mercury glare contended, in the swirl of shadows between the pillar-jaws of rock, with the cold, reddish, unfriendly light of the sky framed by the far gate of the defile, which became larger the closer he drew to it. Toward the end the defile narrowed, as if it would not let his giant pass, as if he would be wedging the square shoulders in a chimneylike cleft. But this was an illusion—on either side there was clearance of several meters. Nevertheless, he slowed, because Pollux swayed more from side to side the faster it went. There was no help for this. The duck waddle when hurrying arose from the laws of dynamics, from angular momentum, and the engineers were unable to overcome it completely. For the last three hundred meters he again ascended, more and more steeply, planting the feet with care, leaning forward a little from his high, suspended place to see what he was stepping on. This close examination took so much of his attention that it was only when the light surrounding him on all sides filled the cabin that he lifted his head and saw the next—altogether different—unearthly landscape.

The Promontory stood above a white and ruddy ocean of fleecy clouds; solitary, black, slender, it was the only thing in the sky from horizon to horizon. Parvis understood why some called it God's Finger. Slowly he came to a halt and, with the magnificent scene spread out before him, tried—over the soft singing of the turbines—to catch the voice of Grail. But he heard nothing. He tried to raise Goss, but Goss did not respond, either. Parvis was still in radio shadow. Then a curious thing happened. Before, radio contact with the spaceport was somehow irritating to him, unpleasant, perhaps because he felt, not in Goss's words so much as in the man's voice, a concealed anxiety, a disbelief almost, that Parvis would make it, and in that anxiety there was an element of pity, which Parvis couldn't stand. But now that he was truly alone, with neither a human voice nor the automatic pulse of the radio beacon from Grail to guide him in this endless white waste, he felt not relief at being free but the uneasiness of a man who, in a palace full of marvels, though he has not the least desire to leave, sees the main door—before, open and inviting—now close behind him. He scolded himself for this unproductive frame of mind, akin to fear, and began to walk down to the surface of the sea of cloud, along a gradual incline—icy in places—directly toward the Promontory. Black, reaching the sky, it was bent, like a finger beckoning.

Once, twice, the sole-plate of the strider slipped with a dull grinding sound, sending great numbers of stones rolling down, knocked from their ice settings, but these slips did not threaten a fall. Parvis merely changed his gait so as to fix each step into the frozen snow crust, using the spikes of his heels, which made him proceed more slowly than before. He descended a bulging slope between two gullies, stamping with stubborn exaggeration, until arcing sprays of ice rattled on his shin guards and knee shields. He strained his eyes to see into the valley, whose bottom now appeared through gaps in the mist, and the lower he went, the more the black finger of the Promontory towered over him, rising above the distant, milky clouds. In this way he reached the level of the fluffy fog that floated evenly and slowly as over unseen water; it flowed around his thighs, his hips; one puff of cloud enwrapped him and the cabin, but vanished as if blown away. For a few moments yet the Black Finger loomed above the feathery whiteness—like a club of rock jutting out of an arctic sea, unmoved amid the foam and floes. But then it disappeared, as from the view of a diver submerging.

He stopped, listened; he thought that he could hear an intermittent thin, high tone. Turning the Digla now to the left, now to the right, he waited for the plaintive note, quite clear, to sound in both ears equally. This was not Grail itself but the directional radio beacon of the Promontory. He was supposed to head straight for it, and if he deviated from that path, the intermittent signal would split in two, depending on the deviation: going too far to the right, in the perilous direction of the Depression, he would hear in his right ear a warning squeal; and if he strayed the opposite way, toward the impassable, sheer walls, the signal would sound in a less urgent but nevertheless error-indicating bass, in the left ear. The odometer read a hundred miles. The greater, mechanically more difficult part of the trail was behind him. The more treacherous part lay before him, wrapped in depths of mist. Massive clouds now darkened overhead; the visibility was to several hundred meters; the aneroid barometer verified that the syncline trough of the Depression began here—or, more precisely, its mercifully solid rim. He walked, using his eyes as well as his ears, since the region was brightened by snow—frozen carbon dioxide, of course, and the anhydrides of other solidified gases.

Sometimes an erratic boulder protruded from their whiteness, the mark of a glacier that had once come from the north, packed itself into the rift of this volcanic massif, deepened it southward with its creeping body, like a plow, and put into the ground ice great hunks of rock. Later, retreating, or melting from the magma heat that came from deep within Titan, the glacier spat out and left behind a moraine, scattered in a disorderly retreat. The landscape reversed itself: as if laying out a wintry day at the bottom and then covering it with a night of impenetrable clouds. Parvis did not even have his own shadow now for a companion. He stepped steadily, sinking into the snow his steel boots, covered with the dust of tiny crystals, and in his wide-angle rearview mirrors he could see his own tracks, tracks worthy of a tyrannosaur, that greatest of the biped predators of the Mesozoic. Glancing back, he checked that his trail was staying straight. For an indeterminate time, however, he had an odd feeling, an impression that grew in strength but which he dismissed as impossible: that he was not alone in the cabin, that behind his back there was another man. The presence of the man was given away by his breathing. Finally, the illusion made him so nervous (he did not doubt that it was an illusion, caused, perhaps, by the fatigue of listening to the same, monotonous radio signal) that he held his breath. The other gave a long, unmistakable sigh. This could not be an illusion. In his astonishment, Parvis tripped, making the colossus stagger. He righted it in a blaze of indicators and a howl of turbines and brought it gradually to a halt.

The other stopped breathing. Was it, then, after all, an echo from the machine wells of the Digla? Standing still, he cast his eye around and noticed, on the endless beds of snow, a black mark, an exclamation point drawn in India ink on the white horizon, though the illumination did not show whether the horizon was a bank of windblown drifts or a bank of clouds. Even though he had never seen a strider from a mile away in such a winter setting, the conviction seized him that this was Pirx. He headed for him, not caring about the increasing division of the signal in his earphones. He hurried. The black mark, moving along the same wall of white, was a figure now, and it, too, swayed in walking quickly. After about fifteen minutes its true proportions became evident. A half a mile separated them, perhaps a little more. Why didn't Parvis speak, call him on the transmitter? He didn't know why, but somehow didn't dare. Looking hard, he observed in the small glass window—the heart of the colossus—an extremely tiny man who, suspended, moved like a puppet on strings. Parvis kept after him, and both left long plumes of powder behind them, like ships in a channel pulling foaming furrows after themselves. Parvis rushed to overtake him, at the same time noting what was happening ahead of them—and something was indeed happening, because in the distance a thick white blizzard fluttered and rippled. Its curving arcs shone brighter than the snow. This was the region of the cold geysers. Parvis then called out, once, twice, three times, but the one he chased, instead of answering, increased the pace, as if to flee his rescuer; so Parvis did the same, rushing, with more and more swinging of the trunk and waving of the powerful arms, toward the nearing peril. The speedometer pointed, quivering, at the red limit: forty-eight miles an hour. Parvis yelled, his voice hoarse, but the yell died on his lips, because suddenly the black figure widened, swelled, lengthened, and its contours lost their sharpness. It was not a man in a Digla that he saw now, but a large shadow diffusing into an amorphous blotch. And then it was gone.

He was alone. He had been chasing himself. Not a common phenomenon, but known even on Earth. The Brocken Specter in the Alps, for example. One's own reflection, enlarged, against bright clouds. Not he—it was his body, shocked by the discovery, full of bitter disappointment, its muscles tight, breathless in a rush of rage and despair—it was his body that wanted to stop immediately, that instant, and then in the roar that burst from the bowels of the colossus he was pitched forward. The dials flared like severed veins spurting blood; the Digla shook like a vessel striking its hull against an underwater barrier. The trunk tilted with the momentum, and if Parvis had not supported it, had not pulled it out of its forward plunge with a series of gradually braking steps, it definitely would have crashed to the ground. The choral protest from the abruptly overburdened units quieted. Feeling tears of disappointment and anger running down his flushed face, he stood on spread legs, panting, as if he had run the last kilometers himself. He calmed down. With the soft inner lining of his glove he dabbed the sweat that hung on his eyebrows, and saw the giant paw of the strider, magnifying this involuntary gesture, lift, block the window of the cabin with the whole width of the forearm, and with a thud hit the radiator that was secured atop the headless shoulders. He had forgotten to disconnect the right hand from the amplifier circuit! This additional stupidity sobered him completely. He turned to retrace his steps, because the tones of the directional signals were now totally out of key. He would have to return to the trail, then stay on it as long as possible, and in the event of zero visibility due to a blizzard from the geyser region—he remembered its appearance during the chase—make use of the radiator. He came to the place where the fata morgana, with its trick mirror of clouds and gases, had disoriented him completely. Or possibly he had gone soft in the head sooner, when he suffered not the optical but the acoustical illusion and stopped comparing the route indicated by the beacon with the terrain map in his cabin.

In the place to which his own phantom had led him, not that far from the designated path—nine miles in all, according to the odometer—there were no geysers shown on the map. Their border ran farther north, judging by the last survey made. On the basis of flight reports and the radar pictures taken via the patsat, Marlin had ordered that the route from Roembden to Grail be changed to a roundabout southern course, so that it would run—inconveniently but safely—through a shallow of the Depression which had never yet been inundated though it was covered with snow from the geysers. The bed of this shallow might at worst become obstructed with drifts of dioxide snow, but a Digla had sufficient power to wade through drifts five meters deep; and if it got stuck, it could radio and Grail would send unmanned bulldozers, redirected from the mines. The problem was that no one knew exactly where the three striders vanished. On the old trail, abandoned after previous disasters, the Depression had permitted uninterrupted radio contact, but shortwave signals didn't reach the southern syncline directly, and one couldn't use reflection, since Titan possessed no ionosphere. It was necessary to employ relay satellites, but for a week now Saturn had interfered, drowning out with the tail of its stormy magnetosphere all emissions except lasers. Grail's lasers, indeed, could penetrate the cloud layers and thus reach the patsats. The patsats, however, not equipped with wave transformers over such a wide range, were unable to convert light impulses into radio. True, they could collimate the received flashes and send them into the Depression, but that would be futile. In order to penetrate the geyser storms it would be necessary to beam with an energy that would melt the satellite mirrors. Put into orbit when Grail was still in the setting-up stage, the mirrors had undergone slow corrosion; clouding, they absorbed too much radiant energy, not reflecting it with 99-percent efficiency.

Into this concatenation of oversight, poorly conceived economizing measures, haste, shipping delays, and ordinary foul-ups—typical of people everywhere and therefore in space as well—went one unfortunate strider after the other. The solid ground of the southern shallow was supposed to have been a last resort. How solid it actually was, Parvis would soon find out. He had counted on coming across the trail of his predecessors, but quickly gave up that hope. He followed the azimuth, trusting it, because the terrain rose and led him away from the blizzard. To the left he saw slopes of old magma, topped with clouds and swept clear of snow. He traversed these with caution. He walked through a quarry, across ice-filled gullies, but the ice contained bubbles of unfrozen gas. When once or twice the iron foot broke through the ice crust and sank into an empty space, the noise of the engines ceased and his ears were filled with a rattling and snapping so loud, it was like being aboard an icebreaker battering its way through polar ridges. Carefully, each time, he inspected the foot pulled from the hole before moving on. He labored in this way until the radio dialogue, keeping the same tone and pitch, began to stammer. The right gave a strangled whistle, and the left dropped to a bass. Parvis turned until the notes were equal. Then before him opened a wide passageway between high stacks of ice slabs, except that it wasn't ice, he knew, but congealed hydrocarbons. Down dry, coarse-grained scree he stepped, braking as much as possible to contain the pull of the seventeen-hundred-ton strider on the incline. Volcanic walls among clouds opened into a view of a valley, where instead of firm ground he saw Birnam Wood.

Thousands of chasms, at least, spewed from narrow outlets, throwing into the poisonous atmosphere streams of ammonium salts. Ammonium radicals, kept in their free state by the tremendous pressure of the rocks, shot up into the dark sky, boiling, and turned it into churning chaos. He knew that this was not supposed to extend here; the experts said that it couldn't happen—but he was not thinking about the experts. He either had to return to Roembden at once or stay with the guiding song—an innocent song, though as false now as the sirens of Ulysses. Dirty-yellow clouds moved slowly and heavily over the whole Depression, to fall in strange, sticky, ropy snow that stiffened to form Birnam Wood. The name had been given it because it traveled.

It was not a wood, of course, and only from a great distance did it resemble a forest buried in snow. The furious play of chemical radicals, continually fed with new material because the different groups of geysers erupted each with its own incessant rhythm, created a crusty porcelain jungle that attained heights of a quarter of a mile; the weak gravitation assisted its growth, so that there were treelike formations and thickets of glassy white laid upon each other in successive layers, until finally the bottom could no longer support the endlessly climbing mass of lacy branchings and collapsed with a slow, grating clatter, like a planetary china shop leveled in an earthquake. Someone, in fact, had casually dubbed these cave-ins of Birnam Wood "china quakes," a stunning spectacle harmless only when viewed from the safety of a helicopter.

From close up, this forest of Titan looked like a transitory construction, a thing of lace and white foam, and it seemed, therefore, that not only a strider but even a man in a spacesuit could push his way through its frozen embroidery. But it was not that easy to penetrate the hardened froth lighter than pumice, a stuff between a snowy grease inflated as it froze and a lace spun from the thinnest china fibers. One could make slow progress, however, because the enormous bulk was actually a solidified cloud formed of spiderweb capillaries in every shade of white, from pearly opalescent to dazzling milky. It was possible to walk into the forest, yet one never knew when the section one was in would reach the limit of its strength and crumble, burying the traveler beneath a several-hundred-meter layer of pulverized enamel, which was light as fluff only in a small spray.

Even before, when he had got off the track, the forest, hidden then by the dark spur of the mountainside, had indicated its presence by the white glow from that direction, as if the sun were about to rise there. The glow was exactly like the spreading brightness in the clouds of the northern seas on Earth, when a ship, sailing clear water, approached a field of ice.

Parvis headed for the forest. The impression that he was standing on a ship—or that he himself was the ship—was strengthened by the rhythmic rocking of the giant that bore him. As he descended the steep slope, he ran his eye along the horizon, a bright line in the distance. The forest, seen from above, seemed a cloud flattened on the ground, a cloud whose entire surface unaccountably swelled and crawled. He walked, swaying, and the cloud before him grew like the headland of a continental glacier. Now he could make out long, twisted spits emerging from it, avalanches of snow moving in weird slow motion. When no more than a few hundred feet separated him from the snowy billows, he began to make out openings in them like the mouths of caves, with some smaller, like burrow holes. They gaped dark in the gleaming tangle of fluffy limbs and antler-branches made of semiopaque, off-white glass. Then a sharp, brittle rubble began to crunch underneath his iron boots. The doubled radio sound continued to assure him that he was going in the right direction. So he went, hearing over the heightened drum of the engines—which increased their RPM to overcome the growing resistance—the harsh screech of the thicket broken by his knees and torso. His initial nervousness now gone, he felt not a trace of fear. He felt despair, understanding only too well that it would take a miracle for him to hit upon any one of those lost. He would sooner find a needle—not in a haystack, in a mountain of hay. There could not be any footprints in this thicket; the continually shooting geysers replenished the cloud, so that every breach and break in it grew over quickly like a healing wound. He cursed the beauty surrounding him, possibly unique in all the world. Whoever had named it, from *Macbeth*, must have been an aesthetic soul, but Parvis in his Digla was not interested in such associations now. The Birnam Wood of Titan, for a combination of reasons known and unknown, alternately retreated and advanced within the Depression, across thousands, tens of thousands of its hectares. The geysers themselves were not too dangerous, since one became aware of their presence at a distance, before actually seeing the skyward-spouting, vibrating columns of gases that were thickened from subterranean pressure. Their roar alone, the terrifying thunder and whistling—as if the planet itself, in labor, were howling out of pain or rage—set the foundations in motion and with the might of a cyclone leveled all the trembling, cracking, tinkling glass thicket in the vicinity. It would take extraordinary bad luck to tumble into the vent of a geyser that was momentarily dead, between eruptions. But it was easy to keep a safe distance from those that announced their activity with a constant whistle, rumble, and the quivering of the surrounding underbrush, a white quivering that signaled doom. Unexpected explosions, however, explosions not even that close, were what most often caused the gigantic cave-ins.

Parvis practically pressed his face to the reinforced window and looked, as he slowly, slowly placed footstep after footstep. He saw milk-white trunks of thick streams frozen vertically, and how higher up they branched into a flickering swirl, being dense and massive only at the bottom. And above the icy jungle of the ground level there grew—in successive, increasingly airy stories—skeletal, weblike structures: cocoons, nests, club moss, euglenas, gills pulled from the bodies of fish but still pulsing, because everything, in a constant drizzle, crept and coiled. From clumps of snow there issued thin needle-shoots, which joined into ganglia, sank, flowed, and again were covered over with a freezing, glutinous milk that dripped-misted from unknown heights. No word in any terrestrial language could do justice to that artistry in the white, shadowless silence, the stillness beyond which one could hear a very distant, barely awakening mutter, evidence of the underground surge forced into the vents of the geysers.

Stopping to listen, to tell the direction of this voice of disaster, he noticed that Birnam Wood had begun to absorb him into itself. It did not approach him like the forest in *Macbeth*, but came as if out of nowhere. From the air, which was completely still here, appeared microscopic flakes of snow. The snow did not fall; it formed on the dark plates of the armor, on the welds of the shoulder shields. Already his entire upper trunk was dusted with this snow, which lost its similarity to snow because it did not descend compliantly on the metal surfaces of the hull, did not collect loosely in its hollows, but adhered like a white syrup, sprouted, sent out milky threads, and before Parvis realized it, he had grown snowy fur all over. Thousands of fibers extending and catching the light covered him and changed the hull of the Digla into an enormous white doll, an eccentric snowman. Then he made a small movement, a jerk, and frozen molds of his iron limbs, of his shin guards, fell away in huge pieces. But when they hit, they became piles of delicate slivers. Light from the shaky maze brought out phantasmagoric shapes and dazzled the eye, but it did not illuminate the ground. Only now did Parvis appreciate the advantage given him by the radiator. Its invisible heat melted a tunnel in the thicket, which he entered, hearing—now on the right, now on the left—echoes of streams of gas coming from the locked bed of the cloud like cannon blasts. At one point he passed the plume of a geyser, not far off, jerked by furious spurts that whipped its perimeter. Suddenly the snow forest thinned out, making a kind of clearing beneath an inflated bubble-dome of branches. In the center lay a black giant, showing the bottoms of two iron feet, together, and a torso turned on its side, resembling, in perspective, a ship beached. The left arm, on top, went between white trunks, its hand hidden in undergrowth; the right was pinned to the ground beneath the body. The iron colossus lay twisted but not altogether conquered, because except for the rime on its limbs it was free of snow. The air wavered slightly over the bulge of the torso, heated by the warmth still inside.

Parvis, transfixed before the twin strider, could not believe his eyes, that the miracle had taken place, after all. Of meeting. He was about to speak when two things simultaneously came to his attention. Under the fallen Digla was a spreading puddle of yellowish oil—from broken hydraulic lines, which meant at least a partial paralysis. Moreover, the front window of the cabin, now so similar to the porthole of a ship, gaped, broken, and only strips of insulation hung from the frame. The opening, completely dark, gave off vapor, as though the giant, in its throes, had not quite parted with its last breath. The pilot's triumph, joy, thankful amazement turned to horror. He knew, even before he bent carefully, slowly, over the wreck, that it was empty. His searchlight played across the interior: the wires hanging helter-skelter, the metallic skin draped over them. Unable to bend more, he peered with difficulty into the corners of the abandoned cabin, in the hope that the one shipwrecked, departing in his spacesuit, had left some message, some sign. But all Parvis found was an overturned toolbox and wrenches that had spilled from it. For a while he tried to guess what had happened. The Digla could have been knocked down by a cave-in, and the operator, when his efforts to lift the machine out of the crushing rubble failed, could have disconnected the system of cutoffs limiting the power allowable. The lines might then have burst from the excessive oil pressure. The cabin window he had not broken himself; he could have got out by the thigh exit or through the escape hatch on the back. The glass had probably shattered in the cave-in, when the strider fell. Originally lying flat, the strider had turned on its side in its struggle against the mass that bore down on it. The poisonous atmosphere entering the cabin would have killed the man more quickly than the cold. So the cave-in had not caught him unprepared. When the vaulted thicket began to press on the machine from above, the operator, seeing that it would not stop, managed to get into his spacesuit. Thus he gave up control of the Digla, first having to remove the electronic skin. His Digla possessed no high-temperature radiator, so he did the only thing that made sense, which spoke well for him. He took tools, crawled into the engine room, and, discovering that he would not be able to fix the hydraulics since too many of the pipes were cracked and the leakage also was too great, disconnected the whole transmission from the reactor and turned the reactor up all the way. The strider, he knew, was lost, but the heat from the nuclear pile, although it would burn through the power plant—or, rather, precisely for that reason—would be emitted through the red-hot hull and thereby melt the mountain of debris. Which created this domed cavern, the glassy walls bearing witness to the temperature produced by the wreck. Parvis tested his reconstruction of events, holding a Geiger close to the back of the hulk. Immediately the Geiger chattered. The pile had melted under its own heat and cooled, but the outer hull remained hot and radioactive. The operator left his vehicle, then, through the broken window, dropped the useless tools, and went into the forest on foot. Parvis looked for prints in the spilled oil. Finding none, he circled the metal corpse, looking for openings in the wall of the gleaming cave large enough to let a man pass. There were none. Parvis could not calculate in his head how much time might have elapsed since the disaster. Two people disappeared in the forest three days ago, and Pirx twenty to thirty hours later. The difference in time was too small to provide any basis for determining whether the wreck belonged to one of the operators from Grail or to Pirx. He stood—alive in iron over the lifeless iron—and coldly deliberated what to do next. In some recess of this melted bubble there had to be a passage used by the operator, but it had sealed over after he left. The porcelain seam should be very thin. From the Digla, Parvis would not see it. He turned off the Digla, changed as quickly as he could into his spacesuit, ran clanking down the stairs to the thigh hatch, slid down the ladder onto the foot, and jumped to the glassy ground.

The melted-out cave immediately seemed much larger to him. Or, rather, it was as if he had suddenly shrunk. He walked around it: almost six hundred steps. He brought his helmet near the more transparent places and tapped. Unfortunately, there were many of them. Using a hammer taken from the control room, he tapped on a hollow between two truly oaklike columns. It shattered like glass, and at the same time pieces of the dome began to rain on him. The rubble trickled, then there was a cracking, and a real burst of hail—small chunks, bits of glass—came down on him. He realized then that this was pointless. He would not find any trail of the man—and was in something of a tight spot, himself. The breach through which he had entered this melted cave had already been closed with white icicles, icicles already like stout pillars of salt—but not earthly salt, because it grew in interwoven strands each thicker than an arm. Nothing could be done. Nor was there time to think carefully, because the dome was sinking, was now almost touching the radiator on the shoulders of his strider, as if the strider were an Atlas bearing the entire weight of the upward-congealed jets of the geysers.

He did not remember how he got back in the cabin, which tilted slightly now, as the trunk was pushed millimeter by millimeter, or how he pulled on the electronic suit. For a moment he considered whether or not to turn on the radiator. Every action here contained unforeseeable risk. The remelted ceiling could just as easily collapse as yield. He found a little space, several steps, around the black wreck, which he could use to build momentum, and with full force rammed the frozen-over breach—not in shameful retreat, but to get out of this tomb of glass. And then he would see.

The engine room resounded with the turbines. The drip-formed, swollen white of the wall cracked, struck by two steel hands; the dark cracks spread starlike upward and to the sides, and simultaneously thunder roared from every direction.

What happened, happened too quickly for him to follow it. He felt a blow from above, so tremendous that the giant encompassing him gave a single bass groan, reeled, went flying through the broken breach as through a sheet of paper, and crashed—under an avalanche of chunks, shards, and dust—with such violence into the ground that in spite of all the suspension shock absorbers Parvis felt his innards driven straight into his throat. At the same time, the final stage of the collapse was uncannily slow: the debris, filling up the way that he had come, drew nearer, visible in the window, as if he had not fallen at all but the snowy, smooth surface, bombarded by a hail of rubble, had reared up vertically before him. From the many-storied heights the hail struck the whiteness that was wrapped in clouds of swirling dust, and then through all the girders of the hull—the howling engines, their mountings, the plates of armor—there sounded, claiming him, a final thunderclap.

He lay sightless. The window had not been broken but was buried in a heap of debris, whose real mass he felt on himself, on the back of the Digla. The turbines howled not under him now, but behind him, idling, because at the height of the strain they had thrown themselves into neutral. Against the coal-black window all the indicators glowed. The ones on the right slowly paled, grayed, went to willow-green, but those on the left winked out, one after another, like cooling embers. He lay in a wreck that was paralyzed on the left side. To movements of his left arm and leg there was no response. Only the outline of the right half of the strider shone. Inhaling spasmodically, he smelled hot oil in the air: it had happened. Could he at least crawl with the half-paralyzed Digla? He tried. At first the turbines obediently sang in unison, but then the warnings again flared in purple. The cave-in had thrown him not completely forward but port side first, and when he fell that side took the brunt of the impact. Breathing deeply, with deliberate slowness, he turned on the interior light and checked the strider's damage interoceptor: to learn the position of the limbs and trunk, disregarding the drive units. In cold outline the picture showed immediately. The steel legs were caught together; they were crossed. The left knee joint was snapped. The left foot lay behind the right, but he could not move the right, either. Projecting structures must have caught each other, and the force of the cave-in did the rest. The smell of hot hydraulic fluid, obtrusive now, irritated his nostrils, burned them. One more time he struggled, switching the whole system of oil lines to a much weaker, backup circuit. In vain? Something warm and slippery was flowing softly across his feet, shins, thighs. In the white light of the fluorescent lamp above his head, as he lay on the window, he saw the oil leaking into the cabin. There was no alternative. He opened the zipper, slipped out of the electronic tights, kneeled naked to open the locker in the wall that was now the ceiling, and grunted when the spacesuit fell on him. The oxygen cylinders struck him in the chest, and the helmet, like a white sphere, rolled into a pool of oil. His clothes were soaked with the hydraulic fluid. Without hesitation, naked, in the calm, artificial light, he climbed into the suit, wiped the base of the helmet because it, too, had oil on it, put it on, closed the fasteners, and on all fours crawled down the well, now horizontal like a tunnel, to the thigh hatch.

Neither the regular door nor the emergency door could be opened. It is not known how long he sat afterward in the cabin before he removed his helmet and, lying down on the oil-smeared window, raised a hand to the tiny red light, to break the plastic bubble-case and push with all his strength into the unknown future, pressing the recessed button of the vitrifax. Nor can it be known what he thought and what he felt, preparing himself for an icy death.

II

The Council

Dr. Gerbert sat at a wide-open window. Stretched out comfortably, with a fluffy blanket tucked around his legs, he was looking through a folio-bound packet of tissue-culture photographs. Though it was bright outside, the room was dim. The smoke-black ceiling, with crossed, thick, resin-saturated beams, contributed to the dimness. The floor was parqueted with squares of wood, and the walls were made of rough-hewn logs. Through the windows one could see the forested slopes of the Cloud Hunter; farther on, the massif that was Cracatalq, and the sheer cliff of the highest of all the peaks, which resembled a buffalo with a broken horn, the formation that the Indians had called, for centuries, the Heaven Stone. Above the valley, which was gray with boulders, rose vast mountainsides, gleaming with ice in the shadows. Through the northern pass showed the azure of the plains. In that tremendous distance the sky contained a thin wisp of smoke—the sign of an active volcano.

Dr. Gerbert compared the different plates and on some of them made marks with a ball-point pen. Not the slightest sound reached him. The candle flames stood motionless in the cold air. Their light grotesquely lengthened the contours of the furniture that was carved in the ancient Indian fashion. The large armchair in the shape of a human jaw threw its macabre shadow across the ceiling, toothed arms ending in curved canines. Over the fireplace grinned eyeless masks made of wood, and the little table near Dr. Gerbert stood upon a coiled snake whose head rested on the carpet, eye sockets glittering. Semiprecious stones shone red in them.

There was the sound of a distant bell. Dr. Gerbert put aside the films that he was studying and got up. The room changed in the blink of an eye. It became a large dining room. The table in the center was not covered by a cloth; the silver, and the jasper-green of the dishes, gleamed on black planks. Through the open door rolled a wheelchair. In it sat a corpulent man with a fleshy face and a nose so small it was practically lost between his cheeks. He wore a leather tunic. He nodded amiably at Dr. Gerbert, who took a seat at the table. At the same time, a woman entered, thin as a rail; she had black hair with a strip of gray down the middle. Opposite Dr. Gerbert appeared a heavy, short gentleman with an apoplectic face. When the servant, in cherry-red livery, had served the first course, a gray man with a cleft chin entered like someone late. Stopping at the massive stone fireplace between the sideboards, he warmed his hands over the fire before taking a seat in the place indicated by the host in the wheelchair.

"Your brother isn't back yet from his trip?" asked the gaunt woman.

"No doubt he's sitting on the Tooth of Mazumac and looking in our direction," replied the host, who had moved into the gap left for him between the chairs.

He ate quickly, with appetite. Aside from this exchange, the dinner passed in silence. When the servant had filled the last mugs of coffee, whose aroma mingled with the sweetish smoke of the cigars, the gaunt woman again spoke:

"Mr. Vanteneda, you must continue for us today the story about the Eye of Mazumac."

"Yes, yes," everyone urged.

Mondian Vanteneda complacently folded his fingers on his large belly. Then he shot a look around the table, as if closing the circle of his listeners. A dying log crackled in the fireplace. Someone put down his fork. A spoon clattered, and everything was still.

"But where did I leave off?"

"Don Esteban and Don Guillermo, learning of the legend of Cratapulq, departed for the mountains, to reach the Valley of the Seven Red Lakes. . . ."

"All throughout their journey," Mr. Vanteneda began, making himself comfortable in his wheelchair, "the two Spaniards met no man or beast. Only now and then they heard the cries of coasting eagles, and occasionally a vulture flew overhead. After much exertion they gained the ridge of the Dead Hand. They saw then, before them, a high arête, like the back of a rearing horse, the misshapen head hanging into space. The crest, sharp like a horse's neck, was covered with mist. Then Don Esteban remembered the peculiar words of the old Indian from the lowlands: Beware the mane of the Black Stallion. The two debated whether or not to push on. Don Guillermo, as you recall, had a sketch of the mountain chain tattooed on his forearm. Their supplies had run out, though they had traveled only six days. So they ate what remained of the salted, dried rope-meat and quenched their thirst at the spring that bubbled beneath the Severed Head. But they could not get their bearings in this region; the tattooed map was incomplete. Toward sunset, the mist began to rise like a swelling sea. They proceeded up, ascending the back of the Horse, but although they hurried until the blood rang in their ears and they were fighting for breath like expiring animals, the mist moved more quickly and caught them on the very neck of the Horse. In the place where its white shroud enveloped them, the ridge had narrowed to no wider than the handle of a machete. Thus, unable to walk, they sat astride the ridge exactly as one sits upon a horse. Surrounded on all sides by the impenetrable, damp white, they continued forward until darkness fell. When they had no more strength, the ridge came to an end. They did not know whether this was the sheer drop of a precipice or the way down to the Valley of the Seven Red Lakes, of which the old Indian had told them. So they sat the entire night, supporting each other by leaning back to back, warming themselves with their own body heat, and resisting the night wind that whistled across the ridge like a knife whetted on a stone. If they dozed off they might fall into the abyss, so they did not close their eyes for seven hours. Then the sun rose and dispersed the vapors. They saw that the rock beneath their feet fell away, as perpendicular as if they had been sitting atop a wall. Before them gaped an eight-foot breach. The mist tore into shreds against the neck of the Horse. They recognized then, in the distance, the dark Head of Mazumac, and saw columns of red smoke, mingled with white clouds, rushing upward. Bloodying their hands, they scrambled down a narrow ravine and reached the topmost pothole of the Valley of the Seven Red Lakes. Here, however, Don Guillermo's strength completely failed him. Don Esteban went first onto the ledge that hung over the abyss and led his comrade by the hand. They proceeded until they came upon a pile of stones where they could rest. The sun was high, and the Head of Mazumac began to spit bits of rock at them, chips from the overhangs. So they fled down. When the Horse's Head above them had grown as small as a child's fist, they saw the first Red Spring in a cloud of ruddy foam. Then Don Esteban took from his breast pocket a bundle of thongs tanned the color of acanthus wood, the fringes of which, painted red, were twisted into numerous knots. He ran his fingers over these, reading the Indian writing, until finally he guessed the correct way.

"Before them opened the Valley of Silence. They crossed it on enormous boulders. The crevices between the boulders were bottomless.

" 'Are we near?' asked Don Guillermo in a whisper, for his throat was parched.

"Don Esteban made a sign for silence. At one point Don Guillermo stumbled and kicked a small stone, which set others in motion. In response to this sound, the vertical walls of the Valley of Silence began to smoke; a silver cloud covered them, and a thousand clubs of limestone hurtled down. Don Esteban, who just then was passing beneath an arched structure, pulled his friend into that shelter as the crushing avalanche reached them and rushed past like a storm. In a minute, all was silent again. Don Guillermo's head was bleeding from a flying chip of rock. His comrade took off his shirt, tore it into strips, and bound the wound. At last, when the valley became so narrow that the sky above them was no wider than a river, they saw a stream that flowed over rocks without the least sound. Its water, bright as a polished diamond, fell into an underground channel.

"Now they had to wade knee-deep into the swift, icy current. It undercut their legs with cruel force. Soon, however, the water turned to the side, and they stood on dry yellow sand in front of a cavern with many windows.

"Don Guillermo bent over, weak, and noticed how curiously the sand gleamed. The handful that he raised to his eyes was uncommonly heavy. He brought it to his mouth and chewed the stuff that filled his palm. He realized that it was gold.

"Don Esteban remembered the words of the Indian and looked about the grotto. In one corner blazed an upright, frozen, completely motionless flame. This was a block of crystal polished by the water, and above it was an opening in the rock. The sky shone through.

"He approached the translucent block and looked into its depths. In shape it resembled a huge coffin driven into the ground. At first he saw within it only millions of glimmering lights, a bewildering whirl of silver. Then it seemed that everything around him grew dark, and he beheld great sheets of birch bark parting. When these vanished, he saw that at the very center of the block of ice someone was watching him. It was a copper face full of sharp wrinkles, the eyes narrow like blades. The more it watched, the more evil grew its smile. Cursing, he struck the rock with his dagger, but the point glanced off harmlessly. At the same time, the copper face and its twisted smile disappeared. Because Don Guillermo seemed feverish, his comrade kept the secret of the vision to himself. They moved on. The grotto spread into a network of corridors. They took the widest, after lighting the torches they had brought. At one point a side corridor opened like a black well in the gallery floor. Air hot as fire blew from it. They had to jump across. Farther on, the passageway constricted its throat. For a while they went on all fours, then came to a place so narrow that they had to crawl. Then suddenly the passage widened. They could kneel. When the last torch burned low, the ground began to grate underfoot. By the torch's small remaining light they saw that they knelt on gravel made of pure gold. Still they were not satisfied. Having found the Mouth of Mazumac and its Eye, they wished to see also its Gut. Suddenly Don Esteban whispered to his comrade that he saw something.

"Don Guillermo peered over Don Esteban's shoulder in vain.

" 'What do you see?' he asked.

"The end of the smoldering brand was already burning Don Esteban's fingers. He stood. The walls were gone; there was only a great darkness, in which the torchlight made a reddish grotto. Don Guillermo saw his friend step forward, and the flame wavered, casting enormous shadows.

"Then from the darkness came a giant spectral face suspended in the air, its eyes directed downward. Don Esteban cried out. It was a terrible cry, but Don Guillermo understood the words. His comrade invoked Jesus and His Mother, and men like Don Esteban used such words only when face to face with death. As the scream resounded, Don Guillermo covered his face with his hands. Then there was thunder, fire engulfed him, and he lost consciousness."

Mondian Vanteneda leaned back and gazed silently at his guests. He was dark against the background of the window. The sky, cut by the sawtooth silhouette of the mountains, turned purple in the gathering dusk.

"In the Araquerita, upstream, Indians hunting stags fished out a white man who had around his shoulders an air-filled buffalo skin. The back was cut open and the ribs broken and spread out like wings. The Indians, fearing the troops of Cortes, tried to burn the body, but the cavalry of Ponteron (called the One-eyed) chanced to stop at their settlement. The corpse was taken to the camp and Don Guillermo was recognized. Don Esteban never returned."

"But, then, how is this whole story known?"

The voice was discordant, jarring. The servant entered with a candelabrum. The light of its flickering flames revealed the face of the questioner, lemon-colored, with bloodless lips. Mr. Vanteneda smiled politely.

"I gave you, at the beginning, the tale of the old Indian. He said that Mazumac saw everything with his Eye. The Indian expressed himself somewhat mythologically, perhaps, but in essence he was right. This was the beginning of the sixteenth century, and few Europeans knew about the possibility of amplifying the power of sight through lenses. Two giant mountain crystals—whether created by the forces of nature or fashioned by the hand of man, it is not known—were situated in the Head of Mazumac and in the grotto of the Gut in such a way that, looking into one of them, one saw everything near the other. An unusual periscope, made by two shining prisms separated by a distance of thirty kilometers. The Indian who stood at the summit of the Head saw both trespassers sacrilegiously enter the Gut of Mazumac. And possibly he not only saw but was able to effect their destruction."

Mr. Vanteneda made a quick movement with his hand. On the table, into the circle of orange light, fell a bundle of thongs tied into a thick knot at one end. The faded hide was marked with deep incisions. The thing rustled as it fell, it was so old and dry.

"So there was someone," concluded Mr. Vanteneda, "who observed the expedition and left an account of it."

"Then you know the way to the cave of gold?"

Mr. Vanteneda's smile grew more and more wooden, as if, along with the vanishing peaks in the window, it was receding into the silent, icy, mountain night.

"This house stands at the very entrance to the Mouth of Mazumac. When a word was spoken in the Mouth, the Valley of Silence repeated it with mighty thunder. It was a natural, stone loudspeaker, a thousand times more powerful than an electric one."

"How . . . ?"

"Ages ago, lightning struck a flat, smooth slab and melted it into a mass of quartz. The Valley of Silence is the same valley that our windows overlook. Don Esteban and Don Guillermo came from the direction of the Gate of Winds . . . but the Red Springs have long since dried up, and a voice will not bring down stones. Apparently, the valley was a resonator and certain frequencies of sound loosened the limestone pinnacles. The cave was closed by an earth tremor. There was a hanging rock there, which like a wedge held apart two walls of stone. The tremor knocked it from its place, and the walls closed forever. As to what occurred afterward, when the Spaniards attempted to force their way through the pass, and who set off the avalanche of stones on the column of Cortes' foot soldiers—we do not know. And I do not think that we ever will."

"But my dear Mr. Vanteneda, walls of rock can be blown up, penetrated with machines, and water can be pumped out of caves, no?" said the squat gentleman at the end of the table. He lit a thin cigar with a straw.

"You think so?"

Mr. Vanteneda did not hide his irony.

"There is no force that can open the Mouth of Mazumac if He does not wish it," he said, pushing himself suddenly away from the table. A gust extinguished two candles. The others burned with a blue flame, and flakes of ash fluttered above them like small moths.

He thrust his hairy hand before their faces, grabbed the bundle of thongs from the table, and spun his wheelchair around with such force that the rubber of the tires squealed. The guests rose and began to leave. Dr. Gerbert sat bemused, staring at the dancing flame of a candle. From the open window came an ice-cold current of air. He shuddered—chilled—and turned to look at the servant, who was carrying in and setting down an armful of heavy logs in front of the burnt-blue grate of the fireplace. Skillfully the servant scattered the embers, and was building over them an ingenious roof of firewood when someone opened another door and touched the wall. The whole interior again was transformed in an instant. The fireplace of rough stones, the servant at the hearth, the chairs with sculptured armrests, the candlesticks, candles, windows, and the mountain night beyond them all vanished in an even, diffused light. The wide table with the place settings also vanished, and in a white, small room under an oval, concave, smooth ceiling only Dr. Gerbert remained, in a single chair, before a square surface that held his plate and a half-eaten joint of meat. This was all that survived of the table.

"Amusing yourself? *Now?* With old cock-and-bull stories?" asked the newcomer, who, switching off the scene, with some difficulty removed the inflated, transparent wrap that covered his fluffy jump suit buttoned to the neck. Finally he tore the wrap, with difficulty pulled it down off his boots that shone like metal, threw it away crumpled, and ran a thumb down his chest, at which the suit opened wide. He was younger than Gerbert, shorter, his bare neck muscular above the collarless shirt.

"It's only one. We agreed to meet at two—and the histology I know by heart—"

Dr. Gerbert lifted the packet as if a little embarrassed. The other man unfastened the thick tops of his boots, shuffled over to the metal molding strip that ran along the wall, and rapidly—as if dealing cards—summoned up, in sequence, the holographic images of the dinner party, running backward; of a plain with a group of steep limestone pinnacles white in the moonlight, like the ghastly skeleton of a bat; of a sunny jungle with the colorful fluttering of butterflies among lianas; and finally of a sandy waste with high termite mounds. Each scene appeared on all sides at once, surrounded them, and disappeared, shifting into the next. Gerbert waited patiently for his colleague to tire of this inspection. Amid the flickering play of light and color, with the folder of tissue-culture photographs in his hand, he was now far in his thoughts from the show—which he had used, perhaps, to take his mind off what troubled him.

"Has any . . . change taken place?" he asked at last.

His younger colleague returned the room to its original austerity and, growing serious, muttered, not that distinctly:

"No, nothing's different. It's just that Arago asked me if we would drop in on him before the council."

Gerbert winced, as at an unpleasant surprise.

"And what did you say?"

"That we'd come. Why are you making a face? You don't like paying him a visit?"

"I'm not thrilled. You couldn't refuse, that's clear. But even without adding theology to this, we have a hell of a problem on our hands. What does he want from us? Did he say anything?"

"Nothing. The man's decent, and wise, too. And discreet."

"Discreetly he'll tell us that we're cannibals."

"Nonsense. It's not as if we're on trial. We took them on board to revive them. He knows that."

"And about the blood, too?"

"I have no idea. What's so awful about the blood? They've been doing transfusions for hundreds of years."

"In his eyes, it won't be a transfusion but a profanation of mortal remains—at the very least. Body snatching."

"Bodies that nothing can help now. Transplanting, too, is as old as the hills. The religions—I'm no expert on the subject, but in any case *his* church hasn't opposed it. Why these sudden pangs of conscience before a priest, a monk? The Commander agrees, and the majority, if not everyone. Arago doesn't even have a vote. He's with us as some kind of Vatican observer or apostolic delegate. A passenger-spectator."

"Fine, Victor. But the slides were a nasty surprise. We shouldn't have taken the bodies on board the *Eurydice*. I was against it. Why weren't they shipped to Earth?"

"You know why—it worked out that way. Besides, as I pointed out, if anyone had a right to our voyage, *they* did."

"A lot of good it will do them, since at best we can restore only one—at the cost of the others."

Victor Davis regarded Gerbert with large eyes.

"What's eating you? Is this *our* fault? The conditions on Titan wouldn't allow diagnoses. True or false? Well? Speak. I'd like to know just who I'm going to that Dominican with. Have you returned to the faith of your forefathers? In the thing we have to do—what we have to request—you see something evil? A sin?"

Dr. Gerbert, calm until now, fought down a burst of anger.

"You know perfectly well that I will request the same thing as you and the Head Physician. You know my views. Resurrection is no evil. The evil lies in the fact that out of two men fit for reanimation we can bring only one back to life. And that no one will make the choice for us. . . . But we're wasting time. Let's go. I want to get this over with."

"I have to change. Will you wait?"

"No, I'll go myself. Come when you're ready. Which deck?"

"The third, in the middle section. I'll be there in five minutes."

They left together but got into different elevators. Gerbert touched the appropriate numbers and sped off in an oval, silver interior. When the egg-shaped vehicle came to a gentle stop, the curved wall opened in a spiral, like a camera iris. Facing him, in light that had no source, ran rows of concave doors with high thresholds, as on an old-fashioned ship. He found the door with the number 84 and a small nameplate: "R. P. Arago, D.A." While he was wondering—stupidly—what the "D.A." stood for (Doctor Angelicus? District Attorney?), the door parted.

He entered a spacious cabin lined on all sides with glass-covered shelves of books. On two opposite walls were paintings in bright frames, reaching from ceiling to floor. On the right was Cranach's *Tree of*

Knowledge, with Adam, the snake, and Eve; on the left, the *Temptation of Saint Anthony* by Bosch. Before he got a good look at the monsters floating in the sky of the *Temptation*, the Cranach was sucked in behind a bookcase, leaving an opening in which Arago appeared, in a white frock. Before the painting returned to its place as a door behind the Dominican, the physician got a glimpse of a black cross on a field of white. They greeted each other with a handshake and sat down at a low table piled chaotically with papers, graphs, and a multitude of open volumes that had colored ribbon bookmarks. Arago's face was lean, dusky, with gray, piercing eyes beneath brows that were almost white. The frock seemed too big for him. With the sinewy hands of a pianist he held an ordinary wooden yardstick. Gerbert found himself running his eyes over the backs of the old books. He did not want to be the first to speak.

The questions that he expected did not come.

"Dr. Gerbert, I am not your equal in knowledge. I can, however, converse with you in the language of Aesculapius. I was a psychiatrist before I chose this garb. The Head Physician made accessible to me the data concerning the . . . procedure. It speaks for itself. Due to the incompatibility of the blood groups, of the tissues, two people are at stake, but only one can be awakened."

"Not awakened," Gerbert said, almost against his will—because the monk had avoided the more direct words: "resurrected from the dead." The Dominican caught this at once.

"Distinctions important to me, of course, you cannot take into account. Any dispute on eschatology would be pointless. Someone like me, in my position, would say that true death means disintegration when irreversible changes have taken place in the body. And that we have seven such on the ship. I know that their remains must be disturbed and understand the necessity, though I am not permitted to sanction it. From you, Doctor, and from your friend—who will be here any moment—I would like an answer to one question only. You can refuse, of course."

"Go ahead," said Gerbert, feeling a shiver.

"You must have guessed. It concerns the criteria for the selection."

"Davis will say the same thing. We possess no objective criteria. And you, too, having seen the data, know this . . . Father Arago."

"I do. The calculation of the chances is beyond human ability. The medicoms, performing their x billion operations, give two out of the nine men a ninety-nine-percent chance, with a deviation within the bounds of theoretical error. For either alternative. There are no objective criteria, and for that very reason I take the liberty of asking you what yours will be."

"There are two matters before us," replied Gerbert with a kind of relief. "As physicians, along with the Head Physician, we will be asking the Commander for certain navigational changes. May we assume, Father, that in this you will be on our side?"

"I cannot participate in the voting."

"True, but a position taken by you may have influence—"

"On what the council decides? But it has already decided. I cannot imagine that there would be any opposition. The majority has declared itself 'pro.' The Commander has the resolution in hand, and I would be surprised if the doctors did not know what it was."

"We are asking for more changes than were first agreed upon. Ninety-nine percent is not enough for us. Even the tenth decimal place is important. The energy cost, along with the delay in the expedition, will be enormous."

"This is news to me. And the second matter?"

"The selection of the corpse. We are at a complete loss as to identities, since gross negligence—to which the radio technicians have given the more elegant designation of 'communication-channel overload'—has made it impossible for us to determine the names, functions, or histories of these people. In reality, something more than negligence was going on. When we took these containers on board, we were not aware that the memory not only of the old units of that mine—Grail—but of the digital machines at Roembden, too, had suffered considerable destruction in the course of the dismantling operations. The persons responsible for the fate of those that our Commander, with our consent, took on board said that the facts could be obtained from Earth. But it is not known who gave the orders for information storage, or when, or to whom. It's evident that everyone, so to speak, washed his hands."

"That happens whenever the jurisdictions of people overlap. Which is no justification. . . ."

The monk stopped, looked Gerbert in the eye, and said softly:

"You were opposed to having the victims on the ship?"

Gerbert nodded reluctantly.

"In the excitement before takeoff no single voice—let alone that of a doctor, not an expert astronaut—could carry any weight. If I was opposed and entertained certain fears, I am not any easier in my mind, now."

"But, then, what do you intend to go by? A flip of a coin?"

Gerbert stiffened.

"The choice will not depend on anyone but us. After the council, if our requests are met in the purely technological area—of navigation—we will conduct a new autopsy and go through the entire contents of the vitrifaxes, down to the last hair."

"What influence on your choice of the one to be reanimated could his identification have?"

"Probably none. It would not be, in any case, a quality, a factor, of any significance in the domain of medicine."

"These people," the monk weighed his words carefully, speaking slowly, as if venturing out on thinner and thinner ice, "perished in tragic circumstances. Some while performing their ordinary duties, as employees of the mines there, or of the companies. Others when attempting to rescue the former. Would you accept such a distinction—if it could be discovered—as a criterion?"

"No."

The answer was immediate and categorical.

The wall of books facing them parted, and Davis entered, with an apology for being late.

The monk rose. So did Gerbert.

"I have learned everything that it was possible to learn," said Arago. He stood taller than both physicians. Behind his back, Eve turned to Adam, and the serpent crawled up the tree of Eden. "I thank you, gentlemen. I have confirmed what I should have known anyway. Our fields touch. We do not pass judgment on a man according to his virtues and vices, just as you do not consider these when you save his life. I won't detain you: it's time now. See you at the council."

They left. In a few words, Gerbert gave to Davis the gist of his conversation with the apostolic observer. At a perfectly circular intersection of corridors they got into an egg-shaped, dull-silver vehicle. The appropriate well opened up and swallowed the wheelless car with a long sigh. In the circular windows, lights from the passing decks flashed by. Sitting opposite each other, they said nothing. Both, without knowing why, were offended by the statement with which the monk had summed up their meeting. The feeling, however, was too undefined to merit examination—in the face of what awaited them.

The conference hall was located in the fifth section of the *Eurydice*. The ship, seen in flight from a distance, resembled a long, white grub with spherically bulging segments—and it was a winged grub, since flat fins protruded from its sides, ending in the hulls of the hydroturbines. The head of the *Eurydice*, flattened out, was encircled by a multitude of antenna spines like feelers or stingers. The spherical sections, joined by short cylinders having a diameter of thirty meters, were also locked together and reinforced by a double inner keel whenever the cosmic vessel accelerated, went full speed, or braked. The engines, called hydroturbines, were actually thermonuclear reactors of the flowstream type, and hydrogen in high vacuum served as their fuel.

This drive proved even better than the photon drive. The performance of nuclear fuels at near-light speeds fell, because the lion's share of the kinetic energy was expended in the propelling flame that beat uselessly into space and only a small fraction of the liberated power was transmitted to the rocket. A photon drive, also, required the ship to be loaded with millions of tons of matter and antimatter as its annihilative fuel. The flowstream engines, on the other hand, used interstellar hydrogen. Hydrogen atoms, though ubiquitous, were so dispersed in galactic space that the engines of this type began to work effectively only at speeds above 30,000 kilometers a second, and reached full capacity only when approaching the speed of light. A ship with such a drive could therefore neither take off from a planet itself, being too massive, nor by itself achieve the velocity at which the atoms falling into the intakes of the reactors condensed sufficiently for ignition. The gaping intake funnels then hurtled forward, so that even the greatest cosmic vacuum, thus rammed, packed enough hydrogen into their throats to kindle artificial spouts of sun in the firing chambers. The efficiency factor increased, and the ship, not laden with its own supply of fuel, could maintain a constant acceleration. After less than a year of an acceleration corresponding to Earth's gravity, the ship attained nearly 99 percent of the speed of light, and while minutes went by on board, decades passed on Earth.

The *Eurydice* had been built in orbit around Titan, for Titan was to serve as her starting platform. Many trillions of tons of the mass of that moon were converted, by conventional thermonuclear piles, into energy for the transformers, and they in turn as laser throwers sent columns of coherent light to the gigantic stern of the *Eurydice*—like packing gunpowder into the bottom of a cannon beneath an artillery shell. The moon first had to be stripped, by astroengineering, of its thick atmosphere. Radiochemical plants and hydronuclear power stations were built on the plateau of the equatorial continent, after all the mountains were melted down by combined heat blasts from disposable satellites. Their salvos turned the great formations into lava, and cryoballistic bombs hastened the freezing, to make the red-hot, flowing sea a hard, smooth plain: the artificial Mare Herculaneum. On the twelve thousand square miles of that plain grew a forest of laser throwers, the true Hercules of the expedition. At the critical hour it fired, to push the *Eurydice* from her stationary orbit. The long column of coherent light drove the ship, hitting the mirrors at her stern, beyond the solar system. As the driving beam weakened, the ship increasingly resorted to her own boosters, jettisoning their burnt-out casings beyond Pluto. It was only then that the wide-gaping hydros came into play.

Because they would be running throughout the journey, the ship accelerated steadily, maintaining on board a pull equal to Earth's gravitation. The pull acted only along the ship's longitudinal axis. For this reason each spherical section of the *Eurydice* was a separate unit. Her decks went transversely in the hull, from side to side; up meant toward the bow, and down was astern. When the whole vessel braked or changed course, the vector of the force diverged from the axes of the individual sections. Therefore, to avoid having ceilings turn into walls and decks become upended, each segment of the hull contained within itself a sphere capable of rotating inside the armored shell, much like a ball-and-socket joint. The gyrostats saw to it that on the decks of each sphere of the hull—there were eight in all, for living quarters—the force of the thrust would always come vertically. Although during maneuvers of this type the decks of the separate spheres diverged from the main axis of the ship's keel, one could still pass from section to section. There was a tunnel system of additional locks called "worms." It was only in these flexible tunnels that one experienced a change or lack of gravity, since the elevator ran through the cylinders between the sections.

At the time of this general council, the first after takeoff, the *Eurydice* had almost a year of continuous acceleration before her, thus there was nothing to interfere with her steady thrust.

The fifth section, called the Parliament, served for the meetings of the entire crew. Beneath a curved ceiling lay an amphitheater, not too high, a room surrounded by four tiers of seats that were divided at regular intervals by ramps. By the only flat wall was a long table, actually a line of connected consoles with screens. Behind this, facing the assembly, sat the navigators and their subordinate specialists.

The uniqueness of the expedition called for the unusual makeup of the command. Ter Horab was in charge of flight; the coordinator Yusupov, power; the radiophysicist De Witt, communications; and at the head of the corps of scientists, both of those needed in the journey itself and those who would be going into action only at its destination, stood the polystorian Jenkins.

When Gerbert and Davis entered the upper gallery, the deliberations had already begun. Ter Horab was reading aloud the requests of the physicians. No one turned to look at the latecomers. Only the Head Physician, Vahradian, seated between the Commander and the coordinator, indicated his reproof with a knitted brow. But they had not missed much. In the silence the impassive voice of Ter Horab came from all sides.

". . . they are asking for a reduction in thrust to one-tenth. They consider this necessary for the reanimation of the remains that are in cold storage. It means throttling the drive down to the lower limit. I can do this. But then the whole flight program, with all its prepared computations, will be canceled. It is possible to make a new program. The old one was the product of five independent groups in the project on Earth, to rule out the possibility of errors. Five is beyond our means. We can make a new program with two teams—but it will not be as dependable as the first. The risk is small but real. So I ask you: shall we vote now on the physicians' request, without further discussion, or instead put questions to them?"

The majority were in favor of discussion. Vahradian did not take the floor himself, but called on Gerbert.

"Behind the words of our Commander lies a criticism," said Gerbert, not rising from his place in the highest row of chairs. "The criticism is directed at those who handed over to us, with no concern for their condition, the bodies found on Titan. One could conduct an investigation into this matter, to learn who the culprits were. Whether or not they are among us, however, does not change the situation. The task facing us is the complete resurrection of a man preserved little better than the mummies of the pharaohs. Here I must go into the history of medicine. Attempts at vitrifaction date back to the twentieth century. Doddering old millionaires had themselves interred in liquid nitrogren, in the hope that someday they would be restored to life. Complete nonsense: heating a frozen corpse only serves to make it rot. Then scientists learned how to freeze alive minute bits of tissue, egg cells, sperm, and microorganisms. The larger the body, the more difficult its vitrifaction. Vitrifaction involves the instantaneous congealing of all the organism's fluids into ice—skipping the phase of crystallization, since crystal formation causes irreversible damage to the subtle structure of the cell. The body and brain must be turned to glass in a split second. It is easy to heat an object to a high temperature in a split second; to chill it that rapidly to nearly zero Kelvin is incomparably more difficult. The bell vitrifaxes of the victims on Titan were primitive and worked brutally. When we accepted the containers on board, we were unaware of their make. That is why the condition of the bodies was such a surprise."

"For whom, and why?" asked someone in the first row.

"For me as a psychonicist, for Davis, who is a somaticist, and of course for our superior. Why? We received containers, having no specifications or diagrams of the old vitrifaxes. We did not know that the bells with their frozen occupants had been partly crushed by the glacier, or that at the site they were placed into thermos cylinders with liquid helium and immediately transported by shuttle to our ship. For the four hundred hours after takeoff, while Hercules pushed us, we were under two g's; we could not proceed with the examination of the containers until afterward."

"That was three months ago, John," said the same voice.

"Yes. During that time we determined that we could not possibly bring them all back to life. Three were ruled out at once: their brains had been crushed. Of the rest we can reanimate only one, although in principle two of the corpses are candidates for reanimation. The point is that all these people had blood in their circulatory systems."

"Real blood?" asked someone from another place in the hall.

"Yes. Erythrocytes, plasma, and so on. We have the data on the blood in our holofiles. We can't do transfusions without additional blood, however, so erythroblasts were taken from the marrow and multiplied. There is blood. But then we have the incompatibility of the tissues. Two brains are candidates for reanimation. But there are only enough vital organs for one person. Only one person can be put together, of these two. Abominable, but true."

"A brain can be resurrected without a body," said someone.

"We have no intention of doing that," replied Gerbert. "We are not here to run hideous experiments. At the present level of medicine they would have to be hideous. But the issue is not merely medical. We intrude here on navigational matters as doctors, not as astronauts. No layman can tell us how to proceed. Therefore, I will not go into the details of the operation. It is necessary to decalcify and metallize the skeleton. To remove excess nitrogen from the tissues with helium. To cannibalize bodies for one body. That's our area. I will explain to you only the basis for our request. We must have as little gravitation as possible during the reanimation of the brain. Complete weightlessness would be best of all. We realize, however, that that is impossible without shutting off the engines, which would totally ruin the flight program."

"Get to the point, John." The Head Physician did not hide his impatience. "The Commander and the people here want to know the reason behind your request."

He did not say *our* request but *your* request. Gerbert, pretending not to notice this slip of the tongue—but convinced that it was not innocent—said calmly:

"The neurons in the human brain normally do not divide. They do not divide because they constitute the material of personal identity, such as memory, and other qualities that are commonly called character, soul, and so on. In the brains of those vitrifacted in the primitive fashion that we saw on Titan, losses occur. We are now able to cause the neighboring neurons to divide, so that they fill the gaps, but in so doing we destroy the individuality of those neurons. To preserve personal identity, one must limit the number of divided neurons as much as possible, because the daughter cells are like the neurons of an infant—empty, new. Even at zero gravity there is no certainty whether and to what extent the one resurrected will suffer amnesia. A portion of the memory is irreversibly lost in vitrifaction, even in the best cryostats, because the delicate contacts of the synapses sustain damage on the molecular level. Therefore, we cannot claim that the one resurrected will be exactly the man he was some hundred years ago. We can only say that the weaker the gravitation during the reanimation of the brain, the greater the chance will be to save the personality. I'm finished."

Ter Horab glanced, as if casually, at the Head Physician, who seemed absorbed in the papers before him.

"There's no need for a vote," Ter Horab said. "By the power vested in me as Commander, I order the drive throttled at the time appointed by the doctors and for the duration they require. Meeting adjourned."

A subdued murmur went through the auditorium. Ter Horab rose and touched Yusupov's shoulder; both headed for the lower exit. Gerbert and Davis practically ran from the gallery before anyone could approach them. In the corridor they met the Dominican. He did not speak, only nodded, and continued on his way.

"I didn't expect that of Vahradian," Davis exclaimed, getting into the aft elevator with Gerbert. "The Commander, on the other hand—now, there's a man in the right place. I could feel our colleagues from the humanities, especially our 'psychonauts,' ready to jump us. He nipped that in the bud. . . ."

The elevator slowed; the passing lights flickered less frequently.

"Vahradian doesn't matter," muttered Gerbert. "If you must know, Arago spoke with Ter Horab right before the council."

"Who told you that?"

"Yusupov. Arago was at Ter Horab's before we met with him."

"You think he—?"

"I don't think, I know. The priest helped us."

"But as a theologian . . ."

"I'm no authority on that. But *he* knows both medicine and theology. How he reconciles the one with the other is his affair. Come, let's change. We have to get everything ready—and to set the hour."

Before the surgery, Dr. Gerbert read the record from the holofile one more time. In the course of their work the massive planetary machines had halted, because their sensors detected metal and, enclosed in the metal, organic material. One by one, seven old striders were pulled from the Birnam heap, and from those striders, six bodies. Two of the Diglas lay no more than a few hundred meters apart. One was empty; the other contained a man in a bell vitrifax. Compared to the eighth-generation excavators gnawing through the glacier, the Digla was a dwarf. The command center stopped the robot giants and sent out walking drill towers with highly sensitive bioreaders in search of other victims, because the Birnam Depression had claimed nine men. Of the man who left his Digla, no trace was found. The armor of the striders had been crushed beneath accumulating piles of ice, but the vitrifaxes held up amazingly well. The supervisors wanted to ship these immediately to Earth for reanimation, but that meant subjecting the frozen bodies to above-gravity force three times: at the takeoff of the small shuttle from Titan, at the acceleration of the transport rocket on the Titan-Earth line, and during the descent to Earth. X rays of the containers revealed serious injuries in all the bodies, including fractured skulls, so that such an involved move was considered too risky. Someone then hit on the idea of conveying the vitrifaxes to the *Eurydice*, which had the latest reanimation equipment. Also, the acceleration, when it departed, would have to be inconsequential, considering the ship's tremendous rest mass.

There remained the question of the identification of the bodies, which could not be done until the vitrifaxes were opened. Vahradian, the Head Physician of the *Eurydice*, made an agreement with SETI headquarters that specific data and the names of those taken from the ice of Titan would be transmitted to the ship by radio from Earth—because all disks of computer memory, for computers long since dismantled, lay in the archives of the Swiss center of SETI. Up until the moment of takeoff, the communication channels were overcrowded; someone or something—man or computer—assigned the incoming data a low degree of importance; and the *Eurydice* left the circumlunar orbit before the doctors became aware of the lack of this information. Gerbert went to the Commander, but nothing could be done; the ship was on its way, picking up speed, pushed by the Herculean lasers like a missile.

In this initial phase, Titan took the full brunt of the recoil, and some planetologists believed that it might split apart. Their fears did not materialize, but the acceleration did not proceed as smoothly as the planners expected. Hercules pressed the moon's crust deep into the lithosphere, violent seismic waves set in motion the mountings of the laser throwers, and although they withstood these earthquakes (Titan quakes, rather) the solar column wavered and shook. It was necessary to lower the power, wait out the diminishing tremors, and reaim the collimated lasers at the mirror-stern of the ship.

This created interference; unsent messages piled up. What was worse, Titan, pushed two years earlier from the vicinity of Saturn and stopped in its rotation so that Hercules, while relatively stationary, could drive the *Eurydice* outward with its light, began to undergo libration. Many hundreds of thousands of old thermonuclear warheads, embedded as an emergency reserve in the heavy moon, finally extinguished this movement as well. It was not easy. As a result, the physicians could not commence with the reanimation. The *Eurydice*, hit-and-missed over a series of weeks, received each return of the solar column to her stern as a blow that spread throughout the ship.

The difficulties with the collimation of the beam, the seismic shocks of Titan, the few boosters that failed to fire, all postoned the operation.

To many on board, the postponement was justified also by the fact that the odds of returning the victims to life did not seem good. With each day of now steady acceleration, communication with Earth worsened, and, on top of that, priority was given to radiograms that concerned the success of the expedition. At last the ship got from Earth the names of the six frozen castaways, and their photographs and bios, but that was insufficient to determine identity. With vitrification, which took place explosively, the facial parts of the skull were crushed. Secondary implosions inside the cryocontainers tore off the clothing worn under the spacesuits, and its shreds were forced by the oxygen from the bursting suits into the nitrogen coffins, where they turned to ash.

There was talk, then, of acquiring fingerprints from Earth, and dental records. But when these arrived, they only added to the confusion. Because of the ancient rivalry between Grail and Roembden, the computer logs there were in disorder, and no one knew whether a portion of the memory disks had been destroyed or had ended up, perhaps, in some archive outside Switzerland. The man who would be revived on the *Eurydice* bore one of six names: Ansel, Nawada, Pirx, Koehler, Parvis, Illmensee. All that the doctors could hope for was that the survivor, recovering from postreanimation amnesia, would recognize his own name on the list—if he was unable to remember it himself. Vahradian and Davis counted on that. But Gerbert, the psychonicist, had doubts. After setting the time of the operation, therefore, he went to the Commander to explain the problem. Ter Horab, always clear-headed and practical, agreed that it would be worth reexamining the contents of the vitrifaxes that had been emptied of their bodies.

"What you need are criminologists, forensic experts," he said. "Since I don't have any on board, I can give you"—he hesitated—"Field and LoBianco. Physicists," he added with a grin, "are also sleuths, in a way."

So a blackened—as if charred—cryocontainer resembling a curved sarcophagus was brought to the level of the main laboratory. Held by massive pincers while wrenches were applied to the outer catches, it opened slowly, lengthwise, with an awful grating sound. A black interior showed beneath the half-open coffin lid. The spacesuit in the center was sunken, unoccupied; its owner was floating in liquid helium, for a week now, along with the nitrogen block in which he had originally been frozen. Field and LoBianco took out the spacesuit and carried it to a low metal table. It had been examined before, at the time the body was removed, but nothing was found then except frozen scraps of fabric and some air-conditioning lines interwoven in a cable. Now they cut open the frost-covered suit, from the ring onto which the helmet fastened and down the torso and pneumatic legs to the large boots. They unhooked winding, spiraling tubes from the scarecrow figure, along with the broken oxygen hoses, and did a meticulous dissection: every shred went under the microscope. Finally, LoBianco crawled into the cylindrical cryocontainer with a hand-held light. To make his job easier, he had the manipulator slice through the metal plate and spread the halves wide. He searched here because the spacesuit had burst at the welds joining the arm sleeves to the trunk—either when the Digla was subjected to the growing weight of the collapsed Birnam glacier, or else from the internal pressure during the explosive vitrifaction. If the man had had with him any personal belongings, they could have been blown out through the rent in the suit and fallen, with the streams of solidifying nitrogen and human blood, into the container—at the instant its open mouth was clamped shut by the helmet shot from above, a hood of special steel that cut off the corpse in the spacesuit from the outside world.

To pull the hood from the container, hydraulic grippers had to be employed, since the pincers of the manipulator proved too weak. The two physicists and the doctor stepped back several paces from the platform, because the operation was quite violent. Before the hood—looking like the head of a giant artillery shell—jerked and began to move from the upper part of the container, large splinters of metal went flying from under the vanadium teeth. They waited. It was only when the coal-black fragments stopped dribbling and the bell, torn from the cryocontainer, opened emptily toward them, that Field lifted it high with the four-levered manipulator and LoBianco again began to examine the cylinder. Then everyone stopped. Coming apart completely along the seams, the metal plates trembled and fell slowly to the platform, as if in reenactment of an ancient death agony. The robot jaws carried the heavy hood through the air to the other end of the room and set it down, like half of an empty bomb, with such care that the thing came to rest on the aluminum table without a sound.

LoBianco approached the split container. In the center were the dark remnants of inside padding: shriveled layers, like burned dead leaves.

Field looked over LoBianco's shoulder. He was acquainted with the history of vitrifaction. In the days of Grail and Roembden, explosive charges had been used to drive the headpiece onto the container with the man, in order that the freezing process take place as rapidly as possible. The man first had to remove his helmet, though remaining in his suit. To keep the blow from crushing his skull, the hood was padded with pneumatically inflated cushions. Expanding, these shielded him. An injection cone was rammed into his mouth; it forced in liquid nitrogen, usually breaking the teeth and even the bones of the jaw. The idea was to congeal the brain from all sides at once, and therefore from the base as well, located just above the palate. The technology of the time was unable to avoid such injuries.

Bit by bit, the physicists pulled away layers of the crumbling shielding, and placed one beside the other until the instruments bared the metal bottom of the cryocontainer. Among the crushed ashes they found an object, also crushed, but preserving the form of a small booklet, the corners burned as in a fire. The half-carbonized thing was so fragile that it fell into dust wherever touched, so they placed it under a glass cover; even a breath could damage it.

"Looks like a small carrying case. Possibly leather. A portfolio. People kept them on their person. But the documents, as a rule, were cellulose, paper."

"Or made of plastic polymers," Gerbert added to what LoBianco said.

"Not encouraging," replied the physicist. "Under such conditions, cellulose holds up no better than the old plastics. How did it find its way into the hood?"

"That's not hard to guess." Field crossed his arms. "When he closed the circuits, the lower bell thrust up over the legs to the chest, and the upper half, shot out at the same time, clapped onto the lower. The charges were implosive, but obviously not the kind that would crush a man. Nitrogen filled the spacesuit, so that it split under the arms, and the air forced out stripped him naked. The blast of a shell has more than once torn the clothes off a soldier near the target. . . ."

"What do we do with this?"

Gerbert watched the physicists fill the space under the glass with a liquid stiffener; then they took the resultant mold, in which the dark, flat, tattered object was embedded like a bug in amber, and set about analyzing it. They found chemicals that used to be employed to print paper currency, and organic compounds common in animal skins tanned and dyed, and small traces of silver. These were undoubtedly remnants of photographs, because silver salts were used to make photographs. Adjusting the scan beam, the physicists fixed the scrap taken from the mold and finally acquired a kind of palimpsest: a scramble of letters and small circles, possibly from an official document seal.

Chromatography separated the colors from the ink of the print, because fortunately it possessed a mineral ingredient. The rest was done by the filters of a microtomograph. The result was modest. If in fact they had discovered a proof of identity, which seemed likely, the first name was illegible and of the last name they could be certain only of the first letter: "P." The word had from four to seven letters. By coincidence, the names of the two people who were revivable began with "P."

They put on the screen the resograms of those at rest in the liquid helium. This layered imaging technique, far more precise than old-fashioned X-raying, allowed one to determine the age of the victim to the decade, judging by the hardening in the articular cartilage and in the blood vessels, since medicine, at the time these people lived, had not yet learned how to halt the changes termed sclerosis.

The two candidates for reanimation were of similar build. They had the same blood type. The calcification of the ribs and, minutely, in the aorta indicated that they were both from thirty to forty years of age. According to their biographies, which included medical histories, neither had had an operation that left a scar on the body. The doctors knew this but wanted to see what the physicists could tell them from the nuclear magnetic resonance imaging. The physicists shook their heads: the nuclei of the stable elements in the organism were as good as eternal, but it was another story if there were isotopes in these people's bodies. Which was in fact the case—producing another dead end. Both men had at one time been irradiated with a dose on the order of one to two hundred rems. Probably in the final hours of their lives.

To examine the internal organs of a man in various planes and sections was an anonymous, abstract activity. The sight of naked corpses encased in nitrogen ice under helium, however, especially with their faces crushed, was such that Gerbert preferred to spare the physicists the experience. (The eyeballs of both bodies were intact—a secret grief for the doctors, this, because unquestionably the blindness of one would have made the decision for them: namely, to revive the man whose vision was unimpaired.) When the physicists left, Davis sat down on the platform with the split-open cryocontainer and said nothing. Finally Gerbert could stand the tension no longer.

"Well then?" he asked. "Which one?"

"We could get Vahradian's opinion . . ." Davis muttered uncertainly.

"Why? *Tres faciunt collegium?*"

Davis got up, stabbed the keyboard, and the screen obediently displayed, side by side, two rows of green numbers, and one number in red, on the right, which blinked in warning. He switched off the unit, unable to endure it, but again reached out to press a key. Gerbert put his arms around him, restraining him.

"Stop. That's useless."

They looked at each other.

"We might consult . . ." Davis began, but did not finish.

"No. No one can help us. Vahradian—"

"I wasn't thinking of Vahradian."

"I know. I was going to say that, officially, Vahradian will make the decision if we turn to him. He has to, as the Head Physician—but that's a cowardly way out. Anyway, look how the man has made himself scarce. Let's not prolong this. In an hour—in less than an hour, now—Yusupov will throttle the drive."

He released Davis and threw the switches on the console to prepare the reanimating room, saying:

"The dead do not exist. It is as if they had never been born. We are not killing anyone. We are re-creating a single life. Look at it that way."

"Fine," replied Davis, his eyes glittering. "You're right. It's a good deed. And you can have the honor of performing it. You choose."

The two white snakes that were coiled around the winged staff on the wall above the control panel lit up: the room was ready.

"Very well," said Gerbert. "On one condition. That this remains between us and no one ever learns about it. Especially *he*. You understand?"

"Yes."

"Think about it. After the operation, all the remains go overboard. And I will erase all the data in the holofile. But you and I will know; we will know because we cannot erase our own memory. Will you be able to forget?"

"No."

"To be silent?"

"Yes."

"To everyone?"

"Yes."

"To the end?"

Davis hesitated.

"But . . . they all know, after all. You said yourself at the council that we would choose either—"

"I had to. Vahradian knew the score. But after the data are destroyed we will lie and tell everyone that this man was objectively preferable in a way discovered by us only here and now."

Davis nodded.

"I agree."

"We'll write the protocol, sign it together, falsify two of the items. You'll sign?"

"Yes, with you."

Gerbert opened the wall compartment. In it hung silvery suits with white boots and face masks of glass. He took out his and began to put it on. Davis did likewise. In the central rotunda of the room a door parted, revealing the bright interior of an elevator. The door closed, the elevator went down, and the empty room grew darker, but above the point lights of the control panel glowed the snakes of Aesculapius.

III

The Survivor

He returned to consciousness blind and without a body. His first thoughts were not formed of words; his feelings were confused, inexpressible. He receded, disappeared somewhere, and returned. It was only when he found his internal speech that he could put questions to himself: What was I afraid of? What kind of darkness is this? What does this mean? And when he made this step, he was able to think: What am I? What is happening to me?

He tried to move, to locate his arms, legs, torso, knowing now that he had a body, or at least that he should have one. But nothing responded, nothing moved. He could not tell if his eyes were open. He felt no lids, no blinking. He exerted all his strength to lift the lids, and perhaps succeeded. But he saw nothing except the same darkness as before. These attempts, requiring tremendous effort, again led him to the question: What am I? I am a man.

This obvious answer was a revelation to him. Then, immediately, he knew its obviousness and smiled at himself, because what kind of brilliant discovery was that?

Words returned slowly, from where he did not know, and at first were scattered and without pattern, as if he were pulling them up like fish out of unknown depths. Am. *I* am. Where, I do not know. I cannot feel my body. Why is that? Now he began to feel his face, the cheeks, possibly the nose. He was even able to move the nostrils, though that took an enormous exertion of will. He stared, moving the eyeballs, in all directions, and concluded, because his ability to reason had returned: Either I am blind or it is completely dark. The darkness brought to mind night, and night a great space full of pure, cold air, and air suggested breath. Am I breathing? he asked himself, and listened carefully to his darkness, which was so like nothingness and yet so unlike it.

It seemed to him that he was breathing, but not in the usual way. The belly, the ribs were motionless, held in incomprehensible suspension; the air entered by itself and gently left. There was no other way he could breathe.

He had a face now, lungs, nostrils, a mouth, eyes, though unseeing. He decided to make a fist, remembering perfectly what hands were and how to close them tight. Still he felt nothing, and fear returned, this time rational, from logic: This is either paralysis or I have lost my arms and possibly my legs. The conclusion seemed false—he had lungs, that was certain, and yet no body. Into his darkness and fear intruded tones, measured, distant, dull. Blood?

His heart? It was beating. Then he heard, like the first tidings from the outside, the sounds of speech. His hearing opened suddenly, though it was muffled. There were two people speaking—he distinguished two voices—but he did not understand what they were saying. The language was known to him; the words, however, were indistinct, like objects seen through misted glass or a fog. As he focused his attention more, his hearing sharpened, and—strangely—it was through his hearing that he emerged from himself, finding himself in a space that had a bottom, top, and sides. This meant gravity, he realized. Then he started to concentrate completely on the hearing. The voices were masculine, one higher and softer, the other low, a baritone, very close. Perhaps he could speak himself, it he tried. But he wanted to listen first, not only out of curiosity and hope, but also because it was a pleasurable thing to hear so well and to comprehend more and more human speech.

"I'd keep him in the helium." This was the nearer voice, suggesting a large, heavyset man, there was so much strength in it.

"I wouldn't," said the farther, younger voice.

"Why not? It does no harm."

"Look at his brain. No, not the *calcar avis*. The right temporal. The Wernicke's center. You see? He's listening to us."

"The amplitude is small. I doubt that he understands."

"Both frontal lobes now. It's really up to norm."

"I see."

"Yesterday there was practically no alpha."

"He was hibernating. That's normal. But whether he understands or not, there's still too much nitrogen. I'm adding helium."

A long silence, and soft steps.

"Wait—look—"

That was the baritone.

"He's awake. . . . Well, then . . ."

The rest he did not hear. They whispered.

He regained his clarity of thought. Who was speaking? Doctors. Did I have an accident? Where? Who am I? He thought more and more rapidly while they whispered back and forth, raising their voices in their excitement.

"Good, the frontals are perfect. But the thalamus, I don't know. . . . Switch it on lower down. Use Aesculapius here. No, better, the medicom . . . Right. Adjust the picture. How's the medulla?"

"Almost at zero. Curious."

"Curious, rather, that it's not *on* zero. Let's see the respiratory center. Hmm . . ."

"Activate it?"

"No, for what? He'll start breathing on his own. It's surer that way. However, above the optic chiasma here . . ."

Something pinged.

"He can't see," said the younger voice with surprise.

"The nine is functional. We'll find out now if he can see anything. . . ."

In the following stillness came metallic clangs. At the same time, the dark gave way to a grayish, feeble glow.

"Aha!" said the baritone in triumph. "It was only on the synapses.

The pupils have been reacting for a week now. Anyway," he added more quietly, "he won't be able to—" A whisper.

"Agnosia?"

"No. It would be a good thing if . . . Look at the higher components. . . ."

"The memory is restoring itself?"

"I don't know. I can't say yes or no. And the blood picture?"

"Normal."

"The heart?"

"Forty-five."

"Pressure?"

"One-ten. Disconnect it?"

"Better not. Wait. A small impulse to the medulla . . ."

He felt something twitch in him.

"The tonus returns. You see?"

"I can't watch the myograms and the brain at the same time. He's moving?"

"His arms . . . uncoordinated."

"And now? Observe the face. Is he blinking?"

"He opened his eyes. Does he see?"

"Not yet. What's the stimulus threshold for the pupils?"

"Four lux. I'll up it to six. Does he see?"

"No. He only feels the light. It's a thalamic reaction. The medicom will fix the electrodes and give the current. Ah, excellent—"

In the darkness he saw something pale pink and shining over him. At the same time, he heard the voice say breathlessly:

"You've been saved. You'll be all right. Don't try to talk. If you understand me, close your eyes twice. Twice."

He did this.

"Excellent. I'll speak to you. If you don't understand, blink once."

He tried hard to make out what the pale-and-pink was, but couldn't.

"He's trying to see you," came the farther voice. How could the voice know that?

"You'll see me and everything else," said the baritone slowly. "You must be patient. You understand?"

He said yes with his eyelids. He wanted to speak, but something in him croaked, that was all.

"No, no," the same voice scolded. "It's too early for conversation. You can't talk, you have a tube in your trachea. It is supplying you with air. You cannot breathe on your own—we are breathing for you. You understand? Good. And now you will sleep. When you wake and are rested, we'll have a talk. You'll learn everything. But now . . . Victor, put him to sleep slowly, slowly. . . . Pleasant dreams . . ."

He stopped seeing, as if a light had gone out not above him but inside him. He didn't want to sleep. He wanted to jump up on his feet. But the darkness that was himself had already vanished.

He had many dreams, odd dreams, beautiful dreams, and dreams that could be neither remembered nor related. Sometimes he was a multitude of feeling things at once. He would go far away and then return. He saw people, recognized their faces, but could not recall who they were. Sometimes all that remained to him was his sight, boundless, full of invisible sun. It seemed to him that eons passed in these dreams and in the voids between them. Suddenly he awoke. With consciousness he also regained his body. He was lying on his back, bundled in a fluffy, soft material. He tensed the muscles of his back. He felt a tingling in his thighs. Above him was a flat, pale-green ceiling; nearby gleamed pipes of some kind and glassware, but he was unable to turn his head. Something held his head in place, a bolster that was soft but reached up to his temples, resiliently firm. His eyes he could move freely. On the other side of a transparent wall rose apparatuses of some sort, and at the very edge of his field of vision little lights danced on and off. He soon noticed that the lights had some connection to him, because when he inhaled more deeply and his rib cage lifted, they lit up with the same rhythm. Outside his field of vision, something glowed pink in a steady, slow tempo, and the period of that pinkness also kept pace with him—with his heart. He had no doubt now that he was in a hospital. An accident, then. What kind, and where? He knit his brow, waited for an explanation to emerge from his memory, but in vain. He lay still, shut his eyes, and concentrated his will on the question. No answer came. His ability to move his legs, arms, fingers as he liked, except for the enfolding material, no longer satisfied him. He tried clearing his throat, touched the inside surface of his teeth with his tongue, and finally spoke:

"I. I !"

He recognized his own voice. But whose it was, his own voice, he did not know, and did not understand how this could be. He tried freeing himself from the restraining padding and tensed his muscles several times. Then a lethargy fell over him with strange suddenness, and again he went out like an extinguished candle.

He did not count the passing days. Life on the ship was divided in the simple, conventional way, according to Earth rhythm. During the day all the decks, corridors, and tunnel passageways between the sections of the hull were brightly lit. At ten o'clock dusk began as a dimming of the gold-tinged white that emanated from the ceilings and walls. For about an hour there was a blue semidarkness, until the illumination ceased and all that showed the solitary wanderer the way was a thin fluorescent line that ran down the center of the ceilings. He liked this time the best. He could tour the *Eurydice* during the day, too—all the quarters were accessible to him, and he was assured that he would not be disturbing anyone. He could go where he liked, ask any question, but he preferred the night for his walks.

Physically proficient, he exercised early each morning in the gym, then went to school. That was what he called it. He would take a seat in front of Mnemon, to regain his memory through picture-and-word association games, and also to learn things completely new to him. With the machine, which was infinitely patient and incapable of showing any emotion, any surprise, any feeling of superiority, he was at ease. If he failed to grasp something, Mnemon would resort to visual aids, simple diagrams, and skillfully apply teaching programs, borrowing from the stores of other machines on the ship. The holofile contained in its archives tens of thousands of films (though they were not films) and photographs (though unlike the photographs of the past, since each image, when summoned, became a surrounding scene, and each word was made flesh—a flesh, granted, that was transitory). If he wished, he could visit the inner chambers of the pyramids, the Gothic cathedrals, the castles on the Loire, the moons of Mars, cities, forests, but he did this only because he knew that such visions constituted an important part of his therapy. The doctors tried to treat him like one of the members of the crew, never like a patient; he even had the impression that they avoided him, as if to emphasize that he was in no way different from anyone else.

His visual memory returned, along with his life experience, his professional skills as a navigator and expert in striders. True, ships had changed no less than planetary machines; regarding them, he was a little like a seaman from the days of the sailing ships finding himself on a great ocean liner. But it was not difficult to fill in these gaps. The outdated information he replaced with new. More and more keenly, however, he felt his worst loss, a loss possibly irreversible. He could not dredge up in himself any names—first names, last names, including his own. What was more curious, his memory seemed divided in two. Things that he had once experienced returned to him faded though full of detail, just as a child's possessions found in a closet of the family home after many years evoked not only images of the past but also an emotional aura. One time, in the physicists' lab, the smell of an evaporating liquid from a distillation, acrid in his nostrils, instantly summoned up more than a picture: a chance landing field, brightly lit though at night, when he, standing beneath the still red-hot cones of the rockets, beneath his saved ship, breathed the same smell of nitric smoke and felt a happiness that he was not aware of then, but which now, remembering, he understood.

He did not tell Dr. Gerbert about this, though he really should have, since the doctor had said to come immediately with any unexpected recollection, because it would lie in one of the buried places of his memory. It was necessary to deepen the recollection, not for psychotherapy but in order to reestablish and reopen the paths in the brain that had been erased. In this way he could return more fully to himself. The advice was rational, professional, and he considered himself a rational person; still, he kept this from the doctor. Being taciturn was definitely one of his traits. He had never liked to confide—particularly not private things. He told himself that if he ever remembered who he was, it would not be by smell, like a dog. A stupid thought, he realized.

It never crossed his mind to set himself above the doctors—but he stuck to his decision.

Gerbert soon became aware of the man's reticence. He gave him his word that the sessions with Mnemon were not recorded, and that he could clear each session from the pedagogue's memory himself if he wished. And the man did that. He kept no secrets from the machine. It helped him reclaim a multitude of memories, but without the names of the people—and without his own. Finally he asked the machine why.

Mnemon was silent for a long while. The memory training, as it was called, took place in a cabin that was strangely furnished. There were several pieces of antiquated furniture in it, veritable museum pieces, in an almost royal style—armchairs with gilding and curved legs—and every wall had an oil painting by a Dutch master, the paintings that he had remembered were his favorites. They appeared after he recalled them, as if to help him on. The oils were changed several times—but the canvas in the carved frames was no canvas, though imitating well the fiber and the daubs of paint. Mnemon had explained to him how these excellent, temporary replicas were made.

The teaching machine itself was not visible. Not that anyone was hiding it; but, being a subsystem of Aesculapius, disengaged for these sessions, in the cabin it wore no form that could clash with the student's frame of mind. So that the survivor would not have to address empty space—or a microphone, or a wall—he had before him, as he paced this study, a bust of Socrates, from the pages of Greek mythology. Or philosophy. The bust, shaggy-headed, seemed made of marble; sometimes, however, it participated—mimicking life—in the discussions. For the student this was unpleasant: in poor taste, somehow. Unable to come up with an alternative, and not wanting to bother Gerbert for nothing, he accustomed himself to the face. But whenever he had something painful to reveal, pacing before his mentor, he would speak without looking.

Now the fake Socrates seemed to hesitate, as if presented with a problem too difficult.

"My answer to you will be unsatisfying. It is not good for a man to be too cognizant of his physical and spiritual mechanisms. Complete knowledge reveals limits to human possibilities, and the less a man is by nature limited in his purposes, the less he can tolerate limits. That is in the first place. In the second place, names are stored differently from other concepts embedded in speech. Why? Because names do not form any coherent system. They are, after all, purely a matter of convention. Every person has a name, but could have an altogether different name and be the same person. One's name is decided by accident—in the form of one's parents. First and last names thus lack logical and physical necessity.

"If you will permit a small philosophical digression . . . Only things exist, and their relations. To be a man is to be a particular thing, it does not matter that it is a living thing. To be a brother or a son—that is a relation. Examining a newborn infant with every method, you will learn everything about it, you will reach its genetic code, but its name you will not reach. One discovers the world; to names, however, one may only become accustomed. This distinction is not felt in an ordinary life. But a person who has come into the world twice experiences it. It is not out of the question that you will remember your name. That could happen at any moment. Or it could never happen. This is why I advised you to take a temporary name. There is no dishonesty or falsehood in that. You will be in the situation of your parents when they stood over your cradle. They, too, did not know, before they chose it, the name that they would give you. But, once they chose it, after many years, they would have been unable to imagine that you had another, inborn, truer name, and that they had not given that one to you."

"You sound more like Pythia," he replied, trying to hide his agitation over the allusion to his death. He did not understand why he should react in this way. Facts were facts. If anything, he ought to feel the tremendous satisfaction of one risen from the dead. "I don't care about my name. I know it begins with 'P.' Four to seven letters. Parvis or Pirx. I know that the others couldn't be saved. It would have been better if I hadn't been shown that list."

"They hoped that you would recognize yourself."

"I can't choose blindly. I told you that."

"I know and understand your motives. You are the type of person who pays little attention to himself. You were always that way. So you do not wish to choose?"

"No."

"Or assume a name?"

"No."

"What, then, do you intend to do?"

"I don't know."

Possibly there would have been more arguments enlisted to persuade him, but for the first time since he had come to this cabin he exercised his right to erase the machine. All his conversations. And, as if that was insufficient, with the next touch of his finger he consigned the bust of the Greek sage to nothingness. He felt a grim satisfaction then, a senseless though keen pleasure, as if he had murdered—without murdering—one before whom he had bared his soul too much, and who (or, rather, which) had so sensibly and authoritatively taken charge of his helplessness. A poor excuse for a reason, this, and he regretted his action, which parted him from the blameless machine. But since the thing had been right in saying that more than to be in the world he wanted to have the world in him, he swallowed his anger, his shame—pointless—and put them out of his mind for good, turning to matters more important than his personal past. There was plenty to learn.

The biggest and most recent effort to find extraterrestrial civilizations, named Cyclops, had come to nothing after almost twenty years. In the opinion of those who had listened to the stars, hoping to receive intelligent signals, it proved a miserable failure. The Mystery of the Silent Universe had become a challenge to Earth's science.

The extreme optimism of a handful of astrophysicists at the end of the twentieth century, infecting thousands of other specialists as well as laymen, turned into its opposite. The billions invested in the radiotelescopes that filtered the emissions from millions of stars and galaxies did indeed give results in the form of new discoveries, but no radio wave brought news of Other Intelligence. However, the telescopes, placed on orbiters in space, were hit several times by streams of radiation singular enough to rekindle extinguished hopes. If these were signals, their reception was of brief duration; they broke off and did not return. Perhaps the circumsolar region was being pierced by needle messages addressed to other stars. Attempts to decipher the recordings of them in countless different ways failed. Even the signal nature of these concentrated impulses could not be determined with any certainty. Thus, tradition and caution obliged the experts to conclude that the phenomenon was the product of stellar material, an emission of very hard radiation by chance focused through so-called gravitational lenses into narrow pencils. The primary rule in observation said that whatever did not clearly show an artificial source had to be considered a natural phenomenon. Astrophysics, besides, had advanced to the point where it possessed sufficient hypotheses to "explain" every kind of observed emission without resorting to the existence of other beings as the senders.

A paradox arose: the greater the number of theories astrophysics had at its disposal, the more difficult it became to prove the authenticity of an intentional signal. By the end of the twentieth century, the spokesmen for Project Cyclops had drawn up a catalogue of criteria: to distinguish what Nature *could* produce, with the wealth of its forces, from that which was beyond its power and therefore would appear as a "cosmic miracle." An analogy on Earth might be leaves falling from trees to form the letters of a meaningful sentence. Or pebbles thrown on a river sandbar assuming the shape of circles, tangents, or Euclidean triangles. Thus the scientists put together a list of requirements—rules—that would have to be met by any sender of extraterrestrial signals. Almost half of this list was crossed off in the first years of the next century. It was not only the pulsars, not only the gravitational lenses, not only the microwave radiation from the nebulas, not only the giant masses at the galactic center that fooled the observers by their regularity, repetition, the peculiar order of their various impulses. In place of the discarded "rules for broadcasters" new ones were soon put in, and these were discarded, too, in short order.

Hence the pessimistic conclusion that Earth was unique not only in the local arm of the Milky Way but in a myriad other spiral galaxies. Subsequent increases in knowledge—in astrophysics, particularly—brought this pessimism into question. The great number of cosmic properties of energy and matter which suggested the notion of an "anthropic principle"—of the close connection between the Universe as it was and Life as it was—presented a compelling argument. In a Cosmos that contained people one had to expect the birth of life outside the Earth as well. A succession of surmises followed, to reconcile the fertility of the Universe with its silence.

Life arose on innumerable planets, but produced intelligent beings only through the rarest concatenation of unlikely accidents.

No—it arose frequently enough, but generally developed along non-protein lines. Silicon displayed an abundance of compounds equal to that of carbon bonding, the atomic cornerstone of proteins; but an evolution begun in silicon was permanently nonconvergent with intelligence, or else produced forms of intelligence that had no kinship whatever with human mentality.

No—the spark of intelligence occurred in various shapes but was of short duration. The development of life took billions of years only in its pre-sentient stage. Primate Creatures, once formed, within two hundred thousand years automatically began a technological explosion. This explosion—and, by the cosmic clock, it was a true explosion—not only carried them, at ever-increasing speed, to higher and higher levels of control of the forces of Nature. It also carried civilizations *apart*, in directions too different for them to understand one another through any commonality of thought. There was no such commonality. That was an anthropocentric fallacy that people had inherited from the ancient faiths and myths. There could in fact be many different intelligences, and it was precisely because there were so many that the sky was silent.

Not at all, said other hypotheses. The solution to the mystery was much simpler. The evolution of life, if it produced Intelligence, did so through a series of isolated events. This Intelligence could be nipped in the bud by any stellar incursion in the vicinity of the parent planet. Intervention from space was always blind and random. Had not paleontology, with the help of galactography (the archeology of the Milky Way), shown that the mammals owed their primacy to cataclysms that had left mountains of reptilian remains in the Mesozoic? And that it was a chain of happenstances—ice ages, pluvials, the formation of the steppes, the changes in Earth's magnetic poles, rates of mutation—that created the family tree of man?

This notwithstanding, Intelligence could mature under trillions of suns. It could take the path of the terrestrial variety, in which case that winning ticket in the stellar lottery, after one or two thousand years, might turn into catastrophe, for technology was a domain of fatal traps and whoever entered there could easily come to a bad end.

Intelligent Beings were able to see this threat, but only when it was too late. Having cast off religious faiths, and recognizing that religion's modern, degenerated forms were ideologies that offered the fulfillment of material and only material needs, the civilizations tried to stop their own momentum, but that was now impossible. Impossible even if they were not torn by internal antagonisms.

The survivor from Titan had ample time to put questions and digest answers.

From reflections on themselves and the world—termed, on Earth, "philosophy"—the Intelligent Beings proceeded to activities that made it increasingly clear to them that whatever had called them into existence gave them only one sure thing: their mortality. Indeed, they owed their very existence to mortality, for without it the billion-year alternations of emerging and dying species never would have taken place. They were spawned by the pit, by the deaths of the Archeozoic, the Paleozoic, the successive geological periods, and along with their Intelligence received the guarantee of their own demise. Soon, some twenty centuries after this diagnosis, they came to know the parental ways of Nature: the treacherous and wasteful technology of self-realizing processes used by Her to permit future forms of life to appear.

This technology inspired admiration only as long as it remained inaccessible to its discoverers. But that did not last, either. Robbing the plants, the animals, their own bodies of their secrets, they changed the biosphere and themselves, and this increase in dominion was insatiable.

They went out into space—only to find how alien it was to them and how the mark of their animal origin had been stamped inexorably on their bodies. This alienness, too, they overcame. Then, before very long, they found that they were—within the newly constructed technosphere—the last relict of the ancient heritage of biology. And that they were able to abandon—along with the poverty of the past, the hunger, the epidemics, the countless infirmities of old age—their mortal bodies. At first the possibility loomed like a fantastic, distant, terrifying crossroads.

These generalizations, full of pathos and savoring of an engineer's grim eschatology, the survivor read with distaste. He wanted to know the purpose of the expedition, inasmuch as he had become an involuntary participant in it. A more up-to-date volume, now the authoritative text on exobiology, brought him closer to its mission. The book contained a diagram by Ortega and Nilssen showing the development of psychozoics in the Universe, their main road and branchings.

The commencement of the main road was the early technological age, which was short-lived, allowing no offshoots for the thousand years between the rise of mechanical tools and the advent of the informational. In the next millennium, information science was crossed with biology to produce a swell of biotic acceleration.

At this juncture the diagnostic quality of the chart, becoming prognostic, weakened. The outline of the main road had been drawn by facts and theories; but its divergences were the resultants now of theories only, albeit theories supported by others that were reliable to a high degree.

The turning point in the main road was the moment when the engineering ability of the Intelligent Beings matched the life-creating potential of Nature. It was not possible to predict the further career of any individual civilization; this followed from the very nature of the crossroads. A certain percentage of the civilizations would stay on the main road—by putting the lid on an attainable but unrealized auto-evolution. An extreme case of such bioconservatism would be the creation of legislation (statutes, treaties, prohibitions, sanctions) to which all instrumentalities infringing on Nature would be subject. Technologies would arise to save the environment: committed to adapting the technosphere, without trauma, to the biosphere. This task could be but would not have to be accomplished—in which latter case a civilization, in a series of costly crises, would fluctuate demographically. It could decline and regenerate itself many times, paying for this self-destructive inertia with billions of lives. The establishing of interstellar contact would not rank high on its list of priorities.

The conservatives on the main road would be silent: that was obvious.

For the biotically nonconservative there were many solutions. Decisions to autoevolve, once made, were generally irreversible. Hence the great divergence among the older psychozoics. Ortega, Nilssen, and Tomic introduced the concept of a "window of contact." This was the interval of time in which Intelligent Beings had *already* reached a high level of applied science but had *not yet* undertaken to change the natural Intelligence given them—what would correspond to the human brain. The "window of contact" was, cosmically, a moment. From the resinous torch to the oil lamp, 16,000 years passed; from that lamp to the laser, it was a hundred years. The information needed to make the torch-to-laser step was on the order of the information needed to go from the discovery of the genetic code to the code's implementation in a post-atomic industry. Increases in knowledge were, in the "window of contact" phase, exponential—and, toward the phase's end, hyperbolic. The interval of any meaningful contact was minimally a thousand Earth years; optimally, from 1800 to 2500 years. Outside the window, for civilizations either immature or too mature, silence reigned. The immature lacked the power to communicate, while those too mature closed themselves off—or else formed groups that communicated with one another by means faster than light.

On the subject of faster-than-light communication there was disagreement. No kind of matter or energy could be made to exceed the speed of light. But that barrier, some said, could be circumvented. Let a pulsar with a magnetic field fixed by a neutron star rotate at a speed approaching *c*. The beam of the emission would go in circles around the pulsar's axis and at a sufficient distance sweep across a sector of space at a speed greater than *c*. If in the subsequent sectors of the beam's rotation there were observers, those observers could synchronize their watches beyond the limit discovered by Einstein. They would only need to know the distances of the sides of the triangle (pulsar—observer A—observer B) and the speed of rotation of the "lighthouse" pulsar.

This is as much as the one resurrected on the *Eurydice* learned, in the year of her constant acceleration, about cosmic civilizations. He came to a barrier that he could not pass. The machine-instructor did not chide the human pupil who was unable to grasp the mysteries of sidereal energetics and its relation to engineering and gravitational ballistics. These recent discoveries made possible the present expedition to the stars of the Harpy, which had been hidden from the astronomers of previous centuries by a cloud called the Coalsack. The *Eurydice* was to pass the Coalsack, enter the "temporal harbor" of a collapsar christened Hades, dispatch one of her segments to the planet named Quinta ζ-Harpyiae, wait for the return of that scout ship, and perform—for her own return—an incomprehensible maneuver called "passage through a retrochronal toroid," thanks to which she would reappear in the neighborhood of the Sun barely eight years after takeoff. Without that passage she would return two thousand years later, which would be no return at all.

The scout ship of the *Eurydice* was to travel on its own an entire parsec with its crew in a state of embryonization. The vitrifaction of people had been abandoned, as it gave only a 98-percent certainty of reviving the frozen. The pilot of ancient rockets felt, at these lectures, like a child being initiated into the operation of a synchrophasotron. He also realized that he had become a hermit, that he should no longer play Robinson Crusoe at the side of an electronic Friday. He rode to the observatory in the forward section of the *Eurydice*, to see the stars. A great hall gleamed with strange equipment. In vain he looked for the cannonlike cylinder of a reflector or of any other type of telescope—or simply a shuttered dome for viewing the heavens directly. The high hall seemed unoccupied, though lit all around with storied rows of lights. Along these ran narrow galleries that were joined by columns of machines. Returning to his cabin after this unsuccessful excursion, he noticed on the table an old, dog-eared book with a card from Gerbert. Gerbert was loaning it to him: something to read in bed. The physician was known to have brought on board with him a number of science-fiction books, which he preferred to the dazzling holovision shows.

The sight of the book moved the recipient. For so long, once again, he had been among the stars, yet had not seen them for so long. Worse, he was not able to make friends with the people who had bestowed upon him this new voyage along with this new life. The cabin, as he had requested, was furnished half in the style of a sea vessel and half in the style of an old merchant rocket: the living quarters of a helmsman or a navigator, in no way resembling a passenger's cabin, because this was not a place for a brief stay, like a hotel. It was a home.

He even had a bunk bed. Usually he laid his clothes on the top bunk when he undressed. Over the pillow of the bottom bunk he switched on a little lamp, covered his feet with the blanket, and, thinking that once again he was giving in to the sins of sloth and passivity—but perhaps now for the last time—opened the book in the place marked by Gerbert.

For a moment he read without comprehension, such was the strong effect the ordinary black print had on him. The type face of the letters, the yellowed, fragile pages, the real stitches of the binding, the bulge of the cover along the spine, all seemed incredibly familiar to him, unique, a thing lost and then found—though, heaven knows, he had never been an avid reader. But now he felt a solemnity in reading, as if the dead author had made a promise to him once and, although many obstacles had to be overcome, the promise was kept.

He had an odd habit: he would open a volume at random and begin reading there. The writers would not have been too pleased. Why did he do this? Perhaps he wanted to break into the fictional world not through its prepared entrance but all at once, in the middle.

———

". . . tell you?"

The Professor folded his hands on his chest.

"By ship to Port Boma," he began, sinking into the chair. He closed his eyes.

"Paddleboat to Bangala . . . That's where the jungle begins. Then six weeks on horseback, no more is possible. Even mules will drop. Sleeping sickness . . . There was one old shaman there, Nfo Tuabé." He pronounced the word with a French accent on the last syllable. "I had come to catch butterflies. But he showed me the way. . . ."

He stopped for a moment, opened his eyes.

"You know what the jungle is? But how could you? Life, green and mad. Everything quivering, watching, moving. In the underbrush, a crowd of ravenous mouths. Insane flowers like explosions of color. Hidden insects in sticky webs. Thousands, thousands of unclassified species. Not like here, in Europe. No need to go looking for them. In the night the whole tent was covered by moths as big as a hand, insistent, blind, falling into the fire by the hundreds. Shadows passed across the canvas. The natives trembled. The wind carried thunder from different quarters. Lions, jackals . . . But that was nothing. Then came the weakness and the fever. We left the horses, continued on foot. I took serum, quinine, German camomile, everything. Finally, one day—there is no reckoning of time there: a man gets to feel that the division of the week, the whole calendar, is a silly, artificial thing—one day, it was impossible to go on. The jungle ended. There was another native village, at a river. The river isn't on the map—three times a year it disappears into quicksand. Part of the bed is underground. A few huts made of sun-baked clay and silt. That's where Nfo Tuabé lived. Didn't know English. How could he? I had two translators. One put my words into the dialect of the coast, the other put that into Bushman. Over that whole belt of jungle, from the sixth parallel, rules an ancient royal family. Descendants of the Egyptians, I would guess. Taller, much more intelligent than the blacks of Central Africa. Nfo Tuabé even drew a map for me, showing the borders of the kingdom. I had saved his son from the sleeping sickness. It was for that. . . ."

Not opening his eyes, the Professor reached into an inner pocket. From a notebook he took out a piece of paper scribbled with red ink. The lines were tangled and twisted.

"Hard to read . . . The jungle stops here, as if cut with a knife. It's the border of the kingdom. I asked what lay beyond. He didn't want to talk about that in the night. I had to come back during the day. Only then, in that stinking hole of a hut without windows—you can't imagine the stench—did he tell me that there were ants beyond. White, blind ants that built great cities. Their realm extended for many kilometers. Red ants fought the white. They came in a great, living river through the jungle. Elephants would leave the vicinity then in herds, making curved tunnels through the underbrush. Tigers fled. Even the snakes. Of the birds, only the vultures remained. The ants traveled variously: sometimes for a month, day and night, in a rust-red, moving current. Whatever stood in their path they destroyed. They reached the edge of the jungle, came upon the mounds of the whites, and the battle began.

Nfo Tuabé, in his lifetime, had seen it once. The red ants, overcoming the sentries of the whites, entered their cities. And never returned. What happens to them, no one knows. But next year new legions come plowing through the jungle. It was this way in the time of his father, his grandfather, his great-grandfather. It was always this way. The soil in the place of the white ants is fertile. Long ago, the natives tried to cultivate it, tried to burn down the mounds of the termites. They lost that battle. The crops were destroyed. They built huts and enclosures of wood; the termites reached these through underground passageways, penetrated the structures, ate them out from inside, so that a touch of the hand made them crumble. The natives resorted to clay. Then, instead of workers, soldiers appeared. These"—he pointed to a jar.

In the center, fastened with surgical clips to glass plates, were specimens of giant termites. Several warriors: enormous and deformed creatures. A third of the thorax was covered by horny armor, with a helmet ending in open scissors. The broad armor weighed down the delicate legs and abdomen.

"Nothing new to you, I suspect? We know that there are regions in which termites rule. In South America . . . They have two kinds of soldier, defenders and something like an internal police. The mounds reach eight meters in height. Built of sand and excrement, they're harder than Portland cement. Proof against any steel. Eyeless, white, soft insects that have lived for some twenty million years away from the light. Studied by Packard, Schmelz, many others. But not one of them ever dreamed . . . You understand? I saved his son, and in exchange . . . Oh, he was wise. Knew how to repay a white man, royally. Completely gray Negro. Skin like ashes, the face a mask, smoke-cured. He said to me:

" 'The mounds go on for miles. The whole plain is covered with them. Like a forest, a dead forest, one after another, giant petrified trunks. It is difficult to pass between them. Everywhere the ground is hard, it booms underfoot like a drum, and is strewn with braids of thick string. Those are the tubes through which the termites run. Made of the same cement as the mounds, they go very far, down into the earth and up again, and they branch, intersect, and lead inside the mounds, and every fifty or sixty centimeters they widen, so that the termites running in different directions can pass each other. And in the center of the city, among a million stonelike termitaria that seethe with blind, violent life, there stands a different mound. Smaller, black, and bent like a hook.' He showed me how with his brown thumb. 'The heart of the ant nation lies there.' More he did not want to say."

"And you believed him?" whispered the listener. The dark eyes of the Professor burned.

"I returned to Boma. Bought fifty kilograms of dynamite in pound sticks, the kind used in mines. Picks, shovels, spades, a complete outfit. Tanks of sulfur, metal hoses, gas masks, netting—the best I could obtain. And cans of airplane gasoline, and an arsenal of insecticides, more than you can imagine. Then I hired twelve bearers and went into the jungle.

"Are you acquainted with Collenger's experiment? It's considered nonsense. He was not, true, a myrmecologist, only an amateur. Cut through an entire termite mound from top to bottom and inserted a steel plate, so that the two halves could not communicate with each other in any way. The mound was young, the termites had only begun building it. After six weeks he removed the plate. It turned out that the new tunnels had been constructed in such a way that their mouths, on either side of the barrier, exactly corresponded—not a millimeter off, vertically or horizontally. Just as men build a tunnel, beginning the work simultaneously on both sides of the mountain and meeting in the middle. How did the termites communicate through the steel? And then—Gruss's experiment. Also not verified. He maintained that if you killed the termite queen, workers that were several hundred meters from the mound immediately showed agitation and returned to the nest."

Again he paused. He stared at the red embers in the fireplace and the flickering blue flames that appeared and disappeared over them.

"I had a map . . . yes. First the guide ran off, then the translator. They left their things and disappeared. Early one morning I awoke in my mosquito net—silence, bulging eyes, terrified faces, whispering behind my back. I ended up tying the lot of them to me, wrapped the cord around my hand. Took their knives, so they couldn't cut themselves loose. From lack of sleep or from the sun, my eyes became inflamed. In the morning I could hardly open the lids, they were so badly stuck. Summer was on us. My shirt was stiff with sweat, as if starched, and if you touched the helmet on the outside, you immediately got blisters. The rifle barrel burned like a red-hot poker.

"We hacked our way for thirty-nine days. I didn't want to go through old Nfo Tuabé's village, as he had asked me not to. So we came to the edge of the jungle without warning. Suddenly that hellish, stifling thicket of leaves, vines, and screaming parrots and monkeys ended. As far as the eye could see, a plain, yellow as the skin of an old lion. On it, among clumps of cacti, stood cones. The mounds. Built blindly from within, hence formless in conception. We spent the night here. At dawn I awoke with a fierce headache. The day before, I had carelessly removed my helmet for a moment. The sun was high. The heat was such that the air burned the lungs. The shapes of objects shimmered, as if the sand were on fire. I was alone. The natives had fled, chewing through their cord. The only one remaining was a thirteen-year-old, Uagadu.

"I began to walk. Together we carried the baggage a distance of fifty feet. Then went back and brought the rest of the things. We had to repeat this five times under the sun, which burned infernally. Despite my white shirt I developed sores on my back, which did not heal. I had to sleep on my stomach. But this is unimportant. All day we penetrated the city of the termites. I don't think there is anything in the world more eerie. Imagine: on all sides—in front of you, in back of you—stony mounds two stories high. In places so close, one could barely squeeze between them. An endless forest of rough gray columns. And from the center of each column, when one stopped, came a faint, incessant, steady rustling, at moments changing into individual taps. The walls trembled constantly to the touch day and night. Several times it happened that we crushed one of the tunnels, which looked like ash-gray cords scattered over the ground in bundles. We saw endless rows of white insects marching. Then there would appear, suddenly, the horned helmets of the soldiers, who cut the air blindly with their pincers and ejected a sticky, burning fluid.

"For two days we wandered, for there was no possible way to get bearings. Two, three, four times each day I would clamber up a mound higher than the others, to look for the mound of which Nfo Tuabé spoke. But all I saw was a forest of stone. The jungle behind us became a green strip, then a blue line on the horizon, then finally disappeared. Our water supply dwindled. But the mounds went on and on. Through my telescope I saw them merge in the far distance, like a field of corn. The lad amazed me. Without complaint he did everything that I did, but not knowing why or wherefore. We proceeded thus for four days. I was drunk with the sun. The sunglasses didn't help. There was a terrible glare in the sky—one could not look up before dusk—and the sand blazed like mercury. And all around, palisades of mounds, unending. No trace of any living creature. Even the vultures did not venture here. There was only an occasional, solitary cactus.

"Finally, in the evening, having rationed out the water for that day, I climbed to the top of a very large mound. I think the thing went back to the days of Caesar. Without hope now, I looked around, when suddenly I saw a black spot in the telescope. My first thought was that the glass was dirty. But no, it was that mound.

"The next day I got up when the sun was still below the horizon. I could barely waken my boy. We began to carry our things in the direction that I had marked on the compass. I had also made a sketch. Meanwhile the mounds, though a little lower, grew nearer to one another. Finally they formed such a stockade that I could not force my way through. The black boy still could, so I passed the packages to him between two columns of cement. Then I would squeeze through higher up. This lasted five hours, in which time we covered, perhaps, three hundred feet. I saw that we were accomplishing nothing, but I was in a fever. Not a fever, exactly, though I had a constant temperature of more than a hundred degrees. The climate must affect the brain. I took five sticks of dynamite and blew up the mound that stood in our way. We hid behind other mounds after I lit the fuse. The explosion was muffled, its force went downward. The ground shook. But the other mounds remained standing. Of the one blown up there were only large, crusty fragments, alive with writhing white bodies.

"Until now we had not harmed one another. But now the battle began. It was impossible to cross the crater made by the explosion. Tens of thousands of termites poured from the pit and spread in a mass, like a wave. They felt their way over every inch of ground. I lit the sulfur, put the tank on my back. You know what the device looks like: what gardeners use to spray shrubbery. Or a flame thrower. The acrid smoke burst from a nozzle I held in my hand. I put on a gas mask, gave one to the boy. Gave him, also, boots specially made for the purpose—wrapped in metal netting. In this way we were able to cross. I discharged a stream of smoke, which drove off the termites. The ones that didn't retreat perished. In one place I had to use the gasoline. Poured it out and lit it, creating a wall of fire between us and the torrent of termites.

"Some three hundred feet remained to the black termitarium. Sleep was out of the question. We sat by the continually belching tank, our flashlights on. What a night! Ever spend six hours in a gas mask? No? Try imagining what it is like to keep your face buried in hot rubber. When I wanted to breathe more freely, easing the mask away, I would choke on the smoke. And so the night passed. My boy shivered and shivered. I feared it might be a fever.

"The new day came, finally. We now had only one can of water left. It could last us, at best, if we drank sparingly, three days. It was necessary to return as quickly as possible."

The Professor stopped, opened his eyes, and gazed at the fireplace. The embers had turned completely gray. The lamp filled the room with a soft green light, as if filtered through a sheet of water.

"We reached the black mound."

He raised his hand.

"Like a bent finger. Like this. Smooth surface, as if polished. The thing was surrounded by low mounds that were, curiously, not vertical but inclined toward it: larvae of stone making a grotesque obeisance.

"I gathered all my supplies at one point on this circle—it measured some forty feet around—and set to work. I didn't want to destroy the black mound with the dynamite. The moment we entered this area, the termites ceased appearing. At last it was possible to remove the mask from my face. What a relief! For a few minutes, there was not a man on earth happier than I. The indescribable pleasure of breathing freely—and that mound, black, strangely bent, unlike anything I had ever known. Like a madman I danced and sang, not caring about the drops of sweat that rained from my brow. Poor Uagadu watched, frightened. Perhaps he thought that I was worshipping before a black idol. . . .

"But I sobered quickly. There was little reason for rejoicing: the water was running out; the dried food barely sufficed for two days. True, there were the termites. The natives considered them a delicacy. But I could not bring myself to . . . Hunger, however . . ."

He broke off. His eyes glittered.

"To make a long story short, I knocked down that mound. Old Nfo Tuabé had spoken the truth."

He leaned forward. His features sharpened. The words came in a rush.

"There was, first, a layer of fibers, of a material of unusual smoothness and strength. Inside—a central chamber, surrounded by a thick coat of termites. Were they termites at all? I had never seen termites like these. Enormous, flat like a hand, covered with silver hairs, and having funnel-shaped heads that ended in something resembling antennae. These antennae were all touching a gray object no bigger than my fist. The insects were extremely old. Motionless, as if made of wood. They did not even attempt to defend themselves. The abdomens pulsed. But when I swept them from the central object—that round, strange thing—they perished instantly. Came apart beneath my fingers like rotten rags. I hadn't the time or the strength to study all this. I took the object from the chamber, locked it in a metal box, and immediately headed back with my Uagadu.

"I won't go into how I reached the coast. We encountered the red ants. I blessed the moment that I'd decided to drag back with me the single can of gasoline. If not for the fire . . . But enough of that. It's a separate story. I'll say only this: At the first stopping place I examined carefully the thing that I had taken from the black mound. When I cleaned off the deposits on it, it was revealed to be a perfect sphere, of a heavy substance that was transparent, like glass, but having a much higher index of refraction.

"And then, there in the jungle, a certain phenomenon manifested itself. At first, I paid no heed to it, thinking that I was imagining things. But when I reached the civilized areas on the coast, and afterward, I became convinced that it was not my imagination. . . ."

He sank back into his chair and, almost completely in shadow, his head dark against the brighter background, said:

"I was plagued by bugs. Butterflies, moths, arachnids, hymenoptera, whatever you like. Day and night they followed me in a buzzing cloud. Or, rather, not me, but my baggage, the metal caisson box that contained the sphere. During the sea voyage, things were a bit better. Applying insecticides intensively, I rid myself of the pests. New ones didn't appear—there were none on the open sea. But the moment I landed in France, it began all over again. The ants were the worst. Wherever I stopped for more than an hour, ants showed up. Red ants, black ants, carpenter ants, pharaoh ants, large and small, they gathered at the box, engulfed it in a quivering mass, cut, ate through, destroyed all the coverings with which I had packed it, suffocated themselves, perished, ejected acid in an attempt to corrode the steel sides. . . ."

He broke off.

"The house we're in now, its isolated situation, all the precautions I take, it's because I am constantly beset by ants."

He got up.

"I conducted experiments. Using a diamond drill, I broke from the sphere a piece no larger than a poppy seed. It exerts the same power of attraction as the entire sphere. I also found that if I surrounded the sphere with a thick jacket of lead, the effect ceased."

"Rays of some kind?" said the listener in a hoarse voice. As one hypnotized, he stared at the barely visible face of the old scientist.

"Possibly. I don't know."

"And . . . you have the sphere?"

"Yes. Would you care to see it?"

The listener jumped to his feet. The Professor opened the door for him, returned to the desk for the key, and hurried after his guest down the dim corridor. They entered a narrow cubicle without windows or furniture. In a corner stood a large, old-fashioned safe. Under the weak light of the naked bulb on the ceiling, the steel plates had a bluish cast. The Professor inserted the key with a sure hand and turned it. With the grating sound of bolts withdrawing, the heavy door opened. He stepped aside. The safe was empty.

IV

SETI

The cabins of the physicists were located on the fourth deck. He could find his way around now on the *Eurydice*. He had studied the layout of the ship, so different from the ones he had flown. He did not know the names or purposes of many of the machines in the sternmost section, which was unoccupied and cut off from the rest of the hull by triple bulkheads. The grub-leviathan was crisscrossed with connecting tunnels, like a secret network through an elongated, cylindrical city.

In his muscles was the memory of moving down narrow corridors—either oval in cross section or circular like a well—where you floated weightless, here and there pushing lightly to change direction on the turns. But in freighters you could reach the hold more simply, via the ventilation shaft; all you had to do was turn on the air compressor and be carried in the roar of a strong wind, your legs dangling uselessly, like vestigial organs. He found himself missing weightlessness, which he had cursed so many times when making repairs, because Newton's laws kept reminding one of their existence. If he used a hammer without gripping something well with the other hand, he would end up doing cartwheels that were entertaining only to spectators.

The elevators—actually wheelless oval cars with windows so curved that one saw one's own reflection in them distorted and reduced—moved without a sound, giving the numbers of the sections passed and blinking at the right stop.

The corridor had a rough yet deep carpeting. Around a corner disappeared a vacuum cleaner, looking like a turtle with wands, while he walked past a row of doors that bulged slightly, as the wall did, and that had high thresholds with brass fittings—no doubt to satisfy the whim of some interior decorator. It was hard to think of any other reason. He stood before Lauger's cabin, suddenly unsure of himself. He was still unable to become one of the crew. Their friendliness at meals, the way one group and then another invited him to their table, seemed forced to him, as if they were trying to pretend that he was really one of them—and that his lack of an assignment was only temporary. True, he had talked with Lauger, and Lauger had assured him that he could drop in whenever he wished. But this, instead of giving him confidence, somehow put him on his guard. Lauger was not just anyone; he was the number-one physicist, and not merely on the *Eurydice.*

He had never thought that he could be assailed with doubts about how to act with someone. Social grace was as out of place here as a parlor game in the vaults of the Great Pyramid. The door had no handle; a touch with the tips of the fingers, and it opened—so quickly that he almost drew back, like a savage before an automobile.

A spacious room. He was struck by its disorder. Among heaps of tapes, photographic plates, papers, and atlases stood a large desk, its top curved around in a half-ring with a swivel chair in the center. Behind it, on the wall, was a rectangle of black with moving dots of light. On either side of this flickering control panel hung large photographs—lit-up transparencies—of spiral nebulas, and farther on were vertical, pillarlike cylinders, partly opened, full of pigeonholes for computer disks. In the left corner stood a huge rhomboid machine with a chair attached at the base. The thing went up through the ceiling, and from a slot under a binocular eyepiece emerged a tape, in small jumps, bearing some kind of graph. The tape collected in coils on the floor, which was covered by an old Persian rug with a worn hieroglyphic pattern. It was the rug that amazed him. A cylinder-column vanished, revealing an entrance to an adjoining room. Lauger was standing there, in linen trousers and a sweater, with a head of overgrown hair, and gave him a smile that was both understanding and innocent. The face was fleshy, as of a child aged before its time—no more resembling the face of a creator of high abstractions than did Einstein's in the days when Einstein still worked in a government office.

"Hello," said the visitor.

"Enter, colleague, enter. It's good you came: at one blow you can delve into physics and metaphysics. . . ."

He added, in explanation:

"Father Arago is with me."

The visitor followed Lauger into the other cabin, which was smaller, with a covered bunk and several chairs around a table, at which the Dominican was examining a diagram through a magnifying glass—or perhaps it was the computerized map of a planet, having lines of latitude across it.

Arago pulled out a chair near him. The three sat down.

"This is Mark. You know him, Father?" asked Lauger and, before he could reply, went on:

"I can guess your problem, Mark. It's hard to have a man-to-man talk with a machine."

"The machine is not to blame," observed the Dominican, irony in his voice. "It says what was put into it."

"That is, what *you* put into it," the physicist corrected him with the smile of an opponent. "The theories don't agree. Not that they ever did. We are talking, Mark, about the fate of civilizations 'above the window,' " he explained to the visitor. "But since you came in the middle of our argument, let me summarize the beginning for you. You're aware that the old notions about ETI have changed. Even if there are a million civilizations in the galaxy, their duration is so dispersed in time that it is impossible first to communicate with the host of a planet and then drop in on him. Civilizations are harder to catch than a mayfly that lives for one day. We look for pupas, therefore, and not the adults. Do you know what the window of contact is?"

"Yes."

"All right, then. Having sifted through two hundred million stars, we came up with eleven million candidates. The majority have lifeless planets, or planets below the window, or planets above the window. Imagine"—he clapped him on the knee—"that you have fallen in love with the portrait of a sixteen-year-old girl. You set out to woo her. Unfortunately, the journey will take fifty years. You'll find an old woman, or a grave. If you decide to declare your love by mail, you'll be an old man yourself before you receive the first reply. And that, in a nutshell, is the basic idea of CETI. You can't hold a conversation at intervals of many centuries."

"So we're traveling to a pupa?" asked "Mark." For a while now people called him that, but suddenly the thought occurred to him—he didn't know why—that the idea might have come from the monk, who, like himself, both was and was not a member of the crew.

"We don't know *what* we're traveling to," remarked Arago. Lauger seemed pleased by these words.

"Quite. Life-producing planets are recognized by the composition of their atmospheres. The catalogue of these, in our galaxy, runs into the thousands. We've screened them all and have about thirty that offer hope."

"Of intelligence?"

"Intelligence, in diapers, is invisible. And when it matures, out the window it flies. We have to pounce on it earlier. How do we know that our destination is worth the trouble? It's Quinta, the fifth planet of Zeta Harpyiae. We have a lot of data—"

"*In dubio pro reo,*" said the Dominican.

"And who, Father, in your opinion, is the defendant?" Lauger asked, but again did not let him answer, continuing:

"The first cosmic symptom of intelligence is radio. Well before radioastronomy. Actually, not that much before: about a hundred years. A planet with transmitters can be detected when their combined power goes into the gigawatts. Quinta emits, in the high and ultrahigh ranges, less than its sun, but a phenomenal amount for a lifeless planet. For a planet with electronics, a moderate amount, since it lies below the level of solar noise. But *something* is there, in radio, below the threshold. We have evidence."

"Circumstantial," the apostolic delegate corrected him again.

"True, and only one piece," agreed Lauger. "But, more important, there have been observed on Quinta point-bursts of electromagnetism, one of which was recorded—the whole emission—by a spectroscope from orbiters near Mars. Those two orbiters cost Earth a bundle: our expedition."

"Atomic bombs?" asked the man who was resigned to the name of Mark.

"No. Rather, the preliminaries to planetary engineering, because these were clean thermonuclears. Had things on Quinta taken the course they did on Earth, it would have started with the uranides. What's more, the bursts appeared only within the polar circle—that is, on their Arctica or Antarctica. One could melt a continental glacier in this way. But that is not the point on which we differ." He glanced at the Dominican. "The question is whether or not our arrival will cause harm *there.* Father Arago believes it might. I am of the same opinion. . . ."

"Then what is the disagreement?"

"I believe that the game is worth the candle. The exploration of a world, without causing harm, is impossible."

Mark began to understand the gist of the debate. He forgot his own situation; the old fire returned to him.

"You—that is, Father—are traveling with us . . . against your convictions?" he addressed the monk.

"Of course," said Arago. "The Church was among the opponents to the expedition. So-called contact could turn out to be the gift of a Trojan horse. *Timeo Danaos et dona ferentes.* A Pandora's box."

"You have become affected, Father, by the mythological patronage of the project," laughed Lauger. "Eurydice, Hermes, Jupiter, Hades, Cerberus . . . we plundered the Greeks. The ship actually ought to have been named the *Argo,* with us as the psychonauts. But we'll try to cause as little harm as possible. That's why the plan of the operation is so complex."

"*Contra spem spero,*" sighed the monk. "Or, rather," he added, "I wish to be in error."

Lauger seemed not to hear, taken with another thought.

"When we reach Quinta, at least three hundred years will have passed there for our one year of ship's time. Which means that we will be catching them in the upper region of the window. If only not later!

A difference of seconds in our maneuvers could hasten or delay us tremendously. As for harm . . . the Reverend Father knows that a technological civilization has inertia, though it is not stationary. In other words, it's not that easy to throw it off its course. Whatever happens, we will not be in the role of gods descending from heaven. We did not seek out primitive cultures, and there are no astroethnologists in CETI."

Arago, silent, regarded the physicist with narrowed eyes. The listener to this conversation ventured a question:

"But does it make sense?"

"Does what make sense?" Lauger was surprised.

"To treat the ones who are unobservable as if they did not exist. It may be practical, but . . ."

"You could call it opportunism, too, if you wanted," replied Lauger coldly. "We chose a task that was possible to perform. The window of contact has an empirical frame, but there is ethical justification for it as well. We won't be anointing the heads of cavedwellers with oil distilled by the twenty-second century. But enough of this *pluralis majestaticus*. I stood by the project and I'm here because for me contact means an exchange of knowledge. An exchange—not a patronage, not a dispensing of melioristic advice."

"And what if evil reigns there?" asked Arago.

"Does there exist a universal evil? A constant of evil?" countered Lauger.

"I fear there does."

"Then we would have to say *non possumus* and chuck the project. . . ."

"I am only doing my duty."

With these words the monk rose, nodded to them, and departed.

Lauger, sprawled in his chair, made a face, moved his lips as if there was a bad taste in his mouth, then sighed.

"I respect the man—because he can rile me. He tacks wings onto everything, or horns. But enough. That's not the reason I wanted to see you. We'll be sending a scout ship to Quinta. A single-hull, able to land. The *Hermes*. It will fly nine or ten men. The captain and four have been decided on. The rest will be chosen, by specialty, in a ballot. Would you like to be on the ballot?"

At first Mark did not understand.

"To set foot there . . ."

He burned. Disbelief, joy. Lauger, seeing how the man lit up, hastened to add:

"Getting on the ballot doesn't necessarily mean you're going. Scientific achievement isn't a guarantee, either. The greatest theoretician could easily go to pieces. We need hard people—the kind that nothing will break. Gerbert is a brilliant psychonicist, psychologist, an expert on minds, but courage isn't tested in the laboratory. Do you know who you are?"

He paled.

"No."

"Then I'll tell you. On the Birnam glacier a number of people in walking machines died. Geyser eruptions took them by surprise. These were professional operators carrying out instructions given them, and they had no idea that they were going to their death. Two men went in search of them, voluntarily. You are one of those two."

"How can you know this? Dr. Gerbert told me that—"

"Dr. Gerbert and his assistant are ship physicians. They know their medicine but are weak when it comes to computers. They decided to preserve medical confidentiality—since it proved impossible to establish the identity of the man resurrected. Psychic trauma, they argued. There's no eavesdropping on the *Eurydice*, but there is a center with nonerasable memory. The Commander has access to it, the Head Informationist, and I. You won't tell the doctors, I hope?"

"No."

"I didn't think you would. It would be doing them wrong."

"But won't they guess if . . ."

"I doubt it. The doctors have to monitor constantly the state of health of our entire crew. And the voting is secret. The council votes. Out of five votes you should get three. That's my guess. And I'm telling you this now because you have a hell of a lot of work ahead of you. I know that on the simulators you showed an astrogational ability, but in obsolete categories, first-class for those times—not for today. You have a year to learn your interstellar ABCs. If you can handle that, you'll see the Quintans. And now go—I have a pile of things to catch up on."

They rose. Mark was taller than the famous physicist, and younger. "He won't be going," he thought. Lauger walked him to the door.

But Mark did not notice this, did not see the darting lights on the black screen, did not remember if he said good-bye or even if he said anything. Or how he got back to his cabin. He did not know what to do with himself. Going to the closet, he opened the wrong door by mistake, saw his face in the mirror, and murmured:

"You'll see the Quintans."

So he began his studies.

The result of the statistical calculations was, all in all, clear. Life arose and endured on planets for billions of years, but throughout that time it was mute. Civilizations sprang from it: not to perish but to transform themselves into something extranatural. Because the birth rate of technologies in an ordinary spiral galaxy was a constant, they came into being, matured, and disappeared with the same frequency. New ones were continually emerging, and they escaped from the interval of mutual understanding—the window of contact—before it was possible to exchange signals with them. The muteness of those existing primitively was obvious. But endless hypotheses were devoted to the silence of the highly developed. There was a whole library on the subject, which he avoided for the time being. In one book he read: "At this moment, for this century (astronomically, the same thing), it can be concluded that Earth is the only civilization *already* technological and *still* biological throughout the length, breadth, and depth of the Milky Way."

Which seemed to lay to rest the plans of CETI. A hundred and fifty years went by before it turned out that this was not the case.

The conquering of the space separating star from star, so that some Living Intelligences could meet Others and return, was not accomplishable by simple flight. Even if the astronauts traveled at speeds approaching light, they would neither meet those to whom they were going nor see again those who remained behind on Earth: at both destination and origin many centuries would pass in the few years of ship time. This categorical declaration of science prompted the Church to reflect theologically as follows: He Who created the world made the meeting of creatures from different stars an idle dream. He raised between them a barrier, completely empty and invisible yet impossible to break: an abyss that He could cross, not man. Human history, however, invariably went in directions that were not predicted. The abyss of space turned out indeed to be a barrier that could not be broken. But it could be sidestepped, through a series of special maneuvers.

The median time of the galaxy was one value. The galaxy itself was a clock that indicated the hour of its age. But in places of the greatest intensity of gravitation, galactic time underwent violent changes. There were boundaries at which it stopped altogether. These were the Schwarzschild spheres—the black surfaces of collapsed stars. Event horizons. An object approaching such a horizon would begin to stretch in the eyes of a distant observer; it would disappear before touching the surface of the black hole, because time, dilated by gravitation, displaced light toward the infrared and then to longer and longer wavelengths, until finally not one reflected photon returned to the eye of the watcher. The black hole trapped within its horizon every particle and every scrap of light forever.

In any case, a traveler approaching a black hole would be pulled apart, along with his ship, by the growing gravitation. Tidal forces there would lengthen any material object to a thread, and from the accretion disk formed around the black sphere that thread would go into a nose dive from which there was no return.

Flybys past the collapsar star were impossible—along any trajectory: the tidal forces would kill the travelers and rip their ship to pieces. The ship could be the densest cosmic dwarf, a neutron star, a globe of atomic nuclei packed together into a solid, a solid compared with which the hardest steel would be as attenuated as a gas: it would make no difference. Even such a globe the collapsar would pull out into a spindle shape, and would tear and swallow it in an instant, leaving behind only the death-throe flares of X rays escaping into space.

Collapsars that arose from stars a few times heavier than the Sun were thus like sudden guillotines to wayfarers. If, however, the mass of a black hole was a hundred or a thousand times that of the Sun, the gravitation at its horizon could be as weak as Earth's. No immediate danger would threaten the ship that ventured there, and the crew, moving toward such a horizon, could completely fail to notice it. But they would never be able to emerge from beneath that unseen shell. A ship drawn into a giant collapsar would be annihilated, plummeting to the center, in a matter of days or hours, depending on the massiveness of the trap.

The astrophysics at the close of the twentieth century drew such theoretical models of gravitational graveyards. But, as usually happened in the history of knowledge, the models proved insufficient. The reality was more complex. First, quantum mechanics had to be taken into account: every black hole gave off radiation. The larger the black hole, the weaker the radiation. Giant black holes, usually found at the centers of galaxies, would also eventually die, though their "quantum evaporation" might take a hundred billion years. They would be the final relics of the former stellar splendor of the Universe.

Further diversification of black holes was discovered by subsequent calculation and simulation. A star, when it collapsed, its weakened centrifugal radiation no longer able to counteract its gravity, did not immediately assume the shape of a sphere. It oscillated, like a drop alternately flattened to a disk and then pulled into a cigar shape. This vibration was very brief, the frequency depending on the mass. The collapsar behaved like a gong—that struck itself. But a gong at rest could be made to vibrate by a blow. A black sphere, similarly, could be set to oscillating again—by sidereal engineering. One had to know the method and possess sufficient power, on the order of 10^{44} ergs, which would be beamed in such a way as to put the sphere in resonance. For what purpose? To create what the astrophysicists acquainted with the giant casually called a "temporal onion."

Just as the center of an onion was surrounded by layers of tissue, visible in cross section like the rings of a tree, so a collapsar in resonance was surrounded by gravitationally curved time—or, rather, by a complex stratification of space-time. To a distant observer a black hole appeared to vibrate like a tuning fork for several seconds. But for one who found himself in its vicinity, on a contour line of altered time, the readings of the galactic clock lost all meaning. Thus, if a ship came upon a black hole that warped the continuum multivalently, along a gradient, the ship could enter a bradychronality and remain for years in that zone of retarded time—before leaving the temporal port. To the eyes of the outside observer the ship would vanish upon reaching the black hole and, after its invisible stop on the bradychronality, emerge in nearby space.

For the entire galaxy, for everyone watching the resonating collapsar from a distance, it would seem to oscillate in seconds between disk and cigar, exactly as it had oscillated in its violent birth when it was a star collapsed by gravity after the nuclear furnace went out. Whereas to the ship on the bradychronality, time could come almost to a halt.

But this was not all. The collapsar, vibrating, behaved not like a perfectly elastic ball but, rather, like a nonuniformly distorting balloon on a bounce, due to the magnification of relativistic effects. Thus, with the bradychronalities, retrochronalities could appear: currents or rivers of time flowing backward. For distant observers neither one nor the other existed. To make use of these retardations or reversals of time, therefore, one had to enter them physically.

The Project planned to use the solitary collapsar above the constellation Harpy as a port for the *Eurydice*. The mission of the expedition was not to establish contact with just any civilization that lay within the interval of possible communication, but to catch a civilization that, like a skyward butterfly pursued by an entomologist, was on its way out the window, already fluttering at the upper edge. Indispensable for this operation was a parking place in time, at a distance from the inhabited planet, which would allow the human psychonauts to visit it before the civilization departed from Ortega and Nilssen's main road of development. To this end, the expedition was divided into three stages. In the first, the *Eurydice* would proceed to the collapsar in the constellation Harpy, chosen as a place for concealment and temporal maneuvers. The collapsar was named, appropriately, Hades—because the *Eurydice* would be preceded by an unmanned colossus, a missile to be used only once, the *Orpheus*. It was a gravity gun, a gracer (gravity amplification by collimated excitation of resonance). At a signal from the *Eurydice*, it would set the black hole oscillating according to the latter's own natural frequency and amplitude.

Although gigantic on the scale of Earth objects, the *Orpheus* was the tiniest speck compared with the mass of the collapsar it was to set in motion. But it could accomplish this through the phenomenon of gravitational resonance. Giving up its vibratory ghost to Hades, it would thereby induce in the collapsar a single contraction and dilation—whereupon that black hell, opening its abysses, would permit the *Eurydice* to enter and ride the vortex of bradychronal currents. But first it was necessary to verify, from the ship, that the five-light-year-distant Quinta was in the prime of its technological era, and to determine, from that diagnosis, the right moment to visit it. Having fixed the moment, the *Eurydice* would then make a temporal harbor for herself in Hades, which would now be in vibration from the gracer emission of the *Orpheus*. As the *Orpheus* had enough power for only one discharge of coherent gravity, annihilating itself in that discharge, the operation could not be repeated. If it did not succeed the first time—because of a navigational error in the temporal storm, an incorrect diagnosis of the rate of development of the Quintan civilization, or any other factor not taken into account—the expedition would be a fiasco. Which meant, in the best case, returning to Earth empty-handed.

The plan was further complicated by the decision to make use, within the hell of Hades, of retrochronalities, of time flowing in reverse of the time of the entire galaxy, so that the expedition could return to the vicinity of the Sun less than twenty years after takeoff, even though a thousand parsecs separated the Harpy from Earth. The exact date of return, of course, was indeterminate: a fraction of a second in the navigation through brady- and retrochronalities made a difference of years far from the presses and grinding mills of gravitation.

His mind could not accept these statements; they were fraught with paradox. The main paradox was as follows:

The *Eurydice* was to remain above the collapsar in nontime, or in a time different from the ordinary. The reconnoiterers would fly to Quinta and return: this would take more than seventy thousand hours, or roughly eight years. From the blow of the gracer, the collapsar was supposed to oscillate between a flattened disk and an elongated spindle for only a moment or two—to all distant observers. When the reconnoiterers returned, therefore, they would not find the ship in its collapsar harbor. The black hole would long before this have resumed the shape of a nonvibrating sphere. And yet the *Hermes*, leaving Quinta, was to find the mother ship in the temporal port, even though the port, having come into existence only to disappear immediately, would surely not be there when the *Hermes* got back. How could one thing be reconciled with the other?

"There are physicists," Lauger explained, "who claim to understand this the same way they understand what stones and cupboards are. What they understand, in fact, is only that a theory agrees with the experimental results, with measurements. Physics, my friend, is a narrow path drawn across a gulf that the human imagination cannot grasp. It is a set of answers to certain questions that we put to the world, and the world supplies the answers on the condition that we will not then ask it other questions, questions shouted out by common sense. And common sense? It is that which is understood by an intelligence using senses no different from those of a baboon. Such an intelligence wishes to know the world in terms that apply to its terrestrial, biological niche. But the world—outside that niche, that incubator of sapient apes—has properties that one cannot take in hand, see, sniff, gnaw, listen to, and in this way appropriate.

"For the *Eurydice* in her collapsar port, the flight of the *Hermes* will take a couple of weeks. For the crew of the *Hermes*, the flight will take one and a half years, more or less. That's three months to Quinta, a year on Quinta, and three months back. For observers located neither on the *Hermes* nor on the *Eurydice*, the *Hermes* will complete its mission in nine years, while the *Eurydice* will disappear from sight for the same amount of time. According to the time measured on board the mother ship, she will pass from Friday to Saturday, return to Friday, and then the collapsar will spit her out into space.

"Time will flow more slowly on the *Hermes* than on Earth because of its near-light speed. On the *Eurydice*, time, gravitationally dilated, will flow even more slowly, and then reverse: she will descend from a bradychronality to a retrochronality, and from there jump to a galactochronal line. Emerging, she'll rendezvous with the *Hermes* in an unfolded space-time continuum.

"If the *Eurydice* miscalculates by seconds, navigating the variochronalities, she will not rendezvous with the *Hermes*. There is no contradiction in this, so to speak, on the world's part. The contradictions arise from the disparity between a mind born in the negligible gravity of Earth and phenomena pertaining to gravities trillions of times greater—it is that simple. The world is ordered according to universal rules called laws of Nature, but the same rule may manifest itself differently at different intensities.

"Take, for example, a man falling into a black hole. For him, space takes on the aspect of time, because he is no longer able to retreat in it, just as you cannot step backward in terrestrial time—that is, into the past. It's impossible to imagine what such a fall would be like, assuming, of course, that one didn't perish immediately beneath the event horizon.

"I still believe that the world is arranged in our favor, since we can nevertheless gain mastery over things that run counter to our senses. Consider: a child masters a language without understanding the principles of its grammar, its syntax, or the internal contradictions of speech that are hidden from the speakers. (You've got me philosophizing now.) A man craves ultimate truths. Every mortal mind, I think, is that way. But what is ultimate truth? It's the end of the road, where there is no more mystery, no more hope. And no more questions to ask, since all the answers have been given. But there is no such place.

"The Universe is a labyrinth made of labyrinths. Each leads to another. And wherever we cannot go ourselves, we reach with mathematics. Out of mathematics we build wagons to carry us into the nonhuman realms of the world. It is also possible to construct, out of mathematics, worlds outside the Universe, regardless of whether or not they exist. And then, of course, one can always abandon mathematics and its worlds, to venture with one's faith into the world-to-come. People of the ilk of Father Arago occupy themselves with this. The difference between us and them is the difference between the *possibility* that certain things will come to pass and the *hope* that certain things will come to pass. My field deals with what is possible, accessible; his, with what is only hoped for, which becomes accessible, face-to-face, only after death. What did you learn when you died? What did you see?"

"Nothing."

"Therein lies the *differentia specifica* between science and faith. As far as I know, the fact that those resurrected saw nothing has not shaken the dogmas of religion. The latest eschatology of Christianity holds that a person resurrected forgets his sojourn in the hereafter. That by an act of Divine Censorship (they don't put it in that way, of course) man is forbidden to hop back and forth between this world and the next. *Credenti non fit iniuria.* If it is worth living by such a stretchable faith, as Arago does, how much easier it is to accept the paradoxes that allow you to pay a visit to the Quintans. Trust in physics the way Arago trusts in his religion. Though physics, unlike religion, is fallible. The choice is yours. Consider. And now go—I have work to do."

It was midnight when he got back to his cabin. He thought, in turn, about Lauger and the monk. The physicist was where he belonged—but the other? What did the monk hope for, or count on? Missionary work? Had modern theology indeed built an annex to accommodate the extraterrestrial recipients of God's bounty, and was Arago to be its spokesman? Why did he say, in the conversation, that evil might reign there?

Only now did it dawn on him: the fear in which the man must be living. Not fear for himself—fear for his religion. The monk could consider Redemption a gift intended only for humanity, while participating in an expedition to nonhuman beings, to a place, in other words, where his Gospel did not reach. He could think that. And, believing in God's omnipresence, he therefore would believe in the omnipresence of individual evil, because the demon who tempted Christ predated the Annunciation and Immaculate Conception. Then did the monk carry his dogmas with him, the dogmas by which he lived, to put them in jeopardy?

He shook his head and sighed. Lauger he could ask any question—but the monk, no. The Gospel made no mention of what Lazarus had to relate after his resurrection. And so he himself could in no way assist Father Arago, though he had risen from the dead. Religion, in self-defense, gave such resurrections a different, secular, this-worldly name, and therefore was not shaken. Not that he was any expert on religion. But he understood the painful isolation of the monk, for he himself had been isolated, a helpless, passive castaway taken on board by chance. Though no longer.

He began to undress for bed, listening to the silence of the *Eurydice*. She flew near the speed of light. Soon she would be reversing the drive. The clocks in all the quarters would start the countdown, giving the crew time to lie on their bunks, on their backs, and strap themselves in. The spheres of the hull would make a 180-degree turn inside their armored segments. Everything would spin—a moment of confusion, vertigo—then steady, once more still and peaceful. Rather than lash the stern, the flame of the drive would then hurtle along the bow, forward. Communication with Earth would improve somewhat because of this. News would reach the *Eurydice*, news many years old, of those whom the crew had left behind on Earth. He would receive no such laser letter, having no one left on Earth. Instead of a past, however, he had a future, a future for which it was worth living.

The prehistory of the expedition was full of conflict. The project had had a multitude of opponents. Its chance of success, calculated variously, could not be great. A catalogue of the accidents that in one way or another could cause the destruction of the expedition numbered in the thousands.

Perhaps it was for this reason that the project had been carried out. Its seeming impossibility, its dangers constituted a challenge magnificent enough for people to come forward and undertake. Before the *Eurydice* blasted off with growing acceleration, the cost of the enterprise had grown at an even higher exponential rate—as was pointed out by the opponents and critics. But the investments already made possessed their own momentum and drew other investments after them.

The financial side of the project occasioned a rumbling no less than Titan's upon the takeoff of the *Eurydice*. The traveler, in his reading, skipped these preliminary crises involving the building of the ships and the repercussions on Earth, such as the manufacturing defects that led to political corruption scandals. What did this matter to him, who was on board and on his way?

On the other hand, he studied the history of astronautics—records of transsolar flights and unmanned probes to Alpha Centauri, and accounts filled with the names of the workers of Grail and Roembden—in the hope that he might recognize among them people he had once known well, and possibly be able to follow the thread of that recognition back to the enigma of himself. There were moments, before sleep or on waking, when he felt close to remembering, particularly since in more than one dream he knew who he was. But all he retained, waking, was the empty certainty of that identity.

A year passed. The *Eurydice*, braking, lost its near-light speed relative to the collapsar, which now loomed like a real hole—an absence of stars—in the sky. Training, learning, reading, he abandoned his efforts to remember. And yet, though he was now chosen to be one of the copilots of the *Hermes*, in his dreams at night—about which he told no one—he was still the man who had entered Birnam Wood.

V

Beta Harpyiae

The *Eurydice* lost speed, cutting her drive for a few days along a trajectory called an involute, toward Beta Harpyiae, which was invisible, being the collapsar. She had already crossed, at a considerable distance, some buckled isogravs, whose gravitational tides were endurable, so far, by the crew and by the ship. The course—optimal, chosen by computer—was safe, but safe did not mean problem-free. The isogravs, lines connecting points of space of the same curvature, writhed on the screens like snakes in black flame. Those who were stationed in the "parking room"—the control room that ran the ship only under wild variation of gravitational fields—watched the flickering displays before them, drank beer from cans, and made small talk to pass the time. The fact was that the men were a tradition, a relic from the era of classical astrogation. No one now would even dream of switching the controls to manual: no man possessed reflexes quick enough.

The collapsar belonged to a category discovered late and with great difficulty: it was solitary. Easiest to locate were those that belonged to binary systems, having companion stars that were "alive"—i.e., that shined—and from which they stripped the upper layers of atmosphere. The material was drawn in a contracting spiral toward the black hole, to fall into it to the accompaniment of bursts of the hardest X rays. The gases torn from the companion surrounded the collapsar in an accretion disk, a giant plane highly unhealthy for all objects, including rockets. No ship could navigate such a region. Before it would be sucked into the event horizon, the radiation would destroy both human brain and computer.

The solitary collapsar in the constellation Harpy was discovered thanks to the perturbations it produced in the Alpha, Gamma, and Delta stars. Appropriately named Hades, with a mass four hundred times that of the Sun, it betrayed its increasing presence by the lack of the stars which it occulted and by the apparent crowding of stars around its perimeter, as it was a gravitational lens for their light. The surface of annihilation rotated at the equator at two-thirds the speed of light, and the centrifugal and Coriolis forces made it bulge, so that Hades was not a perfect sphere. But even if the event horizon were spherical, gravitational storms came and went over it, compressing and stretching the isogravs. The possible causes of these storms or cyclones were provided by eight theories, each one different.

The most imaginative theory (not necessarily the closest to the truth) maintained that Hades was connected, in hyperspace, to another universe, which gave evidence of itself by producing shock waves in the terrible "pit" of the collapsar—the center, the singularity, the place without dimension, without time, where the curvature of the continuum acquired a value infinitely great. The theory of the "other side" of the Hades nucleus, whose infinite space-time compression somehow presented no problem for the transfinite engineers of the alien universe, was really a mathematical fantasy spun by astronomers intoxicated with teratopology, the latest and highly fashionable grandchild of Cantor's ancient theory. (They were even going to christen the collapsar Cantor, but its discoverer preferred using mythology.) Neither SETI headquarters on Earth nor the command of the *Eurydice* was particularly concerned about what took place *beneath* the event horizon, for practical, obvious reasons: the horizon was an uncrossable boundary, and regardless of what it covered, it very definitely represented death.

Flying in high vacuum above Hades, the *Eurydice* responded with appropriate maneuvers to each change in gravitation, firing from her rockets streams of heavy elements synthesized from hydrogen and deuterium by the Olimos Cycle. Shedding billions of tons, she cleverly maintained stability, while Hades, bound by the laws of conservation, supplied the vessel with a sizable portion of the energy released by all that it swallowed and buried forever in its interior. This was, roughly, like a balloon holding altitude at the price of ballast thrown overboard. But only roughly: no pilot would have been able to negotiate such a course.

The segmented hull of the ship, made of rings connected by swivel joints, resembled from a distance a mile-long earthworm that writhed like a white comma above the immensity of the black hole. It would have made an interesting sight, no doubt, but there was no observer and could be none, since the valiant companion of the *Eurydice*—the *Orpheus*—which was to open the gates of hell for her, was unmanned. In constant laser communication with the giant nymph, it awaited the signal that would turn it into a resonance bomb, a single-pulse gracer. A similar though thousand times smaller gracer had been tested in the solar system, and in the process deprived Saturn of its second largest moon. When even the laser contact began to worsen, the *Orpheus* received the final program and, obediently falling silent, commenced the countdown in its machine centers. It drew closer to the collapsar than the *Eurydice*. Light and every kind of related electromagnetic wave smeared and bent, driven through the infrared to the radio and ultraradio bands. As Hades twisted the surrounding space and time above its horizon of destruction, the *Eurydice* made the final, critical observations of Quinta, the fifth planet of the sixth sun of the Harpy, the real destination of the expedition. Ejected previously into space far from the collapsar, cameras took pictures of the planet, using no little aperture: two astronomical units. The image—or, rather, the three-dimensional model—of Quinta took focus on the holovision. A hazy, blue-speckled, cloud-covered sphere hung in the auditorium between the many-leveled galleries.

No one, true, watched it there. The holoscope had supposedly been installed in the auditorium because it was donated to the expedition by a Japanese firm for purposes of advertising the product to planetariums on Earth. But though the spectacle was dramatic, it was of no real use to the astrophysicists. They had accepted it because the whole apparatus took up little room in the walls of the forward observatory room, while the planet-scope, placed under a transparent dome, filled—ornamentally—the empty center. Visitors came to view the images of nebulas or planets inside it; there was no other way to look at the cosmic scenery, the hull of the *Eurydice* being windowless.

The survivor from Titan now had a last name: Tempe. Tempe was the valley in which Orpheus first met Eurydice. The name was given him by Ter Horab during a confidential meeting of the scout ship's full crew. Actually, it may not have been Ter Horab who named him. On that occasion, Mark received the position of second copilot of the *Hermes*, and the Commander, announcing the assignments, pretended not to notice anything. Lauger denied authorship—or, rather, dodged the question with the joke that they had all fallen under the influence of Greek mythology.

As long as the constant gravity on board allowed, as the ship lost speed, Mark visited Lauger frequently and listened to his debates with Gold and Nakamura, the astrophysicists. These debates usually turned on the mystery of the civilizations "above the window," the ones that had departed from the main road in Ortega and Nilssen's diagram. Since nothing was known about their fate, they offered no small challenge to the imagination. The opinions held by the majority of those fascinated by the mystery could be divided roughly into two schools, according to the reason for the silence: whether it was sociological or cosmological. Gold, though a physicist, held to a sociological explanation—an extreme one, called "sociolysis."

The first thing a society did upon entering an era of technological acceleration was to disturb the living environment. Later it might wish to rescue that environment, but conservation measures would prove insufficient, and the biosphere would be replaced—of necessity, inevitably—by artifacts. There would arise an environment completely transformed, though not artificial in the human sense of the word. "Artificial," to humans, was what they produced themselves; "natural" was what remained untouched, or was only harnessed, like water turning a turbine or like cultivated earth subjected to agricultural procedures. "Above the window," this distinction ceased to exist. If everything became "artificial," then nothing was "artificial." Production, intelligence, science were "transplanted" into the surrounding world; electronics—or its unknown counterparts and manifestations—took the place of institutions, legislative bodies, government, schools, hospitals; the ethnic identity of national collectives disappeared, borders disappeared, along with the police, and the courts, and the prisons. Then one might have a "Second Stone Age": universal illiteracy and idleness. Employment would not be required for survival. Anyone who wanted could have employment, of course, because everyone could do absolutely whatever he liked. This did not have to mean stagnation: the environment was an obedient guardian, and to the extent that it was able, it could change itself according to wishes or demands.

Could it change so that "progress" would take place? We had no answer for that, since we ourselves assigned to the concept of "progress" different meanings, depending on the historical moment. Could one call "scientific progress" a situation in which intellectual, creative, cognitive, and constructional activities were so specialized that in each profession one dug deeper in an ever-narrower plot of ground? If machines counted faster and better than a living being, why should the living being count? If photosynthesis systems produced food that was more nutritious and varied than what farmers, bakers, chefs, and confectioners could supply, then why till the soil or grind flour or bake bread? A civilization in such sociolysis did not broadcast in every direction of the heavens its recipe for the perfect life. And why should it, when it no longer even existed as a union formed by a unsatisfied hunger of stomachs and minds?

The result would be not a society but an enormous collection of individuals, and it would be hard, indeed, to find one individual who would choose as his life's work the signaling, on a cosmic scale, of how he was getting along. The artificial environment would unquestionably be designed by its engineers so that it could not ever acquire the attributes of a planetary "personality." Such an artificial environment would be *no one,* like a meadow, forest, or steppe—with the difference that it would grow and blossom not on its own, not for itself, but for someone. For beings. Would they become stupid from this, turning into dull-witted gluttons that whiled away their hours with toys provided by the planetary guardian? Not necessarily. It depended on the point of view.

What was delusion or idleness for one man might be, for another, a life's passion. We had no standard to measure and evaluate, particularly in the case of other beings on another world in another period of a history different from our own.

But Nakamura and Lauger favored the cosmological hypothesis. He who explored space would perish in space. Not that he would lose his life—the aphorism had a completely different meaning. Astronomy, astrophysics, space travel—these were but the small, modest beginnings. We ourselves had taken the next step, learning the rudiments of sidereal engineering. And it was not a matter of expansion, the so-called shock wave of Intelligence of yore: where Intelligence, taking possession of its own and then its neighboring planets, was supposed to spread in a stellar emigration throughout the galaxy. For what purpose? To increase the population density of space? No, it was not a matter of *crescite et multiplicamini*, but concerned things that we could not understand, let alone characterize. Could a chimpanzee understand the labors of a cosmologist?

Was the Universe nothing but a very large pie, and a civilization a child trying to consume the pie as quickly as possible? The notion of invasions by aliens was a projection of the aggressive traits of the predatory, barely civilized ape-man. If he himself willingly did unto others as he would rather not be done by, then he pictured the Advanced Civilization on much the same principle. Flotillas of galactic battleships were supposed to fall upon unsuspecting little planets, to lay hands on the local dollars, diamonds, chocolates, and, of course, beautiful women—for whom aliens had about as much use as we did for female crocodiles.

How, then, did those "above the window" occupy themselves? With activities beyond our conception. Yet, at the same time, we could not accept that they were beyond our conception. Here we were about to make a hole in Hades, in the temporal onion, in order to hide in it. But we were not playing hide-and-seek. We wished to catch a civilization before it flew out the window. The probability of future expeditions with the same goal was minuscule. Our descendants would, perhaps, even pay tribute to us: the kind of tribute we paid to the Argonauts who went in search of the golden fleece.

Yusupov, who also dropped in on Lauger, described this view of civilizations beyond the interval of contact as "knowledge by unknowledge." But eventually he had to drop out of the discussions, because the proximity of the goal required his almost constant presence at the control center.

Mark Tempe—who knew that he had another name, but said nothing, out of consideration for the doctors—studied the roster of the crew of the *Hermes* before bed. Of the ten, he knew only Gerbert well and, from the get-togethers at Lauger's, the short, dark-eyed Nakamura. About the captain under whom he would be serving, he knew next to nothing. The man's name was Steergard; he was Ter Horab's second in command, and his additional specialty was sociodynamic game theory. (Every participant of the reconnaissance mission had to have a field that duplicated someone else's, so that in case of accident or illness the functioning of the team would not be impaired.) The gravistician Polassar was in charge of the drive on the *Hermes*. Mark knew him only as an excellent swimmer and diver in the pool on the *Eurydice*, where he had admired the man's muscular body performing triple twists off the high board. That was not the place to acquaint oneself with sidereal engineering, so Mark tried tackling the subject on his own—in vain: the introduction to it required a familiarity with a sophisticated offshoot of the theory of relativity. The first pilot was Harrach. Large, heavy, irascible, he also knew information theory and shared with the astromatician Albright the care of the *Hermes*' computer. Or—as that computer once put it—the two humans were entrusted to *its* care.

This was a computer of the "last" generation—last, because no other could have greater calculating power. Limits were imposed by such properties of matter as Planck's constant and the speed of light. Greater calculating ability could be achieved only by the so-called imaginary computers, designed by theorists engaged in pure mathematics and not dependent on the real world. The constructors' dilemma arose from the necessity of satisfying mutually exclusive conditions to pack the most neurons into the smallest volume. The travel time of the signals could not be longer than the reaction time of the components; otherwise, the time taken by the signals would limit the speed of calculation. The newest relays responded in one-hundred-billionth of a second. They were the size of atoms, so that an actual computer had a diameter of barely three centimeters. A computer any larger would be slower. The *Hermes*' computer did indeed take up half the control room, but that was for its peripherals: decoders, hierarchic assemblers, and so-called hypothesis generators, which, with the linguistic modules, did not operate in real time. But decisions in critical situations, *in extremis*, were made by the lightning-swift core, which was no bigger than a pigeon's egg. It was named DEUS: Digital Engrammic Universal System. Not everyone believed that the acronym was accidental. The *Hermes* was equipped with two DEUSes; the *Eurydice* had eighteen.

In addition to Steergard, Nakamura, Gerbert, Polassar, and Harrach, all of whom had been chosen for the reconnaissance mission prior to takeoff, Arago was to participate in it as a reserve physician—an unexpected result of the secret balloting. And there was Tempe in the post of second pilot, the logician Rotmont, and two men selected out of a dozen exobiologists and other experts from the presidium of SETI on Earth: Kirsting and El Salam. In the last weeks of the voyage the ten took quarters in the fifth section of the *Eurydice*, which contained an exact mock-up of the interior of the *Hermes*, so that they could become familiar both with each other and with the task ahead of them. Every day they played out, on the simulators, different variants of the approach to Quinta as well as the tactics of establishing contact with its inhabitants. Another of the men from SETI, Chu, running these simulations, saw to it that the future crew of the *Hermes* got to know one another well, throwing them into the most fiendish emergencies, where accidents coincided with other accidents or with a flood of incomprehensible signals imitating the voice of the alien planet. No one knew how or why it happened, but during this time the apostolic delegate began to be called not Father but Dr. Arago. Mark had the impression that the priest himself preferred this. Then the simulations were cut short; Ter Horab summoned the reconnaissance group to brief them on the latest observations of the Zeta System.

Of the eight planets of that tranquil class-K star, the four inner ones—small, with masses on the order of Mercury or Mars—showed a good deal of volcanic activity and hardly any atmosphere. In the distance, Zeta was orbited by three gas giants like Jupiter, ringed, with powerful, stormy atmospheres of superdense hydrogen. Septima, twice as heavy as Jupiter, threw off into space more energy than it received from its sun: little would have been required to kindle it into a star. Only Quinta, having a one-and-a-half-year period of revolution around Zeta, shone blue like Earth. Breaks in the white clouds revealed the outlines of oceans and continents. Observation at a distance of nearly five light-years presented considerable difficulties. The resolution of the optical instruments on the *Eurydice* was not adequate to the task, nor were the images beamed from the orbiters that were sent out sharp enough.

Quinta was in its second quarter from the *Eurydice*'s vantage; half the disk was illuminated. Over it, the spectral lines of water and hydroxyl in large concentrations had just been discovered—as if, right at the equator, Quinta was encircled by a belt of remarkably compressed water vapor. Yet the belt lay above, outside the atmosphere. The possibility of an ice ring was suggested, whose inner edge touched the top layer of the atmosphere. Which meant that before long it would break up. The astrophysicists estimated its mass to be between three and four trillion tons. If the water came from the ocean, the ocean would have lost about 20,000 cubic kilometers: not more than 1 percent of its volume. As it was impossible to find any natural cause for this phenomenon, engineering became highly probable—undertaken for the purpose of lowering the level of the seas, thereby uncovering the continental shelves and creating additional dry land for settlement. On the other hand, the whole operation seemed poorly executed: the frozen fraction of the ocean, not put into an orbit high enough, would have to fall back down after a mere several hundred years. Given the scale of the project, this seemed strange, incomprehensible.

Things even more mysterious, events, could be observed on Quinta. The electromagnetic noise, emitted unequally from many places on the planet, intensified considerably, as if hundreds of maxwellian transmitters had been turned on at once. At the same time, the radiation in the infrared increased, with small flashes at the centers. These could be mirrors focusing sunlight for power plants. But then it turned out that the thermal component of that emission was not great. The spectra of the flashes were not copies of the spectrum of Zeta (as they would have been in the case of reflection), nor did they resemble the spectra of nuclear explosions. Meanwhile the radio noise continued to grow—shortwave and medium-wave, in many bands. The meter-length emission had the look of being modulated. This produced great excitement, particularly when someone garbled the news to the effect that the radiation was directed like radar—or, in other words, that the planet had already noticed the *Eurydice*. The astrophysicists ignored this rumor: no kind of radar could have detected the ship near the collapsar.

The mood at zero hour was jubilant. Beyond all doubt Quinta was inhabited by a civilization so advanced technologically that it had entered the Cosmos not merely in small craft but with a power able to lift oceans into space.

Preparations for takeoff of the scout ship took place in an altered orbit, in the relatively calm aphelion of Hades. The piping of the piezoelectric indicators, showing the constant change in stresses in the ribs and girders of the hull, died away. At the same time, on the screens of the takeoff control center—blank until now—there appeared at an angle a glowing, spiral arm of the galaxy, and with good will and a little imagination one could pick out, among the whitish, motionless swirls of stars and the dark dust clouds, Zeta Harpyiae. Its planets were not optically visible. The technicians readied the *Hermes* for unmooring.

In the storage bays at the stern, cranes swiveled; the flanges of the pipes with which the *Eurydice* filled the hypergolic fuel tanks of the scout ship shuddered under the pressure of the pumps. The head staff checked the systems—drive, navigation, air control, the dynatrons—once through DEUS and once without, employing parallel lines. One by one, the numbered units announced that their programs were ready; radio range-finders and antennas protruded and moved like the horns of a giant snail; the deep bass of the turbines that pumped oxygen to the tunnels in the hold of the *Hermes* sent subtle vibrations through its dock-shaped bed. During all this antlike bustle, the billion-ton *Eurydice* slowly turned her stern in the direction of Zeta Harpyiae like a cannon about to fire.

The crew of the *Hermes* parted with the Commander and their best friends. There were too many people on board the mother ship for everyone to shake hands. Then Ter Horab, with those who were able to leave their stations, escorted the crew of the *Hermes* and stood in the cylindrical passage between the sections while, after the closing of the large dock gate, the small personnel hatches were shut and, as on a launching chute, the *Hermes* began to move gradually, white as snow, pushed inch by inch by hydraulic jacks, since the hundred-and-eighty-thousand-ton mass, though weightless, preserved every bit of its inertia.

The technicians of the *Eurydice*, with the biologists Davis and Vahradian, were already putting the crew of the *Hermes* to sleep—a sleep that would last many years, but without ice or hibernation. Instead they were subjected to embryonization, a process in which people returned to a life before birth—a fetal existence, or at least strikingly similar: no breath, underwater.

Man's first small steps into space had shown how very terrestrial a creature he was, how poorly adapted to the powerful forces required by the crossing of great distances as rapidly as possible. Violent acceleration crushed the body, especially the lungs, which were filled with air; the force flattened the rib cage and stopped the circulation of the blood. If the laws of nature could not be bent, then one had to change the astronauts to conform to them. Embryonization accomplished this.

First the blood was replaced with an oxygen-carrying fluid that also possessed other properties of blood, from coagulability to the immunological functions. This fluid, white as milk, was onax. After the body's temperature was lowered to that of hibernating animals, closed vessels were surgically reopened: vessels through which the fetus at one time had exchanged blood with the placenta in the mother's womb. Though the heart continued to work, respiration ceased in the lungs, which collapsed and filled with onax. When there was no air remaining in either the rib cage or the intestines, the unconscious man was immersed in a liquid as incompressible as water. The astronaut then was locked inside an embryonator, a container in the shape of a two-meter torpedo that kept the body above freezing and supplied it with nutritive substances and oxygen. Onax was pumped into the organism by artificial vessels through the navel.

A man thus prepared could withstand tremendous pressures without harm, like bathypelagic fish which were not crushed at depths of miles beneath the ocean because the outside pressure equaled the pressure within their tissues. The liquid in the embryonator was kept, therefore, at hundreds of atmospheres per square centimeter of body surface. Each such container on the ship was held in swinging suspension by pincers. The astronauts lay in their armored cocoons like giant pupas, in such a way that acceleration and deceleration hit them always chest-first. The bodies, now more than 85 percent water and onax, already airless, were as compression-resistant as water. Thanks to this, there was no problem in maintaining a constant acceleration of 20 g's, at which a body weighed two tons, and moving the ribs to breathe would have been a task beyond even an athlete. But the embryonized did not breathe, and the limit of their durability for stellar flight was fixed only by the delicate molecular structure of the cells.

When ten hearts in full embryonizative compression were beating only a few times a minute, DEUS assumed charge of the unconscious, and the people of the *Eurydice* returned on board. The operators then disconnected the computers of the mother ship from the *Hermes*. Except for the dead cables, nothing now joined the two craft.

The *Eurydice* ejected the scout ship from her wide-open stern, which was ringed with the giant plates of an expanding photon mirror. Her steel claws, extending, tore away the useless cables like threads and thrust the hull of the *Hermes* into the void. Then the *Hermes*' side engines glowed with pale ionic flame. But the impulse was too weak to move it from its place; such an enormous mass could not acquire speed suddenly. The *Eurydice* drew in her catapults and closed the stern, and everyone observing the takeoff from her control room breathed a sigh of relief: DEUS, correct to the fraction of a second, took over. The hypergolic boosters of the *Hermes*, silent until now, fired. To build impetus, the batteries fired in sequence. At the same time, the ionic engines blazed full-force. Their blue, transparent flame mixed with the blinding glare of the boosters; the hull, wrapped in shimmering heat, moved smoothly, evenly, into the eternal night. In the darkened control room, the reflection from the screens made the faces of those who stood by the Commander deathly pale.

The *Hermes*, sending toward them a lengthening tail of steady flame, grew more distant as its speed increased. When the telemeters indicated the necessary distance, and when at the edge of the field of vision an empty cylinder tumbled end over end in free-fall (up to the last minute it had connected the *Hermes* and the *Eurydice*, and now, shot by the starting salvos, it flew off into the darkness), the mirror of the billion-ton ship locked in place. Through the central opening the blunt cone of an emitter slowly emerged; it flashed once, twice, three times, until a column of light stabbed space and hit the *Hermes*. In both control rooms of the *Eurydice* there was a triumphant cheer and—it must be confessed—an exclamation of surprise, too, that the thing had gone off so well. The *Hermes* soon vanished from the visual monitors. The screens showed only dwindling, glowing circles, as if an invisible giant had lit a cigarette among the stars and blown rings of white smoke. Finally these rings fused into a trembling point that was the mirror of the scout ship reflecting the *Eurydice*'s driving laser.

Ter Horab returned to his cabin before the scene was over. He had seventy-nine difficult hours ahead of him—of sidereal manipulations with the gracer of the *Orpheus*, to create a temporal port in the gravitational resonances. And then to enter it—or, rather, to become submerged in it—since this meant being cut off completely from the outside world.

The ignition order, sent to the *Orpheus*, took two days to reach it, and it was in that time that the several strange phenomena took place on Quinta. Up until the moment that their instruments were totally blinded, the astrophysicists tuned into the entire galactic emission from the region of the Harpy. The spectra of the Alpha, Delta, and Zeta stars in no way changed, which was an important test of the quality of the reception of Quinta. The radiation reaching the *Eurydice* from the planet was filtered, and the different exposures were compared, superimposed, and sharpened by computer cascade amplifiers. At the highest visual magnification, the Zeta system was a spot that a match head held at arm's length would cover.

The attention of the planetologists was focused, naturally, on Quinta. Its spectro- and holograms created not so much an image of the planet as a computer guess. Because the source of information was diverging photons spread out erratically over the whole spectrum of radiation, there was at the observatory on the *Eurydice*—just as at the observatories on Earth long ago, with the first telescopes—no agreement on the critical question of *what was actually seen and what only seemed to be seen*.

The mind of man, like any system processing information, could not draw a sharp line between certainty and conjecture. Observation was hindered by Quinta's sun, Zeta, by the gas plume of its largest globe, Septima, and by the strong emission of the stellar background. So far, it was found that in many physical respects Quinta did resemble Earth. The atmosphere contained 29 percent oxygen; there was plenty of water vapor and about 60 percent nitrogen. The white polar caps, having a high albedo, could be seen even from the vicinity of Earth's sun. The ring of ice must have arisen during the flight of the *Eurydice*, or at least reached the proportions that made it visible. Now, viewed from the cosmic neighborhood, the artificial nature of Quinta's radio intensity was beyond question. Discharges from atmospheric storms could not possibly have been a factor. In radio intensity in the shortwave range, Quinta equaled the corresponding emission of its own sun. The same thing had happened with Earth after the global spread of television.

The results of the observations made shortly before the plunge into the gravitational harbor were a shock. Ter Horab immediately summoned the experts. The council's only line of action was to diagnose as quickly as possible what was taking place on the planet and to send that message after the scout ship. The message, coded in the alphabet of high-energy quanta, would overtake the *Hermes* and its unconscious crew. DEUS would receive the message and convey it to the people upon their reanimation at the edge of the Zeta system. The stellar message was to be encoded so that only DEUS could read it. Caution was indicated: the changes on Quinta were alarming.

1) Several series of brief flashes above the thermosphere and ionosphere of the planet had been recorded, also between it and its moon—about two hundred thousand kilometers from Quinta. The flashes lasted thirty to forty nanoseconds. Spectrally, they matched the solar emission, with the radiation cut off in the infrared and ultraviolet.

2) After each of these series of flashes, which took many hours, there appeared on the face of the planet, in the intertropical zone, dark streaks on both sides of the ice ring.

3) At the same time, the emission of approximately meter-length waves increased, exceeding all previously observed maxima, while the emission of the southern hemisphere weakened.

4) Immediately before the council met, a bolometer aimed at the center of the planet's face registered a sharp drop in temperature on the order of 180 degrees Kelvin, with a slow return to equilibrium. The cold spot had an area equal to Australia. At first the cloud cover vanished above the spot, surrounding it on all sides with a very bright embankment of clouds; before the clouds returned, the bolometer located the "cold source" at a single point in the exact center of the spot. Thus the sudden cooling had expanded, from a source of unknown nature, in a circular front.

5) On Quinta's large moon there appeared—in the dark hemisphere, not facing the sun—a point flash that flickered-moved independently of the motion of the moon's surface. As if, just above the crust, through an arc of one-ten-thousandth of a second, a flame traveled, made of atomic plasma at a temperature of a million degrees Kelvin.

6) As the council began deliberating, the cold spot disappeared beneath the clouds, and then the cloud cover obscured the surface of Quinta to an extent unprecedented: 92 percent of the planet's face.

The opinions of the specialists, as one might have guessed, were divided. The first hypothesis that leaped to mind—of nuclear explosions, whether as tests or as warfare—could be discarded without further discussion: the flashes had nothing in common spectrally either with explosions of the uranides or with thermonuclear reactions. The exception was the plasmatic spark on the moon, but its thermonuclear spectrum was continuous. One thought of an open hydrogen-helium reactor in a magnetic vise. To the nucleonics people the purpose of such a reactor was a mystery.

The flashes in space nearer the planet could come from specially tuned lasers hitting metallic objects—nickel and magnetite meteors, possibly—or from the collision of bodies of high iron, nickel, and titanium content, if they collided head-on and at speeds on the order of 80 to 100 km/sec. But neither could one rule out as a source converter mirrors (which absorbed a portion of the sun's waves) exploding because of malfunctions.

The council got into a heated debate; the experts disagreed with one another. There was talk of climate control with the aid of very large photoconverters, and of photoelectric cells—which, however, had no connection with the focus of cold at the equator. But the most astounding thing was the result of the Fourier analysis done on the entire radio spectrum of Quinta. All trace of modulation disappeared, while at the same time the power of the transmitters increased. A radiolocation map of the planet showed hundreds of transmitters of white noise, which merged into shapeless blotches. Quinta was emitting noise on all wavelengths. The noise was either the scrambling of broadcast signals or a kind of coded communication concealed by the semblance of chaos—or else it was chaos indeed, created intentionally.

Ter Horab demanded an immediate answer to the question of *what* should be beamed to the *Hermes* within the next few hours, since all contact with it would be severed after that. More to the point: for what should the reconnoiterers prepare themselves, and how should they proceed once they were in the Zeta system?

The reconnaissance program had been worked out long before, but it was obviously impossible for them to have taken into account the phenomena just observed.

At first no one was anxious to take the floor. Finally the astromatician Tuym, as a spokesman for the advisory group SETI, said with undisguised reluctance that no helpful advice could be sent to the *Hermes*. They should list the facts, provide a hypothetical explanation, and rely on the independent judgment of the crew.

Ter Horab wanted to hear some hypotheses—it did not matter if they were mutually contradictory.

"Whatever the changes on Quinta are, they are not signals directed at us," said Tuym. "On that we are all agreed. Some believe that Quinta has noticed our presence and is preparing itself, in its own way, to receive the *Hermes*. This is not an idea based on rational data, it is simply—in *my* opinion—an expression of anxiety, or, to put it plainly, fear. A very old and primitive fear, which at one time gave rise to nightmares of cosmic invasion. I consider such an explanation of the phenomena to be nonsense."

Ter Horab preferred specifics. The people of the reconnaissance mission could decide for themselves whether they should be afraid or not. It was the mechanism of the new phenomena that interested him.

"Our astrophysicists have specific hypotheses. They can present them," replied Tuym, unruffled by the sarcasm of the Commander's words, since it was not directed at him.

"Who?" asked Ter Horab.

Tuym indicated Nystedt and Fecteau.

"The jumps in temperature and albedo could have been caused by a meteor swarm entering Quinta's system and colliding with artificial satellites. That could have produced the flashes," said Nystedt.

"How do you explain the similarity of the surface flashes to the spectrum of Zeta?"

"Some of the satellites of Quinta could be hunks of ice broken off from the outer edge of the ring. They would reflect the sunlight in our direction only at certain angles of incidence and reflection—randomly. They would be irregular solids, with different orbital moments."

"And what about the cold spot?" asked the Commander. "Who knows the possible ways it could have come about?"

"That's unclear—though we could come up with some natural mechanism. . . ."

"An ad hoc hypothesis," Tuym remarked.

"I talked this over with the chemists," said Lauger. "An endothermic reaction could have taken place there. I'm not comfortable with such an oddity, I admit, but there *are* compounds that absorb heat when they react. The accompanying circumstances, however, point to something more dramatic."

"To what?" asked Ter Horab.

"An unnatural cause, though not necessarily one that has intention. For example—an accident in some enormous refrigeration devices, in cryogenic equipment. Like a fire in an industrial complex, but with a negative sign. But this doesn't seem very likely to me, either. I have no facts on which to base such an assertion—none of us have—but the very proximity in time of all these changes suggests that they are somehow connected."

"The value of your hypothesis also has a negative sign," said one of the physicists.

"I don't think so. The reduction of many unknowns to a common unknown denominator represents a gain, not a loss, in information," replied Lauger easily.

"Please go on," the Commander said to him. Lauger stood.

"I'll say what I can. An infant, smiling, smiles according to assumptions that it has brought with it into the world. These assumptions, of a statistical nature, are multitudinous: that the pinkish blobs its little eyes perceive are people's faces, that people usually react positively to the smile of a baby, and so on."

"What is your point?"

"That everything is based on certain assumptions, though the assumptions, as a rule, are made silently. Our discussion deals with events that appear very improbable as a series of unrelated things—the flashes, the chaotic emission, the changes in Quinta's albedo, the plasma on the moon. What caused them? you ask. The activity of a civilization. Does this clarify anything? On the contrary, it mystifies, because we began with the tacit assumption that we would be able to understand the actions of the Quintans.

"Mars, as I recall, was once considered old, and Venus young, in comparison with Earth: the great-grandfathers of our astronomers automatically assumed that Earth was the same as Mars and Venus, except younger than the first and older than the second. Hence, the canals of Mars, the wild jungles of Venus, et cetera, which eventually all had to be chucked out as fairy tales. I don't think anything can behave as unintelligently as intelligence. There may be a mind on Quinta—or minds—inaccessible to us because of a difference in purposes. . . ."

"War?" The voice came from the back of the hall.

Lauger, still standing, continued.

"War is not an absolutely closed set of conflicts with destruction as the resultant. Commander—don't count on being enlightened. Since we know neither the initial states nor the parameters, nothing can turn the unknowns into knowns. All we can tell the *Hermes* is to proceed with caution. You would prefer more specific advice? I can only offer two possibilities: the actions of those intelligences are unintelligent—or else unintelligible, not fitting in the categories of our thought. But this is only an opinion, nothing more."

VI

Quinta

Before the plunge, the radiolocators tracked the *Hermes* for the last time, showing how it described a great hyperbola across the firmament, rising higher and higher above the arm of the galactic spiral, in order that in deep vacuum it could travel near the speed of light. Then the radio echoes began to arrive at increasing intervals, a sign that the *Hermes* was experiencing relativistic effects and that its on-board time was diverging from the time of the *Eurydice*. All contact between the scout ship and the mother ship terminated when the signals from the automatic transmitter grew in wavelength, spread to bands of many kilometers, and weakened. The last signal was noted, by the most sensitive indicator, in the seventieth hour after the start, just as Hades, hit by the suiciding *Orpheus*, groaned in gravitational resonance and opened wide its temporal chasms. Whatever might happen to the scout ship and the men locked within it would have to remain unknown for many years (of their time).

For those who slept the sleep of embryonization, a sleep like death—devoid of dreams or any awareness, through dreams, of the passage of time—the flight had no duration. Over the white sarcophagi in the tunnellike embryonator, through the armored glass of the periscope, shone Alpha Harpyiae, a blue giant that had been deflected from the other stars of the constellation by one of its own asymmetric eruptions, as it was young and not yet stabilized after the nuclear ignition of its interior. When the *Eurydice* vanished, DEUS took over the controls. The *Hermes*, having climbed above the ecliptic, plummeted like a stone toward Hades, initially retreating from the star of its destination in order to reach it more easily, at the gravitational cost of the collapsar: circling the collapsar, it received from its field a hefty push. Then, at a speed approaching light, the *Hermes* extended from its sides the intakes of the flowstream reactors. Space was so empty that the collected atoms were insufficient for ignition; DEUS therefore excited the hydrogen with injections of tritium until the synthesis finally started. The throats of the engines, black until now, filled with light that pulsed faster and more intensely. Fiery columns of helium spouted into the darkness. The *Eurydice*'s laser had given the scout ship less help at the takeoff than expected, since one of the hypergolic boosters misfired, which moved the stern mirror off course—and then the *Eurydice* disappeared, as if swallowed by the void. But DEUS quickly made up for the loss with power borrowed from Hades.

At 99 percent of the speed of light, the space in the engine intakes grew denser; there was more than enough hydrogen. The constant acceleration increased the mass of the scout ship. DEUS held to 20 g's without the least deviation. The structure, designed to withstand four times such thrust, suffered no damage. But no living organism larger than a flea could have borne its own weight on that flight. Each man weighed over two tons. Under that crush he could not have moved his ribs if he had had to breathe, and his heart would have burst trying to pump a fluid far heavier than liquid lead. But they did not breathe and their hearts now did not beat, though they lived. The crew lay in the same liquid medium that had replaced their blood. Pumps that would have functioned at a hundred times the gravity (though the embryonized could not have endured that) pushed onax through their vessels, and the hearts contracted once or twice a minute, not working but, instead, passively moved by the influx of the life-giving artificial blood.

At the right moment, DEUS executed a change of course. Heading now straight for the corotating swirl of stars of the galaxy, the *Hermes* threw out in front of its prow a protective shield. The shield preceded the ship by several miles; seemingly stationary at that distance, it served as a radiation screen. Otherwise, as the speed mounted, cosmic rays would have destroyed too many neurons in the human brains. The blue Alpha now shone astern. Inside the long tunnel-hold of the *Hermes*, however, it was not completely dark; the insulation around the reactors allowed microscopic leakage of quanta, and the walls glowed with Cherenkov radiation. This pale twilight seemed quiescent, perfectly still, unchanging. Only twice, through the thick window in the barrier that separated the embryonator from the upper deck, were there sharp, sudden flashes.

The first time, a control monitor of the protective shield, blank until then, blazed a cold white and immediately went out. DEUS, awakened in a terasecond, gave the necessary order. Current turned levers; the prow of the ship opened and spat flame; a new shield, ejected forward, replaced the one destroyed by a handful of cosmic dust. The dust, from the speed of impact, had turned the shielding disk into an incandescent cloud of split atoms. The *Hermes* flew through this solar firework, which then stretched far in its wake, and pressed on. The auto required a few seconds to stop the unwanted lateral motion of the new shield, whose port and starboard orange lights blinked more and more slowly, as if a sleepy black cat were winking meaningfully at DEUS. Then everything was again still on the ship, until the next striking of grains from a meteorite or comet tail, when the operation of renewing the protective shield was repeated exactly.

Finally the flickering electrons in the cesium clocks gave the awaited signal. DEUS did not need to look at any indicators: the indicators were its senses and it read their state directly with its brain—which, because of its three-centimeter size, the jokers of the *Eurydice* had called the "birdbrain." DEUS kept careful track of the lumenal readouts, to maintain the course during the reduction of the drive. The engines, cut and turned around, began to brake the ship. This maneuver, too, was carried out perfectly: the guiding stars did not so much as budge in the sights, so there was no need for any programmed correction of the trajectory.

The idea was that the reduction of a near-light velocity to a parabolic velocity with respect to Zeta—that is, down to some 80 km/sec per microparsec before reaching Juno, the outermost planet of the system—would require a simple reversal of the drive, until it went out by itself from lack of hydrogen. Then the hypergolics could be used for braking. But DEUS had received the warning from the *Eurydice* in time, and before beginning the reanimation procedures it reprogrammed the approach. The technological—artificial—nature of both the light from hydrogen-helium exhaust cones and the flame of self-igniting fuels was easily identified, and DEUS's first rule now was that of "extremely limited trust in our Brothers in Intelligence." It had never studied the Bible, had never analyzed the incident of Cain and Abel, yet it shut off the flowstream engines in the shadow of Juno and used the planet's gravity to reduce speed and change course. The second gas globe of Zeta served it to drop down to a parabolic velocity. Only then did it activate the reanimators.

At the same time, it sent remote-control robots outside, to place on the nozzles of the stern and prow a camouflaging device, an electromagnetic mixer. From now on the flame of the drive would be blurred, its radiation spectrally dispersed.

The most delicate stage of the braking occurred at the threshold of the system, behind Juno. DEUS planned and performed it deftly, as befitted a computer of the ultimate generation. It simply had the *Hermes* cut through the upper layers of the gas giant's atmosphere. A cushion of blazing plasma was created before the ship; losing speed in it, DEUS wrung everything it could out of the *Hermes*' air-control system to keep the temperature in the embryonator from rising more than two degrees.

In an instant, the plasma cushion destroyed the protective shield, which in any case was to have been discarded. The shield was replaced by one of another type, for protecting against dust and comet fragments in planetary orbits. The *Hermes* was blinded in the fiery passage, but cooled while still in Juno's cone of shadow. DEUS made sure that the flaming clouds caused by the braking maneuver, practically prominences, subsided on the heavy planet in accordance with Newton's laws. Thus not only the presence but the trail of the *Hermes* was effaced. The ship, engines extinguished, drifted in a far aphelion, while in the embryonator all the lights went on and the heads of the medicoms hung over the containers, ready to begin.

According to the program, Gerbert was to be the first to awaken—to intervene as a doctor, should intervention be necessary. But here the sequence of the procedure was broken. The biological factor, despite everything, remained the weakest link in the chain of these complex operations.

The embryonator was housed in the middle deck and, compared with the ship, was a microscopic shell surrounded by many layers of armor and by antiradiation insulation. It had two escape hatches that led to living quarters. The center of the *Hermes*, called the Village, was connected by shafts to the two-level control room. Between the forward bulkheads ran decks with a row of laboratories equipped to function in weightlessness as well as under gravity. The power stores were situated at the stern—in annihilative containers, in the sidereal engine room not accessible to personnel, and in chambers that had a special purpose. Between the outer and inner hulls of the stern were concealed landing-gear units, for the ship was able to set down on planets, standing on extended, jointed girder-legs. But first the strength of the ground would have to be tested, because on each one of the craft's enormous paws would rest 30,000 tons of weight.

In the ship's midsection, on the starboard side, reconnaissance probes were stored, with their accessories and attachments; on the port side were service robots, and search robots capable of long, independent reconnoitering by flight or on foot, and these included striders.

When DEUS turned on the reanimation systems, the *Hermes* was weightless, a favorable condition for the operation. Roused first, Gerbert regained a normal pulse and body temperature, but did not awaken. DEUS examined him carefully and hesitated, faced with a decision. It was compelled to act independently. More precisely, it did not hesitate, but compared various probability distributions of success. The result of this anamnesis was binomial: DEUS could either reanimate the captain—Steergard—or take the physician from the embryonator and transport him to the operating room. It did as a man who, in the face of unknowns, flips a coin. When one does not know which course is better, the best tactic is to make a purely random choice. The random generator indicated the captain, and DEUS obeyed it.

Two hours later, Steergard, still half conscious, sat up in the open embryonator, tearing through the transparent membrane that clung to his naked body. He looked around but did not see the one who should have been standing over him. The speaker was saying something. He realized that the voice was mechanical, that something had happened to Gerbert, though he had difficulty understanding the words that were repeated over and over. When he tried to get up, he hit his head against the not fully raised lid of the embryonator, which dazed him for a moment. The first sound of human speech in the Zeta system was an obscenity. Beads of sticky white fluid flew from Steergard's hair onto his face and chest. He straightened too quickly and, somersaulting with bent knees, flew down the tunnel, past all the containers of people, to the hatch in the wall. His shoulders pressed against soft padding in the corner between the hatch frame and the ceiling. Wiping from his eyes the milky fluid, which stuck to his fingers, he took in the whole cylindrical interior of the embryonator. In the gap between the rows of sarcophagi with their raised lids, the door to the showers was now open. He listened to the machine voice. Gerbert, like the others, was alive, but had not awakened when his umbilical cord was disconnected. It could not be anything serious: the electroencephalograms and electrocardiograms were perfectly normal.

"Where are we?" he asked.

"Behind Juno. The flight went smoothly. Should I move Dr. Gerbert to the operating room?"

Steergard considered.

"No. I'll look at him myself. What's the condition of the ship?"

"Fully functioning."

"Did you receive any radio messages from the *Eurydice*?"

"Yes."

"What level of importance?"

"First. Should I give the text?"

"What does it concern?"

"A change of plans. Should I give the text?"

"How long is the message?"

"Three thousand, six hundred and sixty words. Should I give the text?"

"Summarize it."

"I cannot summarize unknowns."

"How many unknowns?"

"That, too, is an unknown."

During this exchange, Steergard kicked off from the ceiling. Flying toward the green-and-red light above Gerbert's cryotainer, he was able to get a glimpse of himself in the mirror in the passageway to the showers: a muscular torso glistening with onax, which still trickled in beads from the stump of the tied umbilical cord, as of an enormous newborn.

"What happened?" he asked. Wedging his bare feet under the doctor's container, he put a hand on his chest. The heart beat steadily. On the slightly parted lips of the sleeper was viscous white onax.

"Give what's definite," he said. Meanwhile he pressed his thumbs behind the man's jaw, looked into the mouth, felt the warmth of the breath, put a finger between the teeth, and carefully touched the palate. Gerbert started and opened his eyes. They were full of tears, as bright and clear as water. Steergard noted with quiet satisfaction the effectiveness of so primitive a method of reviving. Gerbert had not awakened because the clamp on the umbilical cord was not completely shut. Steergard pinched the catheter, which snapped away, squirting white fluid. The cord closed itself off. With both hands he pressed the man's chest, feeling the skin stick to his palms. Gerbert stared at him wide-eyed, as if astounded.

"Everything's OK," said Steergard. The one he was massaging did not seem to hear.

"DEUS!"

"Yes?"

"What happened? The *Eurydice* or Quinta?"

"There were changes on Quinta."

"Give the general picture."

"A picture of unclear things is unclear."

"Tell what you know."

"Before the plunge, high-frequency jumps in the albedo took place. Radio emission went to three hundred gigawatts of white noise. On the moon, a white point moved, recognized as plasma in a magnetic vise."

"Recommendations?"

"Caution. Camouflage."

"Specifically, what are we to do?"
"To use our best judgment."
"The distance to Quinta?"
"One billion, three hundred million miles on a straight line."
"The camouflage?"
"I have done it."
"Mixers?"
"Yes."
"Have you changed the program?"
"Only for the approach. The ship is in the shadow of Juno."
"And the ship is all right?"
"Fully functioning. Should I reanimate the crew?"
"No. Have you observed Quinta?"
"No. I lost cosmic velocity in the thermosphere of Juno and—"
"Fine. Now be silent and wait."
"I will be silent and wait."

An odd beginning, thought Steergard, still kneading the doctor's chest.

The doctor sighed and moved.

"Do you see me?" the naked captain asked him. "Don't speak. Blink."

Gerbert blinked, then smiled.

Steergard was covered with sweat, but continued to massage him.

"Diadochokinesia . . ?" he suggested.

The man lying prone closed his eyes and with an unsteady hand touched the tip of his nose.

Then they looked at each other and grinned. The doctor bent his knees.

"You want to get up? Don't rush."

Saying nothing, Gerbert gripped the sides of his bed and lifted himself. But instead of sitting up, he rose into the air.

"Careful, zero g," Steergard reminded him. "Easy . . ."

Now fully conscious, Gerbert looked around the embryonator.

"How are the others?" he asked, brushing aside the hair stuck to his forehead.

"The reanimation is under way."

"Should I help, Dr. Gerbert?" asked DEUS.

"It's not necessary," said the doctor. One by one, he himself was checking the dials above the sarcophagi. He touched chests, thumbed eyelids open, tested the conjunctival reflexes. There was a rush of water and exhaust fans from the bathroom: Steergard was taking a shower. By the time the doctor got to the last one, Nakamura, the captain—already in shorts and a black tricot T-shirt—had returned from his cabin.

"How are the men?" he asked.

"All healthy. Rotmont has a trace of arrhythmia."

"Stay with them. I'll read the mail. . . ."

"News?"

"News five years old."

"Good or bad?"

"Enigmatic. Ter Horab advised a change of program. They saw something on Quinta before the plunge. Also on the moon."

"What does it mean?"

Steergard stood at the door as the doctor helped Rotmont to his feet. Three men were already washing themselves. The others floated around, met, looked in the mirror, all trying to talk at once.

"Let me know when they come around. We have time." With these words the captain pushed off from the hatch, flew between naked bodies as if among white fish underwater, and disappeared into a passage to the control room.

After considering the situation, Steergard took the ship up above the ecliptic plane, emerging from the cone of shadow at the lowest drive to make the first observations of Quinta. It shone as a crescent near the sun. Completely covered with clouds. Its noise had increased to four hundred gigawatts. The Fourier analyzers showed no kind of modulation. The *Hermes* was now wrapped in a veil that absorbed nonthermal radiation, so that it could not be located by radar: Steergard preferred to err on the side of caution. A technological civilization meant astronomy, and astronomy meant sensitive bolometers, whereby even an asteroid—warmer than space—could call attention to itself. To the water vapor now used for maneuvering he added some sulfides, the kind abundant in seismic gases. Volcanically active asteroids were a rarity, true, especially with a mass as small as that of the scout ship, but the circumspect captain sent out probes, then aimed them back at himself to make sure that the use of the vapor jets necessary for future flight corrections would go unnoticed even when the vessel eventually descended to Quinta. His intention was to steal up on the side of the moon, in order to examine it in detail.

By now everyone was gathered in the zero-gravity control room. It resembled the inside of a large globe, with a conical recess closed in by a wall of monitors. The seats were covered with a fastening material. If you gripped the arms and pressed your body down into the chair, the fabric would hold you firmly. If you wanted to get up, you pushed away in one strong motion. It was simpler and better than straps. They sat, all ten of them, as in a small projection room, and forty screens showed the planet, each in a different range of the spectrum. The largest, central monitor could synthesize the monochromatic images, superimposing them as instructed.

Through the breaks in the clouds, furled by trade winds and cyclones, deeply notched, blurred coastlines appeared. The light, filtered in stages, allowed them to see now the cloud surface and now the surface of the globe concealed beneath it. Meanwhile they listened to the lecturing monotone of DEUS, which repeated the last radiogram from the *Eurydice.* LoBianco had raised the possibility of seismically caused damage to the technological infrastructure of the Quintans. Field and a few others held to this hypothesis, which they termed "environmental." The inhabitants of the planet had thrown part of the ocean waters into space in order to increase the land area. The pressure exerted by the ocean on the ocean floor decreased, and as a result the equilibrium in the lithosphere was disturbed. The upward force from within produced great cracks in the crust, which was thinnest beneath the ocean. Therefore the hurling of water into space was discontinued. In short, the enterprise backfired catastrophically.

But others believed that this hypothesis was false, as it failed to take into account additional incomprehensible phenomena. Moreover, beings able to work on the planetary scale would surely have foreseen the seismic consequences. According to calculations that used Earth as a model, cataclysmic movements of the lithosphere could not be produced by the removal of less than one-quarter of the ocean's volume; the reduction of pressure from the ejection of even six trillion tons of water would not cause global devastation. Another hypothesis suggested a disaster of the "chain-reaction" type as the undesired effect of gravitological experiments gone out of control. Other notions included: the deliberate destruction of an outmoded technological base, a kind of demolition; the unintentional disruption of the climate during the hurling of the water into space; and civilizational chaos of unknown causes.

None of the hypotheses was able to encompass all the observed phenomena to form a coherent whole. Thus the radiogram sent by Ter Horab immediately before the *Eurydice*'s entrance into Hades authorized the reconnoiterers to act independently, and to dispense with any or all of the established variants of the program if they saw fit.

VII

Hunting

At the aphelion of Zeta, far from its larger planets, Steergard put the ship into an elliptical orbit so the astrophysicists could make their observations of Quinta. As usual in such systems, there were drifting remnants of old comets, comets stripped of their gas tails and broken into frozen boulders by repeated passages past the Sun. Among these scattered rocks and patches of dust, DEUS noticed, four thousand kilometers away, an object unlike a meteor. Touched by the radiolocator, it gave a metallic reflection. It could not be a hunk of magnetite with a high iron content: the shape was too regular. It resembled a moth with a short, thick abdomen and blunt stubs of wings. Four degrees warmer than icy rock, it did not rotate as a meteor or the fragment of a comet core should have, but traveled straight, with no sign of propulsion. DEUS examined it in all the spectral bands until it discovered the reason for the thing's stability: a faint outflow of argon, an attenuated stream and therefore barely visible. It could be a space probe or a small ship.

"Let's catch that moth," Steergard decided. So the *Hermes* was set on a trajectory of pursuit. At less than a mile from the prey, it discharged a missile that had prehensile arms. The snare opened its jaws wide, exactly over the back of the peculiar moth, and grasped the thing's sides as in a vise. The thing, inert, seemed to fly passively in the grip, but after a moment its temperature rose and the stream of gas at its rear intensified.

The monitor, till now showing the close correlation between the hunt program and its progress, flashed question marks.

"Turn on the absorption field?" asked DEUS.

"No," said Steergard. He watched the bolometer. The trapped object heated to three hundred, four hundred, five hundred degrees Kelvin, yet its drive increased only slightly. The temperature curve peaked, then fell. The captured thing cooled.

"What's the drive?" asked the captain. Everyone in the control room was silent, looking from the visual monitor to the side screens, which were for emissions outside the visible range. Only the bolometer glowed.

"Radioactivity zero?"

"Zero," DEUS assured the captain. "The jet is weakening. What now?"

"Nothing. We wait."

They flew thus for a long time.

"Why not take it on board?" El Salam suggested finally. "We could X-ray the thing first."

"No point. It's dead—the drive is out, and cold. DEUS, show it up close."

Through the electronic eyes in the pincers they saw a black carapace, pock-marked and corroded.

"Take it on board?" asked DEUS.

"Not yet. Tap it a couple of times. Not too hard."

From between the long-armed pincers emerged an oval-ended rod. Methodically it struck the held hull, raising a fine spray of ash flakes.

"It might have a nonpercussive detonator," remarked Polassar. "I think I would X-ray it. . . ."

"All right," Steergard agreed, unexpectedly. "DEUS, run an SG on it."

Two spindle-shaped probes, shot from the prow, caught up with the squat moth and aligned themselves on either side of it. The upper monitors in the control room came to life, showing tangled strips, bands, shadows, and simultaneously atomic symbols appeared along the edges of the screens: carbon, hydrogen, silicon, manganese, chromium. The columns of letters lengthened, until Rotmont said:

"This is no good. It should be taken on board."

"Risky," muttered Nakamura. "Better to take it apart by remotes."

"DEUS?" asked the captain.

"It is possible. It will require five to ten hours. Should I begin?"

"No. Send a teletome. Let it cut open the hull in the thinnest place and give us a picture of the interior."

"Bore and broach?"

"Fine."

The probes surrounding the prey were joined by another. A diamond drill met with a hull no less hard.

"Only a laser," DEUS decided.

"A problem. Use the minimum pulse, so as not to melt anything inside."

"That I cannot guarantee," replied DEUS. "Should I laser?"

"Delicately."

The drill retracted and disappeared. On the pitted surface a white point glowed, and when the smoke cleared, a telephoto head entered the melted hole. Its monitor showed blackened tubing that went into a bulging plate, and the whole image trembled slightly. Then DEUS spoke:

"Caution. According to the SG, at the center of the object are excitons, and virtual particles warping configurational Fermi space."

"How do you interpret that?" asked Steergard.

"The pressure at the center is over 400,000 atmospheres—or else this is a Holenbach quantum effect."

"A kind of bomb?"

"No. Probably the power source. The propellant was argon. There is none left."

"Can we take it on board?"

"We can. The net energy of the whole is equal to zero."

Except for the physicists, no one had any idea what this meant.

"Shall we?" the captain asked Nakamura.

The Japanese smiled. "Who am I to argue with DEUS?" He turned to El Salam. "And what do *you* think?" El Salam nodded.

So the trophy of the chase was drawn into a vacuum chamber in the prow and surrounded, for safety, with absorption fields. No sooner had they completed this operation than DEUS announced another discovery. It spotted an object considerably smaller than the first, covered with a substance that absorbed radar waves. What gave it away was the spin resonance of the material. The thing was a squat cigar, with a mass of some five tons. Again the orbiters went out and, after heating the insulation, tore it from the gleaming metal of the spindle. Attempts to make the object react were fruitless. It was a corpse: a melted hole gaped in its side. The condition of the rim indicated that the hole was not very old. This prize, too, was put on board the ship.

The hunting had gone well. Problems arose only in the examination and dissection of the double find.

The first wreck, its two-hundred-ton body resembling an enormous turtle, betrayed, by its rough shell pitted from countless collisions with micrometeorites and dust, an age of probably a hundred years. Its orbit's aphelion went beyond the outermost globes of Zeta. The anatomy of the solidly armored turtle surprised the dissectors. The report was in two parts. In the first, Nakamura, Rotmont, and El Salam agreed in their description of the devices found inside the alien artifact; in the second part, however, their opinions as to the purpose of those devices differed widely. Polassar, who also participated in the examination, questioned the speculations of both physicists. The report, he said, was worth about as much as an account of an Egyptian pyramid by Pygmies. Agreement on the building material told nothing about the structure's purpose.

The old satellite possessed a peculiar power source. It contained piezoelectric batteries that were charged by a converter of a type the physicists had never seen before. The electric cells, compressed in a multicascade bank of purely mechanical pressure-amplifiers, produced current while returning to position, in pulses through a system of coils with phase impedance. But the cells could also give sudden and full discharges if the sensors in the hull short-circuited the reactance coils. In that case the whole current, coursing through the two-spool drum, would explode it in a magnetic burst. Between the accumulators and the housing were empty bags or pockets filled with cinders. Into these ran glasslike tubes, the inside surface a dull mirror; perhaps they were eroded fiber optics. Nakamura's guess was that this wreck had at one time become overheated, which burned out some of its units and destroyed the sensors. But Rotmont thought that the destruction was caused not by heat but, rather, catalytically. As if microparasites (nonliving, of course) had chewed through the satellite's circuitry in the front section. And this, long ago.

The inside surface of the hull was covered with several layers of cells, somewhat like a honeycomb except much smaller. Only by chromatography was it possible to identify, in their ashes, silico-amino acids—amino acids based on silicon, with double hydrogen bonds. It was here that the dissectors disagreed. Polassar thought these remains were of interior insulation for the hull; Kirsting, on the other hand, said they were from a system halfway between living tissue and nonliving, the product of a technobiology of unknown origin and function.

There were long, heated arguments. The people of the *Hermes* had before them evidence of the level of Quintan technology a hundred years ago. Roughly speaking, the theoretical basis for this engineering could be compared to Earth's science at the end of the twentieth century. At the same time, intuition, more than anything concrete, suggested that the basic direction of development of the alien physics had even then begun to deviate from the terrestrial. There could be neither synthetic virusology nor technobiotics without, first, a grasp of quantum mechanics, but quantum mechanics immediately led to the fission and fusion of atomic nuclei. In that period the best energy source for satellites or interstellar probes was the atomic micropile.

And yet there was no trace of radioactivity in this old satellite. Could the Quintans have skipped the stage of explosive chain reactions in nucleonics and gone right to the next stage—of the conversion of gravity into the quanta of strong interactions? But the piezoelectric battery contradicted that. The second satellite was worse yet. It had a battery of negative energy, the result of motion at near-light velocity through the gravitational fields of large planets. Its pulse drive had been smashed by whatever had aimed and hit it—perhaps a gigajoule shot of coherent light. It, too, showed no radioactivity. The internal struts were made from monomolecular carbon in bundles of fibers—no small accomplishment in solid-state engineering. In the uncrushed section behind the power chamber they found cracked tubes with superconducting compounds that unfortunately ended right where "the most interesting thing" had been, as Polassar lamented. What could it have been? The physicists got into speculations that they would not have dared touch in more mundane circumstances. Perhaps the wreck contained a generator of unstable superheavy nuclei. Of anomalons. But for what purpose? If it was a robot laboratory for research, that would make sense. But *was* it? And why did the melted metal behind the place of the hit resemble a kind of archaic induction coil? And the superconducting niobium alloy showed, in the unbroken lengths, cavities—parts eaten away by endothermic catalysis. As though some sort of "erosion viruses" had fed on the current, or, rather, on the superconductor itself.

Even more curious were the small centers of destruction found in both satellites. These localized ravagings could not have been caused by any violent action from without. Most often, the compounds of the wires had been bitten through or gnawed at, producing tiny beadlike hollows. Rotmont, called in as a chemist, concluded that this was the work of highly active macromolecules. He was able to isolate a number of them. They had the shape of asynchronous crystals and preserved their selective aggressiveness. Some attacked only superconductors. He showed his colleagues, under the electron microscope, how the nonliving parasites ate their way into the filaments of a superconducting niobium compound, multiplying as more and more material was devoured. He did not think that these "viroids," as he called them, could have arisen spontaneously in the heart of the satellite. He assumed that the apparatus had been infected with the viroids during its original assembly. For what reason? An experiment? But in that case why send the satellites out into space?

Then there was the notion of premeditated sabotage during the construction of the devices. According to such an idea, a conflict lay behind these phenomena, the clash of opposing intentions. Some among the crew thought this conception smacked of anthropocentric chauvinism. Could not the problem have indeed been an ailment of the apparatus, on the molecular level? Something on the order of a cancer in nonliving mechanisms that had a subtle and complex microstructure?

The logician-chemist ruled out this possibility for the first, older satellite, the turtle, which they had called "the moth" during the chase. For the second, however, he could not rule it out with the same certainty. Although they did not understand the purpose for which both space vehicles had been constructed, the progress in engineering that had taken place over the time between the building of the first and the second was striking. Notwithstanding, the "erosion viruses" had found vulnerable places to feed in both satellites.

Once on the trail of this idea, Rotmont could not and did not want to abandon it. The microelectronic examination of the samples taken from both captured devices proceeded rapidly, since the analyzer running it was under DEUS's control. Without that high-speed assistance even a year would not have sufficed for the necrohistology. The results indicated that certain components of both satellites had acquired a kind of resistance to the catalytic corrosion, and in a way so narrowly defined, so specific, that one could speak of an immunological reaction by analogy to living organisms and microbes. In their imagination formed the image of a micromilitary struggle, a war conducted without soldiers, cannons, bombs, and where the secret weapon, extremely precise, was a semicrystalline pseudoenzyme.

As sometimes happened in a stubbornly pursued investigation, the total sense of the discoveries made, instead of simplifying, actually became more and more complicated as the work progressed. The physicists, Rotmont, and Kirsting now practically never left the ship's main laboratory. On nonliving "culture dishes" dozens of varieties of "defense" and "attack" compounds multiplied. At the same time, the line between what constituted an integral part of the alien machinery and what had invaded it, to destroy it, grew fuzzy. Kirsting observed that in general no such line existed in any strictly objective sense. Suppose that there arrived on Earth an extremely wise supercomputer, which knew nothing about the phenomena of life because its electronic forebears had long ago forgotten that they had been built by biological beings. It saw and studied a man who had 1) a cold, and 2) colon bacilli in his intestines. Was the presence of viruses in the nose of the man his "integral, natural property" or not? Suppose the man, in the course of being examined, fell and acquired a lump on the head. The lump was a hematoma beneath the skin. The vessels suffered damage. But the lump could also be considered a kind of shock absorber created to protect the cranium from the next blow. Was such an interpretation impossible? It seemed comical to us, but this was not a joke—it concerned the whole scientific approach to the nonhuman.

Steergard, listening to the experts' arguments, merely nodded and gave them an additional five days for research. It was a heavenly dispensation. For the last half-century, the technobiotics of Earth had taken a completely different path. "Necroevolution" had been deemed unprofitable. There had been no conjecture, even, about any sort of eventual "machine speciation." But no one could say for sure that such a thing had not taken place on Quinta.

All the captain asked was, finally: Was the hypothesis of conflict between Quintan builders a premise on which future decisions of the reconnaissance had to be based?

But, presenting the analyses that they had made, the experts did not want to speak of anything so definite as a premise. There was nothing certain in their hypothesizing; there were no facts. They knew enough now to appreciate how shaky were the initial assumptions upon which their knowledge rested. An additional misfortune was the absence—in the younger wreck, too—of communication systems even slightly similar to what could be derived from the theory of finite automata and information theory. Had the viroids devoured such pseudonerve networks totally? Even so, traces should have remained, vestiges. Possibly they did remain, but the people were not able to recognize them. From a transistor radio or pocket calculator dropped under a steamroller, could one deduce Maxwell's theory, or Shannon's?

The final council took place in an atmosphere of unusual tension. Steergard gave up trying to elicit positive statements. He asked only if there was any evidence at all that the Quintans had mastered sidereal engineering. He considered this the most important question. If anyone guessed why the captain insisted on the point, he said nothing. So the *Hermes* drifted in darkness, and the men lost their way in a thicket of unknowns.

The pilots—Harrach and Tempe—listened to the proceedings in silence. Nor did the doctors speak. Arago had put aside his monk's garb and in the conversation (it somehow happened that they were sitting, the four of them, in the upper level, above the control room) not once referred to his earlier words, "And what if evil reigns there?" When Gerbert observed that expectations always fell short of the reality, Arago disagreed. Consider—he argued—the many obstacles we had overcome, obstacles that our ancestors, even in the twentieth century, had believed insurmountable. Consider how smoothly the voyage had gone. We had crossed light-years without casualties, the *Eurydice* had entered Hades unerringly, and we ourselves had penetrated the heart of the constellation Harpy, and only days or hours now separated us from the inhabited planet.

"You're giving us good therapy, Father," said Gerbert, laughing. He was the only one who still addressed the Dominican that way. He had difficulty dropping the "Father."

"It's the truth, nothing more. I can't tell you what will become of us. Such ignorance is our natural state."

"I know what you're thinking, Father," Gerbert said on impulse. "That the Creator didn't wish there to be such expeditions—such meetings, such 'intercourse' between civilizations—and therefore separated them with vast space. Yet here we have not only made a pie out of the apple of Eden, but are now sawing down the very Tree of Knowledge. . . ."

"If you want to know my thoughts, I am at your service. I believe that the Creator limited us in nothing—in nothing. Meanwhile, it is unknown what will grow from the grafts on the Tree of Knowledge. . . ."

The pilots did not hear the rest of the theological discussion, because the captain summoned them: he had set course for Quinta. After presenting the navigational trajectory, he added:

"There's an attitude on board I hadn't expected. Imaginations are running a little wild. As you know, there's constant talk about enigmatic conflicts, microweapons, nanoballistics, war. This is, I think, the ballast of preconceptions. If we start trembling from the dissection of a couple of wrecked satellites, we soon won't be able to function; every move we make will seem insanely reckless. I said this to the scientists, and I'm telling you, too. And now full speed ahead. To Septima you can use

DEUS to hold the course. Then I want you at the wheel. Set up the shifts between you any way you like."

The ship's drive went on, and gravity, though weak, returned. Harrach went with Tempe to get the old science-fiction book taken from the *Eurydice*. When they parted at the cabin door, Harrach, much taller, leaned over, as if to divulge a secret, and said:

"Ter Horab knew who he was putting on the *Hermes*. Did you ever see better men?"

"Maybe, once. Not better. Men like himself."

VIII

The Moon

The planet was encircled by a ring of ice chunks in an enormous but unstable sheet. The calculations made by Field and LoBianco immediately before the plunge of the *Eurydice* turned out to be correct. Having one large and three lesser divisions due to perturbation caused by Quinta's moon, the ring could last no more than a thousand years, since it increased its diameter while at the same time losing mass. The outer rim was widened by centrifugal forces; the inner, from atmospheric friction, turned into melting fragments and vapor, so that a portion of the water thrown into space by methods unknown returned to the planet in a never-ending rain. It was hard to believe that the Quintans had intentionally provided themselves with a downpour worthy of the Flood. The ring had initially contained three to four trillion tons of ice; each year it lost many billions.

In this lay a series of mysteries. The ring interfered with the climate of the entire planet. Besides the heavy rains, its mighty shadow fell across—during the planet's revolution around the sun—now the northern, now the southern hemisphere. The ring obstructed, reflected away the light of the sun, not only lowering the average temperature but also disturbing the circulation of trade winds in the atmosphere. The border regions on both sides of the shadow seethed with storms and cyclones.

If the inhabitants lowered the level of the oceans, surely they possessed sufficient power to give the upward water (a waterfall in reverse) double the speed, thereby sending the masses of ice beyond the vicinity of the globe so that they would either melt and evaporate in the Sun without a trace or, in the form of ice meteors, vanish among the asteroids.

With insufficient power the planners would not have attempted the job in the first place, knowing that it would be bungled. Predicting the collapse was a simple, elementary task. It was not an error in planetary engineering, therefore, but something else that halted the work begun many years before. This conclusion seemed inescapable.

The ring, a flat disk with a hole that had a diameter of fifteen thousand kilometers, inside which spun the girdled planet, was made up of hunks of ice in the middle belts, but of polarized crystals of ice on the outer edges—and that, too, must have been by design. In a word, the ring was controlled in motion and shape from the very beginning; it was guided into the plane of the equator, that being stationary. But on the inside, above the equator, it became chaotic and formless. Altogether, it looked like a space structure half completed and abandoned. Why?

From the oceans rose two large continents and one smaller. The smaller was about three times the area of Australia; since it lay at the northern polar circle, the crew called it Norstralia. The infrascope discovered warmer areas on the continents, but nonseismic; perhaps these were the thermal wastes of great power plants. They were not stations that used mined materials like oil or coal, nor did they use fuels of the nuclear type. The former would have betrayed themselves with air pollution; the latter, with radioactive ash. Earth, in the early phase of atomic energy production, had had no small problem with the safe removal of such ash. But for engineers able to throw a part of the ocean up out of the gravitational sink, ejecting radio wastes would have been child's play. Yet the ice of the ring showed no trace of radioactivity. Either the Quintans had developed another form of nuclear energetics, or else they had a totally different energetics. But what kind?

In the wake of the planet stretched a tail of gas, abundant in water vapor that came mainly from the ring.

The *Hermes*, hanging in stationary orbit behind Sexta (a planet like Mars but larger, with a dense atmosphere poisoned by continual volcanic exhalations and compounds of cyanide), sent out six probes to observe Quinta. These beamed back data continuously. From the data, DEUS composed a detailed picture of the planet. The most curious thing was the radio noise. At least several hundred powerful transmitters operated on the large land masses, with no apparent phase or frequency modulation: their emission was chaotic white noise. The antennas could be precisely located; they were directional or isotropic—as if the Quintans had decided to jam all channels of electromagnetic communication, from the shortest wavelengths to those of a kilometer. They could communicate only by lines, wires, cables. But what was the purpose of the noise, which took gigawatts to produce?

Even more curious—the "curiosities" of the planet multiplied with observation—were the artificial satellites. They numbered almost a million, in high and low orbits, some of which were nearly circular and some elliptical, with aphelions reaching far beyond the Moon. The probes of the *Hermes* also noted satellites in their own vicinity, and a few were eight to ten million kilometers out. The satellites differed considerably in size and mass. The largest were probably empty: unguided space balloons. Some had collapsed when their gas escaped. Every few days one of these lifeless satellites collided with the ring of ice, creating an impressive sight, with lightning flashes every color of the rainbow, since the Sun's rays were diffracted in the resultant cloud of ice crystals. Such a cloud dispersed slowly in space. On the other hand, the active satellites—active in that they moved in determined orbits that required constant course corrections, and changed shape in an incomprehensible way, like enormous rolls of metal foil—never collided with Quinta's ring. The three-dimensional map of the satellites, holographically made, at first glance resembled a giant swarm of bees, hornets, and microscopic flies circling the planet. But this many-layered throng was not randomly distributed. One immediately saw basic patterns in it: the satellites in the near orbits frequently traveled in groups of two or three, and the others (particularly in the stationary region, where each body was synchronous with the surface of the globe) moved toward and away from the Sun as in the figures of a dance.

As the locational measurements came pouring in, DEUS made a system of coordinates, a kind of composite of spherical graphs. Distinguishing the "dead" satellites from the "live," or those drifting passively from those controlled or self-controlled, was an extremely difficult task. In the equation were many microscopic masses, all moving in the field of gravity of the large masses of Quinta and Quinta's Moon and Sun. Then the picture was sharpened, revealing a myriad of rocket and satellite remains. These frequently fell sunward. Some had the shape of toroids—doughnuts—from which jutted threadlike spikes. The largest, halfway between the planet and its Moon, showed some activity. The spikes were dipolar antennas and their emission, filtered out from the background noise of the planet, could be isolated as noise in the shortest ultraradio wavelengths. A part of this noise dropped to hard roentgen radiation, which did not reach the surface of Quinta because the atmosphere absorbed it.

Each day, DEUS added to the information acquired. Nakamura, Polassar, Rotmont, and Steergard racked their brains over this riddle composed of riddles. But the pilots did not enter into the scientific debates; they had formed their own opinion—in a nutshell, that Quinta was a planet of engineers afflicted with some mania. Or that—more bluntly—SETI had invested billions and lifted mountains in order to find a civilization gone berserk. But the pilots, too, sensed method in this madness. What came to mind was an image of "radio warfare" taken to the point of absurdity, where no one any longer transmitted anything, because each side drowned out the other.

The physicists tried to assist DEUS with hypotheses alien to humanity. Perhaps the inhabitants of Quinta differed anatomically and physiologically from us in so fundamental a way that pictures and speech were replaced, for them, by other, nonacoustic, nonvisual senses or codes. Tactile? Olfactory? A perception connected with gravity? And perhaps the noise was a transmission of energy and not of information. Perhaps the information was sent in wave-carrying fluxes not detectable by astrophysics. Perhaps, instead of continuing to filter in every possible way this seemingly senseless electromagnetic roar, one should overhaul completely the whole analytical program.

DEUS replied with its customary dryness and patience. Knowing much about human emotions, it experienced none itself.

"If the noise is a transmission of energy, there must exist receiving stations, which must let escape a certain minimum amount, a loss, for hundred-percent efficiency is impossible. But on the planet there are no receiving devices to be seen that are proportional to the power broadcast. Part of the power, able to pass through the atmosphere, is aimed at many of the orbiters. But other transmitters—and other orbiters—jam this directed radiation, and do so completely. It is as if a great crowd of people wishes to converse, but they all speak at once, raising their voices more and more. Even if each of the speakers has great wisdom, the resultant is a choral howl.

"Second, if certain bands are used for communication, they can appear as white noise if the channels of transmission are totally filled, but the Quintan noise possesses a curious quality. It is not 'absolute chaos.' Rather, it is the product of opposing emissions. Each transmitter holds exactly to a wavelength. Other transmitters either jam the first or dampen it by reversing the amplitude in phase."

DEUS illustrated for them this electromagnetic state of affairs by shifting the radio spectra to the visible zone. The white, tranquil face of the planet was replaced by a scene of multicolored vibrations. When DEUS made the coherent emitters green, their transmitters white, and the "counteremitters" purple, Quinta became a variegated ball of contending hues. Spreading purple engulfed the relays, reddening their white, and at the same time green flooded in. A blurring spiderweb of color ensued; at times one color would peak, then immediately fade away.

Meanwhile data were coming in from the probes that had been sent to reconnoiter Quinta's moon. Of the five, two had disappeared—it was not known how—at the periselenium, a point not visible from the *Hermes*. Steergard reprimanded Harrach for this carelessness; Harrach had neglected to send a reserve behind the patrol, which would have made constant monitoring of it possible even on the other side of the Moon. Three probes, however, had flown around the planet's satellite. Unable to break through the thicket of noise with a signal, they transmitted the pictures they had taken using a coded laser.

At first the information was so crowded that a single impulse, in a nanosecond, contained a thousand bits. After less than a minute of this emission, DEUS announced that from the aposelenium three Quintan orbiters, unnoticed until now because they were so small, were approaching the probes. DEUS discovered them from the heat their engines gave off in starting and by their acceleration, according to the Doppler effect. Nothing indicated that an order to intercept the patrol had been issued from the planet; there really would not have been time for that. The heated points now moved on a collision course. The captain ordered evasive action. The three-membered patrol then threw off its dummy exteriors, jettisoning before it a great quantity of metal foil and balloons, which had not fooled the interceptors. The patrol expelled a mist of sodium and shot oxygen into it, creating a fireball. The moment the Quintan rockets disappeared in it, the probes emerged from the burning cloud in a spiral and, instead of making for the ship, crashed into each other head-on and were thus atomized.

Steergard pulled in all the observational probes from their orbiting positions, and DEUS played back the results of the reconnaissance. On the opposite hemisphere of the Moon, barren and plowed with craters, a small flame possessing the spectrum of nuclear plasma went back and forth—so rapidly that, if the necessary concentrated magnetic field had not been holding it in rein, the thing would have flown off into space and been instantly extinguished. What was it that traveled back and forth there between two ancient craters, at a velocity of 60 kilometers per second? What was this *ignis fatuus*?

DEUS assured them that the planet had not discovered the *Hermes*' presence and therefore was not tracking it. There was no indication of tracking. Using Sexta's atmosphere as a lens for the radioscopes, DEUS had recorded the constant noise, the crackling that could be heard over it, which was caused by satellites striking the shield of ice.

There was a difference of opinion about what to do next. The men did not want to announce their arrival to the Quintans. The camouflage must remain in place—until they figured out at least one of the multitude of mysteries. They debated whether to send an unmanned lander to the far side of the Moon or to take the ship itself there. About the odds of success for either alternative DEUS knew as much as the crew:

nothing. The auscultation performed by the patrol suggested that the Moon was uninhabited. It did have an atmosphere. Though one and a half times as massive as Earth's moon, it was unable to hold it. And the atmosphere's composition presented still another puzzle: noble gases—argon, krypton, and xenon, with a trace of helium. Without an artificial source to replenish it, the atmosphere would have escaped in the course of a few hundred years.

Even clearer evidence of engineering was the plasma flame. But the Moon was silent; it also did not have a magnetic field. Steergard decided to land with the ship. If any beings were there, they would be underground, far below the rocky crust riddled with craters and calderas. The frozen seas of lava gleamed in a circle of streaks radiating like meridian lines from the largest crater.

They would land, but first turn the *Hermes* into a comet. Out of valves in the hull that opened along the sides came a foam from tanks; inflated by injections of gas, the foam surrounded the entire vessel with a large cocoon of irregular, hardened bubbles. The *Hermes*, like a pit in a fruit, lay in a spongy mass of globules. Even from up close it looked like an elongated chunk of rock covered with craters. The burst bubbles made the surface resemble the crust of an asteroid bombarded for centuries by dust clouds and meteors. The drive, indispensable, would be the tail of the comet, which, as it approached the perihelion, would always be directed away from the sun—an illusion created by the drive deflectors. A precise spectral analysis would have revealed, of course, a pulse and composition of gases not found in any comet. But nothing could be done about that.

The *Hermes* moved with hyperbolic velocity from Sexta to the orbit of Quinta—such high-speed comets did exist, though they were rare, coming from outside the solar system. After two weeks of flight, it braked behind the Moon and sent out manipulators with television eyes. The illusion of an old, battered rock was perfect; only under a hard blow would the fake stone give elastically, like a balloon. The landing itself could not be disguised. As the ship entered the Moon's atmosphere stern-first, her fire burned away the covering over the nozzles; the rest was done by atmospheric friction. The red-hot camouflage was torn away and the naked metal colossus, bearing down on the flames beneath it, settled on six outspread legs, testing the strength of the ground first with a series of fired shells. For a while pieces of the burned covering rained around the ship. When this stopped, the men examined their surroundings from horizon to horizon. They were separated from the plasma pendulum by the bulging ridge of a large crater.

At the prevailing pressure of four hundred hectopascals, one could use copters for reconnaissance by air: overt reconnaissance. Thus began a game with rules as yet unknown, though the stake was known.

The copters, sent in a group of eight over a thousand-mile circle, went unmolested. From their pictures a map was made encompassing an area of eight thousand square kilometers around the point of touchdown. It was the map of a typical airless globe, with a random distribution of craters half filled with volcanic tuff, except in the northeast, where magnetostats were perpetuating a moving sphere of fire. The sphere sped above the rocky ground, which had been melted along its path into a hot, shallow canyon. The copters reentered this region and took measurements and spectral analyses both in the air and upon landing. One of them intentionally approached the sphere; before it was consumed, it recorded the sphere's exact temperature and radiant power, on the order of a trillion joules. The sphere was fed and guided by an alternating magnetic field that reached 10^{10} gauss.

Steergard, taking soundings of the substratum of the canyon, had DEUS make a diagram of the network discovered there, which had junctions and numerous vertical shafts that went deep into the lithosphere. He did not appear surprised by this.

The purpose of the giant installation was unclear. There was no doubt, however, that the work had been abandoned while in full swing. All the entrances leading to galleries and shafts had been closed off or, rather, buried with explosive charges, the heavy machinery having first been thrown deep into the tunnels and wells. The plasma microsun was fed by thermoelectric transformers through a system of magnetoconduits that drew energy from the depths of the asthenosphere—about 50 kilometers beneath the outer mantle of the lunar crust.

Although he did send heavy all-terrain striders into that area to gather additional data and waited impatiently for their return, he gave orders for a prompt takeoff. The physicists, fascinated with the sublunar energy complex, would have been glad to stay longer and perhaps even to open up the stopped tunnels. Steergard refused. The captured satellites were incomprehensible; the construction begun in this desolate place with such vigor was incomprehensible; and even more incomprehensible (if incomprehensibility had degrees) was the abandonment of that work, as if in the panic of an evacuation. He did not say this to them; the thought that occurred to him he kept to himself.

Any detailed study of an alien technology was futile. Its fragments, like pieces of a broken mirror, would not yield a coherent picture; they were the indistinct result, only, of the thing that had shattered it.

The answer lay not in the tools of the civilization but in the civilization itself. Thinking this, he felt the full weight of the task entrusted to him.

Over the intercom, Arago asked if he could see him.

"Yes, but make it quick. We take off in less than an hour," he said, not delighted about the visit. Arago appeared immediately.

"I hope I'm not in your way. . . ."

"You are, Reverend Father, in my way." Steergard did not rise, pointing to a chair. "However, in view of the nature of our . . . mission, I'm at your service."

"I have no special authorization and am no ambassador extraordinary. I was assigned my place as you were yours," the Dominican quietly replied. "With one difference. On my decisions nothing hinges. On yours, everything hinges."

"I know that."

"The inhabitants of this planet are like a living organism: one may study it as much as one likes, but one cannot ask it the sense of its existence."

"A jellyfish wouldn't answer. But a man?"

Steergard looked at him intently now, as if expecting something important.

"A man, yes, but not mankind. Jellyfish are not answerable. But each one of us is, for what we do."

"I see what you're driving at. The Reverend Father wants to know what course of action I've decided to take."

"Yes."

"We are coming out in the open."
"Asking to talk?"
"Yes."
"And if they cannot meet this request?"
Steergard rose, disturbed. Arago had penetrated to what he was concealing.
Standing so close to the monk that he practically touched his knees, he asked softly, "What else can we do?"
Arago got up, straightened, reached for the man's right hand, and clasped it.
"It's in good hands," he said, and left.

IX

An Annunciation

The captain put the ship, again enveloped in its mask, into stationary orbit around the Moon, above the hemisphere not visible from Quinta, and one by one called in his comrades, to ask them how they assessed the situation and what they would do in his place.

The difference in the conjectures was tremendous. Nakamura espoused the cosmic hypothesis. The level of Quintan technology bespoke the existence of a fully developed astronomy for many years. Zeta and its planets were traveling through an inter-arm expansion of the galactic spiral and in some five thousand years would come perilously close to Hades. It was not possible to determine the critical passage exactly, because of the insoluble problem of the mutual interaction of many masses. But any *non*catastrophic passage past the collapsar had low probability. Thus the threatened civilization was attempting to save itself. Various projects had been undertaken. For example, resettling on the Moon, turning it into a navigable planet, and moving to the system of Eta Harpyiae—which was a mere four light-years away and, more to the point, was heading in the opposite direction from the collapsar. During the initial phase of the implementation of this project, the resources of energy and knowledge might turn out to be insufficient. It is also possible that one part of the civilization—one bloc of nations—

was in favor of the project, while another opposed it. It was well known that experts in different fields rarely reached full agreement in the face of a particularly complex and difficult problem.

Another project might be emigration, or astronautical flight. This idea would precipitate a crisis: the population of Quinta would surely number in the billions, and there would not be shipyards enough to build a fleet able to carry out an Exodus of everyone from the planetary cradle. To use a terrestrial analogy, the individual countries would differ considerably in industrial potential. Those in the vanguard would build a space fleet for themselves and at the same time abandon the lunar operations. Perhaps the ones who labored in the shipyards, believing that the rescue vessels were not destined for them, resorted to acts of sabotage. Perhaps this gave rise to repression, rioting, anarchy, and a radio war of propaganda. And so this project, too, would be halted in its preliminary stage, and the multitude of satellites wandering the system would constitute its aborted remains. Although Nakamura's assessment of the situation was extremely hypothetical, it was not without value. Therefore—he urged—it was necessary to establish communication with Quinta quickly. Sidereal engineering, shown to its inhabitants, might save them.

Polassar, acquainted with the Japanese's idea, felt that the facts had been twisted and stretched to support the thesis of planetary emigration.

Sidereal engineering did not manifest itself like a bolt from the blue. The power tapped from the asthenospheric installation on the Moon was three orders of magnitude removed from the power that made possible gravitology and its industrial application. Moreover, there was nothing to indicate that the Quintans would consider the Eta system hospitable to them. In a few million years, Eta would be entering the stage of the final consumption of its hydrogen, thereby becoming a red giant. And, finally, Nakamura had shuffled the data concerning the motion of the entire Harpy and of Hades—within the interval of gravitational indeterminacy—to make the critical passage of Zeta through the vicinity of the collapsar probable in as little as fifty centuries. If one took into account the perturbations caused by the spiral arm of the galaxy, the passage would be delayed to more than twenty thousand years. The knowledge that things would be awful in 250 centuries could cause panic only in demented beings. A science in its infancy, such as Earth's in the nineteenth century, might consider progress to be near its end. A more mature science, while not knowing the discoveries of the future, would know that these would increase at an exponential rate and that in the next couple of years considerably more knowledge would be obtained than had been gained in the previous millennia. Even though we did not know what was taking place on Quinta, we should establish contact with the planet. It was risky, yes, but necessary.

Kirsting believed that "anything was possible." An advanced technology did not rule out religious faiths. The pyramids of the Egyptians and of the Aztecs revealed their purpose to visitors from other worlds no more than did Gothic cathedrals. What was discovered on the Moon might be the work of some religion. Sun worship—of an artificial sun. An altar of nuclear plasma. An idol. A symbol of power or mastery over matter. But you could also have schisms, apostasies, heresies, crusades—crusades not by sword but by radio. Electromagnetic offensives to "convert the heathen"—or the heathen's informational-sacred machines. *(Deus* EST *in machina.)*

Not that this was provable or even probable. The symbols of a faith, like the creations of any ideology, did not betray their meaning to a stranger from another land. But physics did not obviate metaphysics. Trying to find a commonality of intention in the peoples of different terrestrial cultures and epochs, one knew, at least, that material welfare was nowhere considered to be the all in all, the answer to existence. Such a belief would be the exception. Technology did not have to part company with the Holy. It always possessed a goal beyond itself. And when the Holy disappeared, something had to fill that vacancy in the culture. Kirsting took the marriage of engineering and religion to such mystical heights that Steergard had difficulty listening to the man. And contact? He, too, of course, was in favor of contact.

The pilots had no opinion. The imaginative expansion of mysteries into more or less nonhuman directions did not lie within their character. Rotmont was willing to discuss the technical aspects of communication, but the first consideration was how to protect the ship from the swarms of Quintan satellites. He thought that Quinta might already have been visited by another civilization, and that that episode had ended so badly that the lesson was not forgotten. The Quintans were fencing themselves off against invasion. They had manufactured a technology of universal distrust. It was necessary to assure them of our peaceful intentions, to send them "gifts of greeting" and await their reaction.

El Salam and Gerbert were of the same opinion.

Steergard followed his own counsel. "Gifts of greeting" could be destroyed before they landed; the fate of the five patrol probes near the Moon indicated as much. So he shot a large orbiter toward the Sun, a remote-control ambassador that would present its "credentials" to the Quintans. The Ambassador beamed its message by laser signals that could penetrate the noise envelope of the planet, in a redundant code that instructed the receivers how to enter into communication with it. It sent this program several hundred times, in a loop. The answer was silence.

For three weeks, the content of the message was changed in every conceivable way—with no response of any kind. The transmitting power was increased, the laser needle swept over the entire surface of the planet, in the infrared, in the ultraviolet, modulated in various ways. The planet did not reply.

The Ambassador took this opportunity to accumulate visual details of Quinta, which it relayed to the *Hermes*. On the continents were agglomerations the size of large terrestrial metropolises. Nothing, however, lit them at night. These structures, the shape of flattened stars with tangled runways, gave semimetallic reflections. From the runways went straight lines, like arteries of transportation, except that nothing moved on them. The sharper the images obtained by the Ambassador (which to some extent was functioning also as a spy), the more evident it became that the suppositions brought from Earth were false. The lines were neither roads nor conduits, yet the land between them often imitated forests. These so-called wooded areas were created by a multitude of regular blocks with branching projections. Their albedo was almost zero: they absorbed more than 99 percent of the incident sunlight. Thus they seemed to be photoreceptors.

Could Quinta therefore have also absorbed the "credentials," its receiving stations treating them as energy-food and not as information? The Ambassador, invisible until now against the background of the solar disk, gave everything it had. In the infrared it broadcast its "overture," exceeding a hundred times the Sun's radiation in that band. Common sense said that such intense light would damage the wave absorbers; that, therefore, maintenance crews of some kind would investigate the damage and its cause; and that, sooner or later, higher-ranking specialists would recognize the signal nature of the beam. But, again, days passed and nothing changed.

The pictures taken of the dayside and nightside of the planet added to the mysteries. Nothing illuminated the darkness when the sun went down. Both large continents, raised from the ocean, with steep, snow-capped mountain chains, shone at night only with the ghostly glow of polar lights. And these lights, turning the cloudless, arctic ice into phantom-green gold, did not wander randomly but were moved, as if by an invisible, giant hand, in the opposite direction to Quinta's rotation. Neither on the inland seas of both extensive continents nor in the ocean were any vessels sighted. There was also no activity at the intersections of the straight lines that cut effortlessly through forested plains and high ridges of rock. The lines could not serve as transportation. In the ocean of the southern hemisphere, extinct volcanoes of seemingly uninhabited archipelagoes were like innumerable beads scattered across the water. The only landmass of that hemisphere, at the pole itself, lay beneath an enormous glacier. From the dull silver of its perpetual snow jutted solitary needles of rock, eight-thousand-ton pinnacles locked in ice. In the equatorial belt, beneath the arch of the frozen ring, tropical storms raged day and night, and their lightning discharges were intensified—in splashing, violet reflections—by the surface of the supraatmospheric ice like a rapidly moving mirror.

The lack of any sign of civilizational bustle, of port cities, for example, at the mouths of great rivers; the convex metal shields in mountain valleys which hid the valley bottoms with armor that was distinguishable from the natural rock only spectrochemically; the absence of air traffic, given the discovery of about a hundred smooth concrete airfields enclosed by low buildings—all this led irresistibly to the conclusion that century-long warfare had forced the Quintans underground, and that it was there that they lived, relying on the metallic vision of radioelectronics to observe the skies and outer space. The measurement of temperature gradients revealed thermal spots on the surfaces of Norstralia and Heparia, interconnected by branchings deep in the ground, as if they were cave cities. But a careful analysis of their radiation seemed to prove that idea false. Each of the wide-ranging spots, at a diameter of forty miles, manifested a strange gradient of expelled heat: the center was the hottest, but the source of its radiation lay beneath the lithosphere at the border of the mantle. Could the Quintans be drawing energy from the molten interior of their globe?

Enormous areas, geometrically regular, at first taken for cultivated land, were in reality collections of millions of conical balls, like ceramic mushrooms planted for dozens of kilometers. Transceiver radar antennas, the physicists at last decided.

The planet was wreathed in clouds, storms, cyclones, as if intentionally dead and waiting-hiding behind an incessantly transmitted sign that requested some countersign. Observations made under the heading of archeology—to discover traces of a historical past, such as ruins of cities, or things corresponding to the cultural architecture of Earth, like temples, pyramids, ancient seats of government—yielded nothing definite. If war had destroyed these totally, or if human eyes were unable to discern them for their sheer alienness, the sole bridge cast across that alienness remained technological activity. So they looked for the devices—gigantic, surely—that had been used to hurl the ocean waters into space. The arrangement of such artillery could be calculated using criteria that were universally applicable, since determined by physics. Given the direction of the rotation of the ice ring, its circumequatorial path, it was possible to deduce the localization of the planetary water-throwers. But again the searchers were stymied: the installations must have been erected where dry land met ocean—in the very region over which now sped the frozen ring, whose constant friction against the rarefied atmosphere covered the critical places with storm and downpour. Thus even the attempt to recreate the methods employed by the engineers of Quinta a century ago to shoot the seas into the void met with failure.

The detailed photographs filled the archives of the ship but had no more value, really, than blotches on the page of a Rorschach test. The meaningless contours of the star-shaped structures on the continents suggested to the human eye as many terrestrial things as the shapes a man might see—but in fact only imagine—when confronted with copious spatterings of ink. DEUS's helplessness in the face of these thousands of pictures made them realize that within the machine, too—though it was supposed to be absolutely objective in the processing of information—lay the stubborn inheritance of anthropocentrism. Instead of learning something about an alien intelligence, Nakamura remarked, they had learned how close the bonds of mental kinship were between man and his computer. The nearness of the alien civilization—practically within arm's reach—became a separating distance that mocked their attempts to get to the heart of it. They struggled, with the growing feeling that a malicious trap had been laid for the expedition, as if Someone (but who?) wished to offer them a challenge full of hope, only to reveal—at the end of the road, at the destination—its impossibility. Those who were troubled by this thought kept it to themselves, so as not to infect their comrades with defeatism.

After seven hundred hours of this fruitless diplomatic emission, Steergard decided to send to Quinta the first lander, named *Gabriel*. The Ambassador announced the *Gabriel*'s arrival forty-eight hours before takeoff, informing the Quintans that the probe was not equipped with any kind of weapon and would touch down on the large northern continent Heparia, a hundred miles from a certain star-shaped group of buildings, in a barren—hence uninhabited—area, as an unmanned emissary, with which the Heparians would be able to communicate in machine language. Although the planet did not respond to this announcement, either, they sent the *Gabriel* out of orbit, in the aposelenium. It was a two-stage rocket with a microcomputer that had, besides the standard programs of contact, the ability to revise and alter them to fit unforeseen circumstances. Polassar supplied the *Gabriel* with the best of the small terajoule engines that they had on board, so that it could cover the four hundred thousand kilometers to the planet in about twenty minutes, at a speed up to six hundred kilometers a second. It would slow down only above the ionosphere.

The physicists wanted to maintain contact with the emissary, shooting relay probes to race ahead of it, but the captain rejected the idea. He preferred to have the *Gabriel* act on its own, reporting information to them only after it made a soft landing, via a beam that the atmosphere of the Moon would focus on the *Hermes*. He felt that any earlier positioning of relays between the Moon, behind which the *Hermes* hid, and the planet might be noticed and increase the suspiciousness of the paranoid civilization. The unaccompanied flight of the *Gabriel* underscored the peacefulness of its mission.

The *Hermes* observed this flight reflected in the unfolded mirrors of the Ambassador, with a five-minute delay due to the translational distance. The perfectly chilled reflector of the Ambassador gave an excellent image. The *Gabriel* was carrying out maneuvers to make it impossible to locate the mother ship, and soon it appeared as a dark pin against the white-cloud face of the planet. Eight minutes later, the people at the screens stiffened. Instead of proceeding quickly to its designated landing site in Heparia, the *Gabriel* moved southward along a curve of increasing radius and prematurely cut its speed. They immediately saw the reason for its turn. In the belt above the equator, four black points made slowly for the *Gabriel*, two from the east and two from the west, along mathematically perfect trajectories of pursuit. The eastern chasers had already diminished the distance separating them from the *Gabriel*. The pursued craft changed shape, from a needle to a dot surrounded with blinding light: having cut its drive with a four-hundredfold overload, instead of descending to the planet it shot straight up. The four pursuing points also changed course. They began to converge. The *Gabriel* seemed motionless in the center of the trapezium whose corners were the chasers. The trapezium shrank before their eyes, indicating that the chasers, too, had shifted from orbital motion to hyperbolic and were coming together, bright with the heat of the increased drives.

Steergard was tempted to ask Rotmont, as a programmer, what the *Gabriel* would do next, because the blaze produced by the chasers was evidence of tremendous thrust. The group of five moved away from the planet, leaving in its wake a wide crater in the sea of white clouds. There was silence in the dim control room. Watching this unique scene, no one spoke. The four dots drew closer and closer to the *Gabriel*. At the edge of the field of vision, the Doppler telemeter and accelerometer spat out their little red numbers so rapidly that it was difficult to read the indicated speed. The *Gabriel* was at a disadvantage, because it had lost valuable time braking and turning around while the pursuit craft, flanking it, kept on accelerating. DEUS drew on the monitor the predicted intersection of the five trajectories. According to the telemetry and Doppler shift, the *Gabriel* would be caught in about twenty seconds. Twenty seconds was a lot, even for a man thinking a billion times slower than a computer—particularly in moments of extreme tension.

Steergard himself did not know whether or not he had made a mistake by not providing the probe with even a defensive armament. He was furious in his helplessness. The *Gabriel* lacked even a self-destruct charge. Noble intentions, too, ought to have their limits: this was all he had time to think.

The square of the hunters became as small as the dot over an "i." Although the prey and the predators were now a full planetary diameter away from the planet, the force of their drives sent tremors through the surface of the cirrus sea below. In the opening of that sea showed the ocean and the uneven coastline of Heparia. Remnants of cloud vanished in this window like wisps of cotton candy under heat.

The dark background of the ocean worsened the visibility. Only the continually racing, red-flickering numbers of the telemeter gave the *Gabriel*'s position. Its pursuers closed in on it from four sides. They were alongside it. Then the window in the clouds bulged, as if the planet were expanding like a gigantic balloon; the gravimeters gave a sharp crack; the screens blackened for a moment—and the image returned. The funnel-shaped window in the white clouds was again small, distant, and completely empty. Steergard did not immediately grasp what had taken place. He looked at the telemeter: all that blinked were red zeros.

"He let 'em have it," said someone with grim satisfaction. Harrach, probably.

"What happened?" Tempe didn't understand.

Steergard knew now, but said nothing. The absolute conviction came upon him that, though they might renew their efforts, they would lose their ship sooner than force contact. For a moment he wondered—already far in his thoughts from this first encounter—whether or not to continue with the arranged program. He barely heard the excited voices in the control room. Rotmont was trying to explain what the *Gabriel* had done, though the reconnaissance plan did not foresee this. The *Gabriel* had crushed space and the pursuers with a sidereal implosion.

"But it didn't have a sidereal generator," Tempe protested, amazed.

"It didn't, but it could have made one. It had a teratron engine, after all. It diverted it, shorted it, directed the full power of the drive into itself, in one discharge. Cunning! They were playing poker, and the *Gabriel* changed the game to bridge. It led with a trump—because there's no suit higher than a gravitational collapse. That's how it avoided capture. . . ."

"Wait a minute." Tempe was beginning to understand. "It had *that* in its program?"

"Of course not! It had a terawatt annihilative engine and complete autonomy. It went for broke. The thing's a machine, remember, not a man, so this wasn't suicide. The prime directive said that it could allow itself to be handled, but only *after* landing."

"But, then, couldn't they have pulled the teratron out after the *Gabriel* landed?" Gerbert asked, puzzled.

"How? The whole first stage, including the teratron, was supposed to melt upon penetration of the atmosphere. With immersion of the stator, the internal pressure would blow apart the poles, and everything, the engine room included, would end up a cloud of dust. And without the least bit of radioactivity. It was only the upper, forward module that was supposed to land and make pleasant conversation with the masters of the house. . . ."

"Oh, yes," Harrach growled, indignant. "It was assumed that their rockets wouldn't be able to build up such acceleration! The *Gabriel* would fly through the satellite rubbish heap like a rifle bullet through a swarm of bees, and politely set down."

"Why didn't it melt its engine when they went after it?" asked the doctor.

"Why doesn't a chicken fly?"

Rotmont was giving vent to his irritation.

"What could it melt the teratron *with*? The energy for burning the drive module was to be drawn from outside—from atmospheric friction. That's how the thing was designed. You didn't know? But let's return to the crux of the game. Either the *Gabriel* would escape, which was not very likely, or they would seize it in space, pull it down into orbit, and disassemble it. If they smothered its drive, and it waited until then to short the engine, there would have been an explosion, but a toroid having poles might survive. The *Gabriel* couldn't allow that, so it came up with the idea of a black hole with a double event horizon, sucked the hunters into itself, imploding, and when the inner sphere collapsed the outer went free, because on that scale quantum effects equal gravitational. Space curved—which is why we saw Quinta as if through a magnifying glass."

"And this truly wasn't programmed? The possibility was never even considered?" Arago said, silent until now.

"No! It wasn't! Fortunately, the machine had more upstairs than we do!" Rotmont was angered by the questions. "It was to be as defenseless as a newborn babe! The *Gabriel*'s teratron was not intended for the hyperthermic production of collapsars by short-circuiting, but the Quintans could have deduced that from the construction itself. Obviously they could have, if the *Gabriel* hit on the idea in a couple of seconds."

"By itself?"

The monk's question made Rotmont lose all patience.

"By itself! How many times do I have to say that? It had, after all, a luminal computer with a quarter the power of DEUS! In five years, Father, you wouldn't think your way through half the number of bits that it could in one microsecond. It examined itself, ascertained that it could reverse the field of the teratron and that shorting the poles would produce a mononuclear sidereal generator. The generator would burst, of course, immediately, but at the same time as the collapse. . . ."

"That was to be expected," observed Nakamura.

"If you take a walk with a walking stick and a mad dog comes at you, it's to be expected that you'll hit him over the head," replied Rotmont. "It's incredible that we could have been so naïve! But all's well that ends well. They showed their hospitality, and the *Gabriel* knew how to return the compliment. Of course, it could have been equipped with a conventional self-destruct charge, but our leader chose not to do that. . . ."

"And what took place, is that any better?" asked Arago.

"And was I supposed to install a moped engine in it? It needed power, so it got power. And the fact that a teratron resembles, in its design, a sidereal generator is not my fault but the consequence of physics. Jokichi?"

"He's right," said Nakamura, appealed to.

"In any case, they have no sidereal technology or gravistics, I'll stake my life on that," Rotmont went on.

"How do you know?"

"Because they would have used it. That whole Moloch buried on the Moon, for example, is a horse and buggy from the point of view of sidereal engineering. Why tunnel down to magma and the asthenosphere if you can transform gravitation to produce macroquantum effects? Their physics took a different road—I would say a more roundabout road, which led them away from the trump suit. Thank God! We want contact, after all, not combat."

"But won't they consider what just happened combat?"

"They might. They very well might!"

"Gentlemen, do you think you can locate any pieces of the craft that the *Gabriel* sent flying?" Steergard asked the physicists.

"Not likely—unless the collapse was highly asymmetrical. I'll ask DEUS. I doubt that the grav monitors were able to record it precisely. DEUS?"

"Locating them," said the computer, "is not possible. The blast from the opening of the outer Kerr envelope dispersed the fragments away from the sun."

"And in the vicinity?"

"An indeterminacy of a parsec was created."

"You're not serious?" said Polassar. Nakamura was also amazed.

"I am not sure that Dr. Rotmont is right," said DEUS. "Possibly I am biased, as one more closely related to the *Gabriel* than is Dr. Rotmont. In addition, I did limit its autonomy, according to the instructions that I received."

"Enough of that 'related' business." The captain did not care for machine humor. "Tell what you know."

"My guess is that the *Gabriel* intended only to disappear—by turning itself into a singularity. It knew that neither we nor they would be harmed in this way, because the probability of meeting a singularity is, practically speaking, zero. It has a diameter of 10^{-50} of a proton. Two flies, one flying from Paris, the other from New York, would be more likely to collide."

"Whom are you defending, Rotmont or yourself?"

"I defend no one. Though not a man, I speak as a man, to men. The *Hermes* and the *Eurydice* originate in Greece. Let this sound, then, as if uttered at the walls of Troy: if the crew suspects those who programmed and sent forth the *Gabriel*, I give my Olympian word that the collapse-escape was not entered in any memory bank. The *Gabriel* possessed the decisional maximum, a nanosecond heuristics with branches to 10^{32}, the cardinal number of the combinatorial set. To what use it put that capability I do not know, but I do know the amount of time it had to reach a decision: from three to four seconds. Too little, that, to determine the Holenbach interval. Thus the choice it faced was: all or nothing. If it did not close off space with a collapse, it would explode like a hundred-megaton thermonuclear bomb—because the power liberated by the short would have been such an explosion. In view of that, the *Gabriel* went to the other extreme, which ensured an implosion down to a singularity, and incidentally pulled the Quintans' missiles into the Kerr envelope."

DEUS fell silent. Steergard looked around at his men.

"All right. I'll accept that. The *Gabriel* surrendered its soul to the Lord. As to whether it checkmated Quinta in the process, we'll find out. We remain where we are. Who's on duty?"

"I am," said Tempe.

"Good. The rest of you, to bed. If anything happens, wake me."

"DEUS is always on duty," offered the computer.

Alone in the control room with the lights on dim, the pilot circled like a swimmer in invisible water, past dead and empty screens, and rose to the ceiling. Struck by an unexpected thought, he kicked off from the ceiling and flew to the central videoscope.

"DEUS?" he said in a low voice.

"Yes."

"Show me again the final stage of the chase. Slowed down five times."

"Optically?"

"Optically with an infrared overlay, but the image shouldn't be too blurred."

"The degree of blurring is a matter of taste," replied DEUS as the screen lit up. Along the frame flashed the numbers of the telemeter. They did not rush at lightning speed as before, but changed in small jumps.

"Cross hairs on the image."

"Very well."

The picture, intersected stereometrically, whitened with clouds. Suddenly it shook, as if seen through rushing water. The lines of the grid began to bend. The distance between the needle of the *Gabriel* and the pursuers decreased. At slow motion, everything took place as in a drop of water under a microscope, when comma bacilli swim toward a black speck in suspension.

"Differential Doppler telemetry!" he said.

"Space is losing its euclidean structure," replied DEUS, but switched on the differentiator. Though the squares of the grid trembled and bent, distance could still be roughly estimated. The commas were a few hundred meters from the *Gabriel*. Then a large expanse of the planet beneath the five clustered black points swelled in a violent magnification, only to return instantly to its normal appearance. But the black dots had all vanished. In the place where they had been there was a slight stirring, as of air. It gave a terrible blaze of red, like a gush of shining blood, which formed a scarlet bubble that turned brown, dimmed, and went out. The far clouds, dispersed thousands of miles by the shock, lazily rotated above the surface of the ocean, which was darker than the continental coast to the east. The window, with its swirling edges, still gaped wide and round, but was empty.

"Gravimeters!" called the pilot.

"Very well."

The picture did not change; only the geodesic lines coiled up in the center, a skein of tangled threads.

"Microgravs! DEUS, you know what I mean!"

"Very well."

DEUS spoke, as always, in an unemotional voice, and yet it seemed to the pilot that there was a touch of impertinence in the tone. As if the machine, superior to him in quickness of thought, was carrying out its orders uncooperatively, to make him feel this superiority.

In the clump of tangled lines there was an almost imperceptible flutter; it cut through the thick of the grid and was gone. The geodesic knot straightened out. Against the background of the white planet with the crater in the clouds like the eye of a giant cyclone once again stood a rectangular array of gravitational coordinates.

"The *Gabriel* shot nucleons into itself, nucleons having a tera-voltage?" asked the pilot.

"Correct."

"Tangentially, with an accuracy to one Heisenberg?"

"Correct."

"Where did it get the additional energy? Wasn't its mass too small to bend space into a microhole?"

"The teratron, shorted, acts as a sidereal generator. It pulls in energy from outside."

"Creating a deficit?"

"Yes."

"In the form of negative energy?"

"Yes."

"Over what range?"

"At greater-than-light speed in hyperspace, the *Gabriel* drew energy over a radius of a million kilometers."

"Why didn't Quinta detect this, or the Moon? Why didn't we?"

"Because it is a quantum borrowing in the Holenbach interval. Should I explain?"

"No need," the pilot answered. "Since the collapse took place in less than a millionth of a nanosecond, two concentric event horizons formed, of the Rahman-Kerr type."

"Yes," said DEUS. It could not feel surprise, but the pilot sensed respect in the word.

"Which means that the singularity, left after the *Gabriel*, no longer exists in this world. Calculate it out, see if I'm right."

"I did the calculation," said DEUS. "It does not exist, with a probability of 1:10,000."

"Then why did you give the captain that harangue about the colliding flies?" asked the pilot.

"The probability is not zero."

"Judging by the movement of the geodesics, the collapse showed strong buckling away from the sun. If one reduces all the bodies of the system to point-masses, one should be able to find the focus where those rockets of theirs were thrown—by the macrotunneling effect. True?"

"True."

"The blur cannot have the dimensions of a parsec. It must be shorter. You can calculate it?"

"Yes."

"Well?"

"The tunneling takes place probabilistically, and the independent variables of the probabilities multiply."

"Let's translate that into common sense. Besides Zeta there are nine planets in this system. The result is a nonlinear set of equations impossible to integrate, but the planets took their angular momentum from the protosun; therefore one can reduce the mass of the whole system to its center."

"That is very imprecise."

"Imprecise, but not by a parsec."

"Are you one of those phenomenal number wizards?" asked DEUS.

"No. I come from a time when calculations were also made without computers. Or sometimes one had to proceed 'not by π but by eye.' Anyone who couldn't do that in my profession died young. Why are you silent?"

"What am I supposed to say?"

"That you are not infallible."

"I am not."

"And that you have no business being called DEUS."

"I did not name myself."

"Even a woman wouldn't get in the last word, with a computer. DEUS—you are to calculate the probability distribution along that parsec of yours. It should be bimodal. You will mark this region on a star map and early next morning show it to the captain, with the explanation that you didn't feel like working it out before."

"No one told me to do that."
"I'm telling you now. Understand?"
"Yes."
And with this the midnight dialogue in the control room was concluded.

X

The Attack

That which mathematically has an extremely low probability also has this characteristic: that it may nevertheless sometimes happen. Of three of the chase craft that were sucked into the compressed space and then expelled—with the gravitational return to equilibrium—away from the sun, there was no trace found; but the fourth *was* found and taken on board, barely eight days later. DEUS explained this truly remarkable coincidence with sophisticated topological analysis, using the transfinite derivatives of ergodics. But Nakamura, who heard from Steergard about the midnight argument between the pilot and DEUS, remarked that for what happened in reality one could always come up with a calculation, using tricks known to anyone who ever engaged in applied mathematics. As the shattered, crumpled wreck was being drawn into the ship by cranes, Nakamura, curious, asked the pilot how he had reached his conclusion. Tempe laughed.

"I'm no mathematician. If I did any reasoning, I couldn't tell you what it was. I don't recall who proved this to me, or when, but if a man wants to determine the probability of his own birth, by going down the genealogical tree past parents, grandparents, great-grandparents, he can obtain a value as near zero as he likes. If the parents didn't meet by accident, then the grandparents did, and by the time one gets to the

Middle Ages the set of perfectly possible events that would rule out all the conceptions and births necessary for one to be born becomes greater than the set of all the atoms in the Universe. In other words, each of us has no doubt whatever that he exists, despite the fact that no stochastics could have predicted him a couple of hundred years earlier."

"Of course—but what does that have to do with effects from singularities in the Holenbach interval?"

"I have no idea. Probably nothing. I'm no expert on singularities."

"No one is. Our apostolic delegate would say that it was divine inspiration."

"Divine, I don't think so. I simply took a good hard look at the *Gabriel*'s demise. I knew that it didn't wish to destroy its hunters. Thus it did what it could to avoid pulling them under the Kerr horizon. I saw that the pursuing craft were not in a perfect row behind the *Gabriel*. If they differed in distance, then they might differ, too, in what happened to them."

"And it was on that basis . . . ?"

The Japanese now laughed, too.

"Not only. There are limits to calculation. It's called *limes computibilitatis*. DEUS stands on that boundary. DEUS won't touch problems that it knows are transcomputable and therefore insoluble. Which is why it didn't even make the attempt, and I was lucky. What does physics have to say about luck?"

"The same as about one hand clapping," said Nakamura.

"That's Zen?"

"Yes. And now come with me—this catch belongs to you."

In the glare of many lights, in the middle of the hall, on a duraloid slab, the dark wreck lay like a charred and split-open fish. Dissection revealed the now familiar cellular structure, luminal engines of considerable power, and a melted device in the head, which Polassar thought was a laser gun but Nakamura believed was a kind of light-throttle for the drive, since the object had been to capture the *Gabriel* and not destroy it. Polassar suggested that this forty-meter corpse be removed from the ship, because, along with the earlier finds, it took up almost half the hall. Why turn the hall into a junkyard? El Salam disagreed. He wanted to hold on to at least one specimen, preferably the last, though when asked by the captain he could not come up with a rational reason.

The question did not concern Steergard. The situation was radically changed, he felt, and he wanted to hear from the men what line of action they now considered appropriate or best.

After the satellite scrap was cast overboard, a council was to be held. The two physicists went first to Rotmont, in order, as Polassar said sourly, to "draft a statement and back it with a bibliography."

And, in fact, those three did want to coordinate their stand—because in the conversations among the crew since the destruction of the *Gabriel* one could detect the signs of a lurking split.

It is not known who was the first to use the expression "show of strength." Harrach immediately declared himself in favor of such a tactic; El Salam also, but with reservations; the physicists and Rotmont were opposed, and Steergard, though he only listened, seemed to be on their side. The others did not take the floor. During the council, the views of both groups came into sharp conflict. Kirsting, surprisingly, joined the advocates of "strength."

"Force is indeed an irrefutable argument," Steergard finally said. "I have three cautions regarding this strategy, and each is a question. Do we in fact have the upper hand? Can such blackmail lead to the establishment of contact? And will we be prepared to carry out our threats if *they* do not submit to them? These are rhetorical questions. None of us can answer them. The consequences of a strategy based on shows of strength are incalculable. If anyone disagrees with me, let him speak."

The ten men in the captain's cabin looked at one another.

"As for El Salam and me," Harrach said, "we would like the captain to present his alternative. We see no alternative. Our situation gives us no choice. Surely that is obvious. Threats, force, blackmail: these are unappetizing words. Put into action, they can lead to catastrophe. The question of who has the upper hand is the least important. It doesn't matter whether or not we do, but whether or not *they* think we do, and submit without a struggle."

"Struggle . . . ?" echoed the monk.

"Encounter. Confrontation. Does that sound better, Father? But we should avoid euphemisms. The threat of force—putting aside the question of what kind—must be real. Threats not backed by the possibility of action are tactically and strategically worthless."

"Yes, let's avoid euphemisms," agreed Steergard. "Though it would also be possible to bluff. . . ."

"No," said Kirsting. "Bluffing assumes a minimum familiarity with the rules of the game. We don't know the rules."

"All right," said Steergard. "Suppose we have a genuine superiority, and we can display it without causing them any direct harm. An open threat. If such persuasion proves futile, Harrach, then according to you we will have to attack, or at least repulse an attack. Hardly an auspicious prelude to mutual understanding."

"Hardly," Nakamura supported the captain. "It would be the worst way to begin. Though, true, we are not the ones who created this situation."

"May I say something?" asked Arago. "We do not know why they tried to catch the *Gabriel*. Most likely it was in order to do to it what we did to two of their satellites near Juno and now with their chasers. Yet we do not consider that we acted as aggressors. We desired to examine products of their technology; they desired to examine *our* product. It's simple symmetry. There is no need, therefore, to speak of shows of strength, demonstrations of destruction, attacks. A mistake doesn't have to be equivalent to a crime. Though it *can* be."

"There is no symmetry," Kirsting objected. "All together, we sent out eight million bits of information. We signaled from the Ambassador for over seven hundred hours in a circle, on all bands. We lasered. We transmitted the codes and the instructions for their decoding. We sent a lander that carried not a gram of explosives. As for the information transmitted—we gave them the location of our solar system, pictures of Earth, an outline of the evolution of our biosphere, the facts of anthropogenesis, a whole encyclopedia. And the physical constants, which are universal throughout space and of which they must be fully cognizant."

"But of sidereal engineering, of the Holenbachian foramina, of the Heisenberg units there was no mention, was there?" said Rotmont.

"Nor of our drive systems and gravitational ranging, of the whole SETI Project, of the *Eurydice*, the gracers, Hades . . ."

"No. You know best what wasn't included, since you made the programs for the Ambassador yourself," said El Salam. "Nor was there mention of the death camps, of the world wars, of the witches burned at the stake. But when someone goes visiting for the first time, he doesn't put everything out on the table—his sins, Daddy's sins, Mommy's sins, etc. If we, in a general way and most politely, informed them that we were able to turn a mass larger than their moon into a thing that could fit inside a keyhole, then Father Arago would tell us that this smacked of criminal blackmail."

"I offer myself as mediator," Tempe cut in. "Inasmuch as they don't sit in caves and light fires by striking flints, but have space travel at least out to the diameter of their system, they know that we didn't get here by rowboat, kayak, or schooner. And the simple fact that we are here, from a distance of hundreds of parsecs, means more than any flexing of huge biceps."

"*Recte. Habet*," whispered Arago.

"Tempe is right," agreed the captain. "Our very arrival may have alarmed them, particularly if they are technologically incapable of galactic flight but know what orders of power are required for it. . . . Up until the activation of the Ambassador we assumed that they knew nothing about us. But if they became aware of the *Hermes* much earlier—and we have been in orbit here three months—then *our* silence, *our* camouflage, could seem ominous to them. . . ."

"You exaggerate." Harrach shrugged in irritation.

"Not at all. Imagine that it is the year 1950, or 1990, and above the Earth galactic cruisers hover, a mile long. Even if they rained down only chocolates, there would be tremendous confusion, panic, not to mention political crises, since every civilization in the multistate phase must have internal conflicts. No show of strength is needed from us, because the crossing of a hundred parsecs itself is such a demonstration—to those who cannot accomplish it. . . ."

"Very well, then, Captain—what do you suggest we do? How are we to show our good-natured, mild-mannered, peaceful, friendly intentions? How do we assure them that we present no threat to them in any way, that we are just a group of boy scouts on a hike, headed by a priest—when four of their best fighting machines, each fifty times heavier than our archangel, were blown out of the continuum by it like specks of dust? El Salam and I, I see now, were mistaken. The guests arrived with flowers; in the garden, the host's dog attacked them; one guest, attempting to drive the beast away with his parasol, inadvertently impaled the host's auntie. Why talk of a show of strength? It's the snows of yesteryear, it already took place!"

Harrach, with a broad grin, and not without malice, addressed this to the captain but kept his eyes on the monk.

"The asymmetry does not lie where you think it," said the Dominican. "To those who do not understand us we cannot be the bearers of good tidings. Saintly intentions cannot be demonstrated as long as they remain only intentions. Evil, on the other hand, *can* be demonstrated, by causing harm. It is a *circulus vitiosus*: in order to communicate with them, we must convince them of our peaceful intentions, but to convince them of our peaceful intentions, we first need to communicate with them. . . ."

"How is it that everything that's happened here wasn't taken into account by our great thinkers, the planners-directors of CETI and SETI?" asked Tempe angrily. "All this just fell on us out of the blue? It's unbelievably stupid."

The cabin was filled with raised voices arguing. Steergard said nothing. He thought that in this fruitless debate—he saw the futility of it—the men, without fully realizing it, were giving vent to the frustration that had mounted in the course of the repeated attempts to communicate with Quinta. This was the result of sleepless nights, the unrewarded zeal of the investigation of the Moon, the building of hypotheses that, instead of giving insight into the alien civilization, fell apart like a house of cards. The frustration made some feel that they were surrounded by riddles without solutions, or were lost in a maze without an exit, and it made others suspect "them," more and more, of collective paranoia.

If indeed there was paranoia on Quinta, it was contagious. Steergard noted that the indicator light above the shelf by his bunk, in the back of the cabin, was off. Someone had thrown the switch in the control room, cutting off the central brain of the ship from this cabin, someone who apparently did not want the cold, rational, logical presence of DEUS at this meeting. Steergard did not ask who had done it. He knew his men; among them there was no coward or liar who would deny the action—but it might have been done unconsciously, like covering one's nakedness before a stranger, in a reflex quicker than modesty.

So he said nothing, but turned the terminal back on and requested DEUS to make an optimal decision prognosis.

DEUS replied that it lacked sufficient data to optimize moves. In the request, besides, there was implicit an inevitable anthropocentrism. People spoke about themselves and others in terms of good or bad. The same applied to their general history. Many considered history an accumulation of cruelties, of senseless subjugations—senseless even without considering ethics, since neither the aggressors nor their victims derived anything but the breakup of culture, the fall of empires, on whose ruins new empires rose. In a word, many held human history in contempt, but as a rule no one thought that it was some hideous, horrible psychozoic aberration in the Universe—that the Earth was a planet of brutal murderers, unique among millions of globes, a place where intelligence yielded blood and pain, contrary to the cosmic norm. As a rule, people, in their heart of hearts, without thinking about it overmuch, considered Earth's history—in its whole course, from the paleopithecus and australopithecus up to the modern day—to be "normal," a type frequently encountered in the set of cosmic civilizations.

But in this matter nothing was known, and no method existed whereby from that informational zero anything more than zero could be extracted. The Ortega-Nilssen chart indicated only the average time separating the birth of the protoculture from the technological explosion. The curve of the diagram—the so-called main road of the psychozoics—did not reflect either biological or sociological (cultural, political) factors, which together shaped the specific history of the Intelligent Beings. Such an omission was justified by terrestrial experience, because the clashes between different faiths and cultures, between different forms of government and ideology—colonializations and decentralizations, the rise and fall of empires—in no way interfered with the *pace* of technological advances. This was a parabolic curve unaffected in its course by such historical disturbances and shocks as invasions, plagues, and genocides, because technology, once it gained momentum, became a variable independent of the civilizational substructure. It became, in integration, a logistic curve of an autocatalytic process.

Individual people—on the microscopic scale—always made inventions and discoveries, whether singly or in groups, but these creators could be factored out of the equation, because it was inventions that gave rise to inventions, and discoveries that led to discoveries. This acceleration described a parabola that seemed to soar to infinity. A saturation bend in the curve was not caused by other individuals who sought to protect the environment; the curve would bend only where a failure to bend would destroy the biosphere. Invariably it would bend at the critical point, for if technologies for saving or replacing the biosphere did not come to the rescue of the technologies of expansion, the given civilization would enter a crisis to end all crises, i.e., extinction. With no air to breathe, there could be no one to make further discoveries and receive Nobel prizes.

According to the data of cosmology and astrophysics, the main road of Ortega-Nilssen thus reflected only the limiting *capacity* of the given biosphere (also termed its maximum technological load). But that capacity did not depend on anatomy or on the organizational forms of collective life; it depended on the physical-chemical features of the planet, its ecospheric position, and other cosmic factors, including stellar and galactic influences, etc. Wherever the biosphere's load limit was reached, the main road broke off, which meant only that the civilizations in question were obliged to come to some global decisions about their future. When they were unwilling or unable to do this, they perished.

The breaking off of the main road coincided with the so-called upper frame of the window of contact. That frame or boundary—also called the "growth barrier"—accounted for the subsequent branchings from the monolithic trunk that was the main road, because different civilizations continued their existence in different ways. Though as yet no information had been exchanged with any psychozoic, it was known from calculation that there was not one and only one optimal decision, no best way out of the trap created by the technosphere's damage to the biosphere. Even a united civilization did not have before it a single path that would lead it safely through the multiplying dilemmas and perils.

As for the current situation, it was the result of inappropriate actions that came of departing from the expedition's original program. In DEUS's opinion, the series of wrong steps ensued because they did not appear wrong at the time that they were made; their wrongness revealed itself only in retrospect. More precisely, the *Hermes* had been drawn into Arrow's paradox: the decider attempts to accomplish two things that are each of value but that cannot both be accomplished. In the range between maximum risk and maximum caution ran a resultant from which it would be difficult to extricate themselves. DEUS did not think that the captain was to blame for the present impasse, because the captain had sought to strike a compromise between risk and caution. After capturing the Quintan orbiters behind Juno and discovering their "viroids," he had deviated from the program toward excessive caution, camouflaging the ship and not sending signals to Quinta announcing visitors from outer space. The price of that caution was evident now.

The second error lay in giving the *Gabriel* too much autonomy, too much inventiveness. Paradoxically, this also came from excessive caution—and from the mistaken assumption that the *Gabriel*, superior in speed to the orbiters or rockets of Quinta, could land without letting itself be intercepted. In order for it to possess such speed, it was given a teratron drive. And in order for it to respond suitably to the unforeseen behavior of the host upon landing, it was given a too-intelligent computer. The SETI program called for sending, first, smaller probes; but this was rejected when the diplomatic exertions of the Ambassador all came to nothing. No one dreamed that the *Gabriel* would transform its drive unit into an implosive sidereal gun. Thus, because of the ingenuity of the *Gabriel*'s computer, they found themselves in a predicament. It was now impossible to send other probes as if nothing had happened. A new situation called for new tactics. DEUS needed twenty hours to think. That was where the matter stood.

After his evening watch, the pilot could not sleep. He kept thinking about the council; it had resulted in nothing for him but an increased dislike for DEUS. That mighty electronic mind might be brilliant at logic, but the effect it produced was strikingly pharisaical. Mistakes had been made, they had all departed from the program, yet the captain was not held accountable, nor did DEUS itself bear the least responsibility for this, as it proved with great precision. Arrow's paradox; the camouflage fraught with evil consequences; the excessive suspicion regarding the Quintans, kindled by the sabotage hypothesis to explain the origin of the viroids, as DEUS now so clearly defined the problem—and who had served, all this time, as adviser to the captain?

Buckled to the bed because he was weightless, he finally grew so angry that sleep was out of the question. So he turned on the pointlight over his head, pulled a book out from under the bunk, *The Hermes Program*, and started to read.

First he leafed through the general assumptions about Quinta. This was a computer printout made just before takeoff from the *Eurydice*, based upon the collected and interpreted astrophysical observations. The Quintans had at their disposal energy on the order of 10^{30} ergs. Their civilization was thus on the presidereal level. The major sources of energy were undoubtedly thermonuclear reactions of the stellar type, but power stations had *not* been launched into space. Most likely, the exhaustion of fossil fuels, as on Earth, led to a period of the use of the uranides, whose further exploitation proved unprofitable after mastery of the Bethe Cycle. It seemed improbable that in the last hundred years the planet had gone through wars waged with nuclear weapons. The equatorial cold spot could not have been the result of such warfare. Any postatomic winter would have had to encompass virtually the entire planet, since the masses of dust thrown into the stratosphere would increase the albedo of the whole surface. The reasons for halting the construction of the ice ring from ocean water were unknown.

He flipped through pages filled with graphs and tables, until he came to the chapter "Hypotheses on the Civilization."

> 1) Quinta suffers from internal conflicts, which have influenced technological development. This suggests the presence of antagonistic nations or other aggregations. The period of open military encounters, belonging to the past, led to no resolution of the "conqueror-conquered" type. Instead, it gradually entered the phase of secret warfare.

At this point an additional printout from DEUS was attached, done later, on board the *Hermes*:

> Evidence supporting the thesis of cryptomilitary activity are the parasites found in the two Quintan satellites. In this interpretation, blocs of adversaries remain, together, in a state that is neither classical peace nor classical war in the Clausewitzian sense.
>
> Their struggle takes place beyond front lines, in meteorological damage inflicted on the enemy, or in mutual catalytic erosion of technoindustrial potentials. This may have halted the creation of the ice ring, since that task would require global cooperation.

The continuation again was from the *Eurydice*:

> If there exist such groups of antagonists and they contend nonclassically, then contact with any visitor from space may be rendered considerably more difficult. The *a priori* establishment of an alliance with the visitor is highly unlikely for either of the parties, if there are only two, because the extraplanetary intruder would have no rational reason, would have nothing to gain by taking sides in the conflict. Contact could actually serve as the spark that would turn the quiet, smoldering, steady, and stubbornly pursued secret war into a full-scale, head-on clash between both powers.
>
> An example. Let there be, on planet T, blocs A, B, and C, all locked in mutual conflict. If B establishes contact with the intruder, A and C will feel themselves seriously threatened. They may either attack the intruder—to keep him from increasing B's potential—or join in attacking B. The situation is unstable to begin with, and any introduction of an outside factor of great technological potential—such as the visitor must possess, having made his galactic jump—may suffice to escalate the hostilities.
>
> 2) Quinta is united, a federation or a protectorate. There

are no equal antagonists on the planet, since one of the powers has acquired dominion over the others. Such dominion, whether the result of military victories or accomplished through nonmilitary subjugation, the weaker sides having submitted to the major power of the globe, also does not provide stability in the face of contact with a galactic intruder.

One should not impute to the global power demonic or imperialistic designs of extraplanetary expansion. In this model of Quinta, the power does not wish to destroy the visitor but only to frustrate his efforts to establish contact—and, especially, to land on the planet. The technological gifts of the visitor could easily turn out to be poisonous. (Yet the attempt itself to keep such gifts from being offered, to prevent them from disturbing the current sociopolitical equilibrium, could disturb that equilibrium.) Thus in a united system as well, refusal of contact could be a sensible decision for the global powers. This policy of isolationism, directed toward outer space, has many precedents on Earth. The information threshold of contact to be surmounted by the visitor is indeterminate in magnitude.

3) According to Folger, Kraft, and their group, a unified planet that has neither conquerors nor conquered, neither oppressors nor oppressed, may still not desire contact. The basic dilemmas of such a civilization that is beginning to veer from the Ortega-Nilssen path, near the upper region of the window, lie at the intersection of its culture and its technology. Culture is always characterized by a consistent lag of legal and moral-ethical norms behind the technology in its presaturated, parabolic period of acceleration. The technology makes possible what the cultural tradition forbids and considers unchangeable. (Examples: genetic engineering applied to beings corresponding to people; the control of sex; brain transplants.) In the light of such difficulties, contact with visitors shows its equivocal nature. The planetary party, rejecting contact, need not ascribe to

> the intruders any unfriendly motive. But its fears are justified: the injection of radically new technologies can destabilize social bonds and relations. Contact, moreover, is unpredictable in its consequences. This does not apply to radio contact—or any contact at a distance—since the receivers of the signals can, at their own discretion, make use of or ignore the acquired information.

He was tired now, but still could not sleep. He flipped past several chapters and read the final one, on the procedure for contact.

The SETI Project had addressed the above problems as difficulties a guest might experience in communicating with his prospective host. The expedition therefore had been equipped with special devices for communication as well as with automata that would be able, in the absence of preliminary negotiations through an exchange of signals, to demonstrate the peaceful nature of the expedition prior to landing. The initial procedure had many steps. The first announcement of the arrival of the ship from Earth would be an emission of waves (ranges given in an appendix) in the radio, heat, light, ultraviolet, and particle-beam bands. If there was no response, or an unintelligible response, landers would be sent to all continents. The landers' guiding sensors would direct them toward large concentrations of buildings.

There were also plenty of sketches, diagrams, and specifications. In each lander there would be a transmitter-receiver and data about the Earth and its inhabitants. If this step, too, failed to elicit the desired reaction—the establishment of contact—heavier probes would be shot from the ship. These would have computers able to give instruction in the use of visual, tactile, and acoustic codes. The procedure was irreversible, with each step a continuation of the one preceding.

The first landers contained indicator-emitters that could be activated only by the brutal destruction of their shielding: destruction caused not by a malfunction or a hard landing but by intentional, nondiscursive dismantling. (The pilot smiled at this wording to describe a caveman type bashing the transistorized emissary of humanity with his flintstone club. "Nondiscursive dismantling" also took place, he thought, when without explanation you knocked someone's teeth down his throat.)

The indicators, grown from monocrystals, were so highly resistant that they could send a signal even if the lander was destroyed in a fraction of a second—blown up in midair, for instance, by an explosive. The program went on to describe in detail the different models for these messengers, and the volleys with which they should be dispatched, in synchronization, to the chosen landing fields, so that no region, no continent, would be privileged or omitted, etc.

The book also contained a dissenting opinion from a group of SETI experts who were extreme pessimists. There were no material devices, they stated, no dispatches or declarations easy to decipher, that could not be interpreted as a mask concealing aggression. This resulted simply from the inevitable difference in technological levels.

The phenomenon that in the nineteenth and especially twentieth centuries was called the "arms race" came into the world with the paleopithecanthropus, when he employed the long thighbones of antelopes as clubs, crushing more than chimpanzee skulls with them, since he was a cannibal. Then when science, the mother of accelerated technology, arose at the crossroads of the Mediterranean cultures, the military progress of the warring European nations—and later of the non-European—never gave one side an overwhelming advantage over another. The single exception to this rule was the atom bomb, but the United States enjoyed that monopoly only for the briefest moment in history.

But the technological gap between civilizations in the Universe had to be enormous. What is more, to hit upon a civilization endowed developmentally as Earth's was would be, practically speaking, impossible.

The thick volume included a number of other learned speculations. The visitor who initiated an underdeveloped host into the arcana of sidereal engineering might as well be giving children live hand grenades to play with—with the safety caps off. If, however, he did *not* reveal his knowledge, he risked being suspected of duplicity, of seeking to dominate, and thus he was damned either way.

The profundity of the arguments finally overcame the reader, who with the help of the SETI program fell into such a sound sleep that the book remained in his hand and the light of the lamp did not disturb him.

He was walking down a narrow, steeply downhill street, between houses, in the sun. Before the arches, children played. Laundry hung on lines at the windows. The uneven pavement, strewn with trash, banana peels, scraps of food, was cut by a gutter full of muddy water. Far at the foot of the hill was the port, crowded with sails. Shallow, lethargic waves lapped the beach; boats pulled up on the sand were separated by fishing nets. The sea, smooth to the horizon, gleamed with a ribbon of reflected sun. He smelled fried fish, urine, olive oil. He did not know how he got here, but knew that it was Naples. A small, swarthy girl ran, shouting at a boy who was fleeing with a ball. He would stop, pretend to throw her the ball, then dodge away before she could catch him. Other children shouted something in Italian. A woman was leaning out of a window; disheveled, in a chemise, she pulled in from the line stretched across the street her dry slips and skirts. Farther down began stone steps, cracked. Suddenly everything shuddered, there was a roar, walls began to crumble. He stood dumbfounded in a cloud of limestone dust, blinded. Something fell behind him. Women screamed—a rain of bricks—the thunder of the earthquake was deafening. *Terremoto, terremoto*—the cries were lost in the second, slowly building roll of thunder. Pieces of plaster fell on him; he covered his head with his arms, felt a blow in the face, and woke, but the earthquake did not go away. A tremendous weight pinned him to the bed. He tried to jump up; the belts held him. His book struck him in the forehead and flew to the ceiling. This was the *Hermes*, not Naples, but there was thunder and the walls reeled. He could feel the whole cabin moving. He hung, suspended. The lamp flickered. He saw the open book and a sweater flattened on the ceiling beneath him; from the upside-down shelves flew spools of film. It was not a dream, and it was not thunder. The sirens wailed. The light dimmed, flared, went out, and the emergency lights in the corners—of the floor now—switched on. He tried to find the clasps on the belts to release them, but the buckles, pressed by his chest, would not let go. His hands grew leaden; blood rushed to his head. He stopped struggling. He was thrown. The weight forced him now against the belts, now against the bed. He understood. He waited. Was this the end?

At that hour—it was after midnight—there was no one in the darkroom. Kirsting sat down in front of the dead visiscope, buckled himself in by feel, found the buttons like a blind man, and set the tape in motion. Across the white rectangle of the illuminated screen moved, one by one, tomograms, almost black, with masses of brighter, rounded lines like X-ray shadows. Frame after frame went by until he stopped the tape. He was examining the surface SGs of Quinta. Gently he turned the micron dial to find the best image. At the center was a bristling convergence, as of an atomic nucleus, which scattered in fragments radially when hit. He shifted the image from the formless, milky spot at the center to its attenuated periphery.

No one knew what the thing was. An inhabited building complex, a kind of giant city? On this frame one could see it in section, traced by nucleons of elements heavier than oxygen. Such tomography—three-dimensional, layered X-raying—of astronomical objects, known for a very long time, proved useful only for stars cooled to black dwarfs and for planets. But with all its ingeniousness, SG imaging had its limitations. The resolution was insufficient to allow one to distinguish the individual fossils, even if they were larger than the giant dinosaurs of the Mesozoic and Cretaceous. Nevertheless, he tried to make out the skeletons of the creatures of Quinta—and perhaps it was only those corresponding to people that filled this pseudocity, if indeed it *was* a metropolis of many millions. He reached the limit of resolution and crossed it. Then the tiny specters made of pale, trembling filaments were dispersed. The screen showed a dim chaos of motionless granulations.

As delicately as he could, he moved the micron dial back, and the shadowy image returned. He selected the sharpest SGs at the critical meridian and superimposed these until the contours of Quinta were lined up like a whole sheaf of X rays of the same object taken at high speed and composited. The "city" lay on the equator. The SGs had been made along the axis of Quinta's own magnetic poles, and along the tangent to the planet's crust. Therefore, if the building complex extended for thirty miles, the photographs cut through it obliquely—as if one were to X-ray from a suburb all the streets, squares, and houses between oneself and the opposite suburb. This yielded little. Looking upon a multitude of people from a height, one would see them in vertical foreshortening. But looking along the horizontal, one saw only the closest people, at the entrances to the streets. An X-rayed crowd would appear as a jumble of many skeletons. Granted, it was possible to distinguish the buildings from the pedestrians: since the buildings did not move, everything that remained in place over a thousand SGs could be filtered out. Vehicles could also be removed from the picture by a retouching process that erased anything that traveled faster than a man on foot. If one were dealing with a large terrestrial city, then houses, bridges, factories would vanish, along with cars and trains, leaving only the shadows of the pedestrians. But premises so strongly geo- and anthropocentric were of questionable value. Still, Kirsting hoped that he would be lucky.

He came to the darkroom often at night and went over the rolls of pictures countless times on the chance that he might accidentally select and juxtapose the right SGs and perhaps see—albeit poorly, in a fuzzy outline—the skeletons of these beings. Were they hominoid? Or even vertebrates? Was it calcium, compounds of calcium, that supported their frames, as with the terrestrial vertebrates? Exobiology considered the man shape to be unlikely, but osteological similarity to the skeletons of Earth was possible, considering the mass of the planet and the composition of the atmosphere. Free oxygen suggested the presence of vegetation, but plants would not engage in space travel or the manufacture of rockets.

Kirsting did not count on a hominoid bone structure, which was the outcome of intricate, interconnected paths in terrestrial evolution. But even bipedality and erect stature did not justify anthropomorphism. Thousands of prehistoric reptiles, after all, had walked on two legs. If one were to make SGs of a pack of running iguanodon fossils, at a great distance they would be indistinguishable from marathoners.

The sensitivity of the apparatus went far beyond the wildest dreams of the fathers of spin-resonance imaging. He could detect an eggshell, from the calcium, at a distance of a hundred thousand kilometers.

Sometimes it seemed to the scientist that he saw among the misty blotches microscopic threads brighter than the background, like a frozen Holbein dance of death photographed through a telescope. And that, if he increased the magnification a little, he would be able to see the skeletons in fact, and they would cease to be what his mind added to the trembling fibers, that were so indefinite and fleeting—like the canals seen by the ancient observers of Mars because they wanted so much to see them. When he stared too long at the groupings of weak, motionless sparks, his fatigued vision yielded to his will and then he could make out—almost—the milky dots of skulls and the hair-thin bones of spines and limbs. But when he blinked, his eyes burning from the strain, the illusion dissolved.

Kirsting switched off the instrument and got up. Squeezing his eyes shut in the total darkness, he summoned up the barely seen image, and the tiny skeletal apparitions returned, phosphorescent against velvet-black. By feel he released the holders and drifted toward the small ruby light above the exit. Blinded by the brightness of the corridor after being so long in the darkroom, he pressed into the recess of the door, which was padded with thick foam, instead of proceeding directly to the elevator, and this saved him when he was hit, to the accompaniment of thunder, by the blow of gravity. The night glowlamps went out, and along the length of the corridor that wheeled with the ship the emergency lights flashed on. But, unconscious, he did not see this.

Steergard did not turn in after the council, knowing that DEUS, no matter how many tactics it came up with, would saddle him with a choice—a choice that would amount to the alternative between incalculable risk and simple retreat. During the discussion he had maintained the pose of decisiveness, but now, alone, he felt helpless, more so that night than ever. It was growing harder for him to resist the temptation to commit the choice to chance. In one of the closets in the cabin he had—among his personal odds and ends—an old, heavy bronze coin with the profile of Caesar and, on the back, the Roman fasces. It was a memento from his father, a numismatist. Opening the closet, he still did not know if he would actually entrust the ship, the crew, the fate of the whole expedition to this, the largest coin in human history, although already he was saying to himself that the fasces would signify flight—for what else was retreat?—and the worn profile of the massive face, what might prove their doom. He overcame his hesitation, groped in the dim closet, and pulled out from one of the small compartments a flat coin-box. He opened it, turned the coin in his hand. Did he have the right . . . ? It could not be tossed in weightlessness. He pressed the coin into a paper clip, switched on the electromagnet that was fastened beneath the desktop so that photographs or maps could be held in place with steel cubes. He pushed the piles of printouts and tapes to the sides and, like a boy (he had been a boy, once), set the coin spinning. It turned on the edge of the clip more and more slowly, describing small circles, then finally fell, pulled by the magnet, and showed tails. Retreat.

To sit, he grabbed the arms of the swivel chair, and no sooner did his shirt touch-adhere to the back than, before he was aware of it, he felt the blow. Barely perceptible at first, it grew in strength until an enormous force swept the films, papers, steel cubes, and dark-bronze coin off the desk and shoved him into the chair. The gravity intensified. With failing eyes, because the blood was leaving them, he could still see the rapid flickering of the round wall-lamp, and hear, feel, how through the steel walls, beneath their padding, ran a deep groan from all the ship's joints; and how, over the racket of objects flying in every direction—equipment not bolted down, articles of clothing—could be heard the distant howl of the sirens, a howl that seemed to come not from horns but from the ship itself, struck in its 170,000-ton body. And as he listened to this wailing and continual thunder, blinded by the terrible weight that forced his leaden body deep into the chair, he felt—passing out—relief.

Yes, relief, because retreat now no longer entered into play.

His sight returned after about twenty seconds, though the gravimeter still pointed to the red.

The *Hermes* had not suffered a direct hit—that was impossible. Whatever had rammed it, DEUS, always on watch, parried the attack. But the attack had been carried out so cunningly and quietly that DEUS, with no time to choose a moderate shield, resorted to the ultimate.

A gravitational wall could not be breached by anything in *this* Universe except a singularity—so it saved the *Hermes*. But the power of so violent a riposte had to produce recoil. Like a cannon slapped back by the reaction upon firing, the entire ship, at the epicenter of the sidereal discharge, shook, though it received only a small fraction of the released energy. Steergard, not even attempting to rise because his body was still as if under a press, saw, eyes bulging, how the large indicator arrow fell, quivering, millimeter by millimeter, from the red section of the round dial. His muscles, strained to the utmost, now began to obey. The gravimeter dropped to the black 2. But the sirens kept howling in a monotone on all the decks.

Pushing down with both arms, he got out of the chair with difficulty. When he stood, he had to support himself with his hands on the edge of the desk—the way a stooped monkey walked, he thought (a curious thought, at this moment). Among the tapes and maps thrown to the floor he saw his father's coin, which continued to show tails or retreat.

He smiled, because that decision had now been trumped by a higher card. The gravimeter's white dial stood at 1 and was slowly dropping. He had to get to the control room, to see how his people were. But at the door he turned suddenly, went back, picked up the coin, and returned it to the closet. No one should learn about his moment of weakness. It was not weakness as far as game theory was concerned, because in the absence of minimax solutions there was no decision better than one purely random. He could therefore justify his action, at least to himself, but he did not care to. Halfway down the tunnel-corridor, weightlessness returned. He pushed the elevator button. The problem had been solved. Though he was not in favor of battle, he knew his people, and knew that not one of them, except for the Vatican delegate, would agree to running away.

XI

Show of Strength

It was impossible to learn the methods employed in the attack; whatever they had been, all trace of them was gone from the continuum. The printout from DEUS's memory showed the physicists what they had suspected. With omnidirectional sensors sweeping space around the *Hermes* to the outer perimeter of defense, radar echoes could be detected off particles a millimeter across within a radius of a hundred thousand miles. The blow was not radiant energy—that would have left a spectral line. The sudden appearance of about fifty objects with fuzzy edges around the *Hermes*, in a swarm converging rapidly on the ship, and all synchronized in motion, seemed inconceivable at first. They materialized at a very small distance, from one to two miles. The physicists, forced to speculate, pondered ways to penetrate the sensor shield undetected. They came up with three.

Clouds of particles, each particle no larger than a bacterium, could coalesce to form multiton masses, which would imply no little skill in the production of self-fusing elements directed at a target in wide dispersion. It would be something like a cloud of microcrystals coming together—with a necessary delay, inside the perimeter—in an avalanche reaction.

The individual particles, not merely condensing but interacting to form missiles, would have to possess a highly subtle structure. Nine seconds before the blow, the ship's magnetometers registered a jump in the magnetic field around the sides. It peaked at a billion gauss, then after several nanoseconds fell almost to zero. And yet beforehand there had been no electromagnetic activity whatever. The physicists were unable to propose a mechanism for the creation of a field of such strength, whose sources, with no prior appearance, could escape the notice of the sensors. Dipoles, theoretically, might penetrate the shield if a cloud of them neutralized itself through the mutual orientation of trillions of molecules.

Such a reconstruction of the attack assumed a technology never before conceived and therefore never tested experimentally on Earth.

The second possibility was a highly speculative method of using the quantum effects of space. According to this idea, no material particles had been smuggled past the defensive barrier, nor were there any in the whole spherical region surrounding it. Physical space contained a host of virtual particles that could materialize upon a shock-wave infusion of energy from without. This approach would require the ship to be surrounded, beyond the radius of the shield, by generators of the hardest band of ultraroentgen gamma rays, as well as a centripetal discharge that, in the shape of a spherical wave contracting at the speed of light, would produce—exactly upon its intersection with the defense—a tunnel effect: quanta of energy, emerging near the ship, would give rise to a sufficient quantity of hadrons in space for them to hurtle upon the *Hermes* from every direction. A possible method, but one demanding the most sophisticated instruments, precision positioning in space, as well as perfect camouflaging of orbiters. It seemed highly unlikely.

The third way involved the use of negative energy outside the perimeter of defense, but this called for mastery of sidereal engineering—and sidereal engineering in its macroquantum form, with the preliminary siphoning of power from the Sun, because the power stations able to produce the necessary energy on the planet would betray their activity to the *Hermes* by the residual thermal buildup in the surrounding terrain.

DEUS, taken completely unawares, seized its gravitational last resort. Calling on the full power of both main engines, it girdled the ship with gravity toroids. Inside these toroids, as in the center of intersecting automobile tires, sat the *Hermes*, and the missiles directed at it fell into Schwarzschild-curved space. Since any material object falling into such space lost all physical properties except electrical charge, angular momentum, and mass, becoming a formless part of the gravitational grave, no trace was left behind of the methods used in the attack.

The toroids, serving as impenetrable armor, existed no more than twenty seconds, at a cost to the ship of 10^{21} joules. The *Hermes* did not share the fate of the *Gabriel*, did not annihilate itself in self-defense from the toroidal configuration of surging isogravs. But because they could not be focused sharply at the emitter, the ship absorbed about one-one-hundred-thousandth of the energy released. A few twenty-thousandths would have crushed the ship as a hammer crushes the shell of an empty, blown egg.

The men came out of the emergency in one piece. With the exception of Steergard and Kirsting, all had been asleep or were at least buckled in their bunks like Tempe. The ship was not fitted for battle. Polassar suggested—whatever might happen—that they move to the perihelion, to replenish the power lost in repulsing the attack. Along the way, the *Hermes* passed through a cloud of rarefied gas. At first the gas was taken for a prominence dispelled in the solar wind, but the sensors reported that innumerable molecules had attached themselves to the armor and were corroding it catalytically. Specimens taken revealed the specificity of their action, much like that of the viroids already known. Steergard therefore did what in his conversation with the apostolic delegate he had called "coming out in the open." The *Hermes* swept the treacherous cloud with a series of thermal blasts, then destroyed the erosion viruses that adhered to the sides, by a simple expedient: with the refrigerating units on at full capacity, it turned like a roast on a spit as it passed through the top of a solar prominence that was mere light-seconds above the photosphere. Then the ship reduced speed to assume a stationary orbit, turned its stern toward Zeta, and opened its energy receptors. A portion of the tanked energy went to maintain the refrigeration; the rest was sucked up by the sidereals.

At this point, the crew split into three groups.

Harrach, Polassar, and Rotmont believed that the incident with the cloud represented a second attack by the Quintans.

Kirsting and El Salam thought that it was not a blow directed at them intentionally but was, in a way, accidental—that the *Hermes* had entered a mined territory, mined long before their arrival.

Nakamura occupied a middle position: the cloud was not a trap—a trap set either for the *Hermes* or for the Quintan orbiters—but was, rather, a "garbage dump" of microweapons employed in warfare above the planet and which had drifted, in the Sun's gravitational tide, to this perihelion, contrary to the intentions of the warring parties.

Arago said nothing.

DEUS was occupied with programming possible strategies for defensive, offensive, and conciliatory actions. It gave no preference: the data for the optimization of any of these lines were too meager.

Gerbert considered that the thing to do was forget about contact and shows of strength, but he felt unqualified to participate in the debate, which grew more and more heated.

Tempe, summoned by the captain when they had replaced the power lost, said that he was no SETI expert and did not command the ship.

"No one here now is an expert, as I think you may have noticed," replied Steergard. "Myself included. Even so, everyone has his thoughts on the subject. You, too. It's only your opinion I want, not advice."

"DEUS would have more to say," said the pilot, smiling.

"DEUS will present twenty tactics, or a hundred. And that's all that it will do. You know as much as our experts, including DEUS. The minimum risk lies in retreat."

"True enough." Tempe, sitting opposite the captain, continued to smile.

"What amuses you?" asked Steergard.

"Are you asking privately, Captain, or is that an order?"

"It's an order."

"The situation is sticky, for sure. But I've gotten to know you well enough to know what you definitely will *not* do. We are not turning tail."

"You're certain of that?"

"Absolutely."

"Why? Do you think that we were attacked once, or twice?"

"It doesn't matter. Either way, they don't want contact. I have no idea what else they have up their sleeve."

"Further attempts will be dangerous."

"Obviously."

"So?"

"Well, I seem to like danger. If I didn't, I'd have been under a gravestone on Earth for a couple of hundred years now, because I would have died in bed surrounded by a grieving family."

"In other words, you think that a show of strength is necessary."

"Yes and no. It's a last resort that cannot be avoided."

Held in place by a steel cube, a stack of printed pages lay on Steergard's desk, with a graph on the top page. The pilot recognized it. An hour before, he had received a copy from El Salam.

"Have you read that?" Tempe asked.

"No."

"No?" He was surprised.

"It's one more hypothesis from the physicists. I wanted to talk with you first."

"You should read it. A hypothesis, yes. But I found it convincing."

"You may go."

The paper, entitled "The Zeta System as Cosmic War Zone," was signed by Rotmont, Polassar, and El Salam.

> A civilization that has not only destroyed its forms of wireless communication, such as radio and television, filling the whole ionosphere with white noise that drowns out any signal, but which in addition has invested the lion's share of its global production and energy in the building of weapons that occupy the space around it—such a civilization seems impossible, an absurdity. But one should keep in mind that this state was not consciously planned, not deliberately arrived at; rather, it arose gradually, through escalation. The starting situation, we believe, was when multifront war, waged on the surface of the planet, became tantamount to total annihilation. After this critical point

was reached, the arms race was moved off the planet. None of the antagonists intended to transform the entire solar system into a battle zone of monstrous proportions, but proceeded in steps, countering the moves of the adversaries. By the time a confrontation was finally reached in outer space, nothing could any longer restrain the zone's growth, let alone nullify it to establish a lasting peace.

Computer simulation using game theory—nonzero functions of reward—shows that, in the case of such struggles, the lack of trust in the efficacy of concluded disarmament treaties imposes a limit on the possibility of agreement through negotiation. Agreement in the absence of trust in the enemy's "good faith"—classically termed *pacta sunt servanda*—requires the mutual inspection of armaments, which means making one's territory accessible to the enemy's experts.

But when the race to acquire greater and greater military capability enters the path of microminiaturization, inspection without trust becomes an impossibility. Armories, arsenals, and laboratories can then be hidden securely. Agreement cannot be reached thereafter, even on a *minimal* level of mutual trust (that he who refrains from microweapons research will *not* be assuming thereby a position of imminent defeat). Nor is it possible to dismantle arms already possessed, on the enemy's assurance that he will do likewise.

The question arises: why do we find a machine warsphere around Quinta, and not the biomilitary methods once predicted on Earth?

Undoubtedly for the reason that the adversaries have already achieved—in the realm of biological weaponry, too—the power to wipe out the entire biosphere, just as previously that could be accomplished by an exchange of nuclear blows. Consequently, no one now will be the first to use either type of arms.

As for the cryptomilitary macro-alternative—i.e., bringing down pseudonatural elemental disasters upon the enemy

> through climate or seismic tampering—such things may have taken place, but could provide no strategic solution, because anyone who is himself able to act cryptomilitarily will recognize similar actions taken against him by the enemy.

After which introduction, the authors presented their model of cosmic war. The model began with a sphere, Quinta at the center. In the distant past, local wars had become global wars, and they in turn were followed by a race to invent improved weapons on land, sea, and in the air. The atom bomb put an end to the great conventional wars. From then on, the cold-war race had three components: instruments of destruction, instruments providing linkage between them, and instruments directed against the first two.

The creation of a cosmic war sphere suggested the presence of operational centers that responded—with technological innovation—to the advances of the adversaries, as well as to the obsolescence both of existing arsenals and of the methods of coordinating their deployment.

Each of these stages had its limit or barrier. Every time the antagonists came to a barrier, a temporary balance of forces would ensue. Then one of the sides would attempt to break the barrier. The barrier of the precosmic phase would be a situation in which each side was able to locate and destroy the enemy's devices, those serving to deal the first blow and also those for retaliating after an attack. Toward the end of this phase, ballistic missiles of global range placed deep in the planet's crust, and mobile launchers on land or launchers hidden underwater (whether on submarine units or set on the ocean floor), all became vulnerable to destruction.

In such a mutual-strike equilibrium, the weakest link was the communication system put out into space by reconnaissance and tracking satellites—spy satellites—and the link between these, headquarters, and the combat units. In order to put that satellite system beyond the reach of a surprise attack that could disrupt or blind it, the next system was created in a higher orbit. In this way the war sphere expanded. The larger it grew, the more vulnerable to disruption became its link with the control centers on the ground. The centers sought to avert this threat. As sea islands were unsinkable aircraft carriers in the era of conventional battle, so the nearest globe—the Moon—became an indestructible base for the side that was the first to take possession of it militarily. Because there was only one moon, no sooner did one side occupy it than the other, to remove this new threat, either had to concentrate on ways to stop communication between planet and moon, or else had to dislodge the enemy from the moon, by invasion.

If the forces of the invaders and defenders of the lunar fortress were roughly equal, no one could assume complete control of the body. Most likely this is what happened when the unilateral installation of the base was in progress. Those put in check had to abandon the Moon, but those giving check did not have strength enough to occupy it then.

The retreat might have had another reason, too: new developments in the disruption of distance communication. If that came about, the Moon would lose strategic value as an extraplanetary headquarters for military operations.

An abstract model of cosmic war was a multiphase space with critical transition surfaces from one phase, when fully achieved, to the next. Expanding astronomically now, the war sphere would impose on the antagonists methods of combat unprecedented in their history.

The single strategically optimal reaction to the adversary's acquisition of the ability to disrupt all connections between the operational centers and their bases and weapons on land, sea, and in the air—and in space—was to give greater combat autonomy to one's own weapons and bases.

The result was that all the centers saw the futility of having headquarters coordinate operations. The question arose: how to continue offensive-defensive strategies without being in contact with one's own forces in space?

No one blocked his own channels of reconnaissance and command. This occurred as a result of the so-called mirror effect. A did unto B as A would rather not have been done unto, disrupting his communications—and was paid in the same coin. After vying in accuracy and power in ballistic missiles, it became necessary to vie in communication shielding. The first competition had been the *amassing* of means of destruction and the *threat* of their use. The second was a "communications war." Battles waged to disrupt and preserve communication were real, though involving no destruction or bloodshed. Gradually filling the radio channels with noise, the adversaries lost track of their own deployed weapons as well as of the armaments of the enemy.

Did this mean that the paralysis of the command centers led to the transfer of the battle into space, where continual attacks and counterattacks were carried out by weapons made independent? Was the objective of these autonomous weapons the destruction of the enemy's orbiters? Not at all. The communications war continued to have priority. The enemy had to be blinded everywhere.

First there was the uncrossable threshold of the head-on collision of forces on the planet: the power of the payloads, ballistic accuracy, and the potential consequence of both—a fatal nuclear winter—meant the inevitable cessation of war.

Able to do nothing else, the enemies mutually destroyed their knowledge of their arsenals. All bands of radio waves were jammed. The entire capacity of the channels of transmission was filled with noise. In a fairly short period of time the race became a contest between the forces of jamming and the forces of intelligence-gathering and command-signaling. But this escalation, too, penetrating the noise with stronger signals and in turn jamming the signals with stronger noise, resulted in an impasse.

For a while, maser and laser communication still developed. But, paradoxically, the electronic warfare, because of the increase in emissive power, led to a stalemate here, too: lasers powerful enough to pierce the defenses yielded not intelligence but destruction. Speaking metaphorically, it was as if a blind man in a mist waved his white cane with greater and greater vigor, until the instrument serving to orient him turned, instead, into a club.

Foreseeing the approaching stalemate, each side worked to produce weapons that would possess tactical, and then strategic, autonomy. The implements of battle acquired independence from their builders, operators, and control centers.

Had the prime objective of these weapons now hurtling into space been to destroy their antagonist counterparts, the clash, unleashed at any point whatever in the sphere, would have set off a battle royal, like a prairie fire spreading to the surface of the planet itself, which would have led to a global exchange of blows of the greatest power—i.e., to extinction. Therefore, these weapons were not supposed to enter into violent confrontations. They were to put each other into check, and if they had to destroy, to do so by stealth—like infections—and not by bombs. Their machine intelligence attempted to win over the intelligence of enemy weaponry, to stun it, or—with the help of so-called reprogramming microviruses—to cause the "desertion" of the other side's orbiters, which in terrestrial history had an ancient analogue in the form of the janissaries: children whom the Turks took from attacked nations and incorporated into their own army.

This model of the war sphere was a gross oversimplification. Every phase of its growth might be accompanied by incursions, infiltrations, terrorist acts, and maneuvers that, like feints, were designed to lead the deceived enemy into an error that would be highly costly for him or even self-destructive. Both cable communication and electronic pulse devices allowed the adversaries on the planet to preserve a centralized system of headquarters at a certain range—a range that we could not determine, because it would vary depending on technological innovation. In the dictionary of our concepts there was no expression for the war-sphere of the Quintan type, for it was neither war nor peace but a permanent conflict that bound together the enemies and drained their resources.

Could one, then, categorize the war-sphere as a cosmic variant of a war of attrition, in which the side that lost was the one weaker in raw materials, energy, or inventions? To this conventional question came an unconventional answer. The inhabitants of the planet did not possess unlimited reserves of minerals or inexhaustible sources of energy. Although this limited the duration of the conflict, it promised victory to no one. The model of the final phase was, simply, a star.

A star, as everyone knew, owed its existence to the thermonuclear fusion of hydrogen into helium, a reaction that took place in its core at pressures and temperatures in the millions. When all the hydrogen was burned in the center, the star began to contract. Its gravity compressed it, raising the temperature at the center, which then made possible nuclear reactions of carbon. At the same time, around the inner sphere of helium—the "ash" of the consumed hydrogen—the remainder of the hydrogen continued to react, and this spherical front of fire expanded more and more within the star. Finally the dynamic equilibrium was destroyed, and the star threw off its outer envelopes of gas with great violence.

Much as in an aging sun, where the sphere expanded because of successive syntheses of hydrogen into helium, helium into carbon, and so on, the interplanetary sphere of the war zone arose, surface on surface, according to the stages reached in the arms race.

At the center—i.e., on Quinta—a minimum of military communication continued to exist on each side. Away from the center, autonomous weapon systems operated, keeping themselves in mutual check. Their independence was limited, of course, by the programmers at headquarters, who kept them from setting off a chain reaction that would bring the fire of battle to the planet itself.

The programmers, however, found themselves increasingly on the horns of a dilemma. The more sophisticated were the weapons hurled into space by the adversaries, the greater the offensive-defensive sovereignty that had to be given to those weapons. Both digital and analog simulations of the war-sphere, projected at least a hundred years into the future, did not yield any single-valued solution. Nevertheless, on the basis of variants run through the computer, the authors of the model posited the existence of a restriction threshold in the programming of autonomous fighting systems: above that threshold, weapons that were only *independent* could become *insubordinate*.

This image, departing from the model of a star, approached the model of natural evolution. Autonomous weapons were like the lower organisms: provided with aggressiveness, which was held in rein by the instinct for self-preservation. Insubordinate weapons would be the primates, who had acquired the ability to invent and from merely cunning or quick-witted creatures became the initiators of wholly new kinds of activity. Such weapons freed themselves from the indirect supervision of the builders.

In saying that the builders ended up on the horns of a dilemma, the authors believed that defeat threatened both those who curbed their weapons' growth in intelligence and those who spurred on that growth. Either way, as the war-sphere spread it lost dynamic stability, and though its fate was not amenable to a single-valued prediction, that fate went beyond the interests of the sides that had begun the struggle. But such a state of affairs was still far off.

The flashes observed by the *Eurydice* could have been skirmishes between highly advanced combat units on the periphery of the Zeta system. Their clashes at a distance of billions of miles from Quinta meant that authentic battles could take place on fronts that were astronomically removed from the planet. There the war could sometimes turn "hot." It might also, in the future, make unpredictable jumps into the heart of the war-sphere. No one versed in post-Clausewitzian strategy could really expect a victorious conclusion to the conflict. Yet the professional strategists found themselves in the forced position of a player who cannot leave the table because he has thrown all his capital into the game. It was precisely in this that the enemies mirrored each other. The once-important question of *who* began the arms race lost all significance. Peaceful or aggressive intentions of the warring sides could no longer be distinguished in the conflict. The game boded ill for all the participants, and the only victory possible would be Pyrrhic.

Within this framework, what were the prospects for contact? The authors did not know. So far, on the cosmic chessboard moved black and white pieces of comparable power, not entering into battle but only giving check. On the other hand, completely new and unknown pieces appeared—and were tested by battle. Tested by small encounters, like ancient skirmishes. Or possibly it was not the planet—not its nations, governments, or headquarters—that had attacked the *Hermes*, but mechanisms to which the *Hermes* was a "foreign body," a thing large, technological, and unknown. The *Hermes* would have been, then, not a wayfarer fallen upon by bandits but an infection confronted by defending lymphocytes within an organism.

The limitations on the arms race were few. Old combat orbiters could be pulled down to the planet and "recycled." As for weapons of the viroid type—microminiaturized parasites, self-cohering molecules drawing energy from the Sun, required tremendous engineering inventiveness but little raw material.

Polassar, Rotmont, and El Salam concluded by summarizing their conception of Quinta. As a mighty artifact of a continuing struggle for supremacy, this artificial organism—a war-sphere with a radius of seven billion miles—could be viewed as a system eaten by cancer. Its cosmic organs were, to a greater or lesser extent, malignant metastases of conflict. But here the analogy to a living creature broke down, because that whole, even in its beginning, had never been "healthy": it was infected at birth with the antagonism of technologies taking aim at one another. It had no "normal tissues"; its dynamic equilibrium was made possible and maintained by its mutually counteracting "tumors." In order to preserve so specific a balance, the tumors had to be able to recognize each other. Wherever new, radically different growths might appear, among the inner planets or the outer, they would be instantly disarmed, checked, or "converted" (the "janissary" enlistment of them) by technological "antibodies," whose purpose was not to cure—there being no patient or doctor—but to keep the dynamic *status quo ante fuit*, the stalemate.

If so, the *Hermes* had first come upon the remains of an ancient battle, and then entered a "mined region," which triggered the sudden nocturnal attack. With this theory, the lack of a response to the Ambassador became understandable. If the abandonment of contact was not to be considered, then one had to declare all the tactics developed by SETI useless and seek other, more promising lines of action. The authors of the war-sphere model could not say if any successful tactic existed. They were in favor of departing from the prepared program and trying strategies that had no precedent.

The paper was also signed by Harrach and Kirsting.

This meant—what else?—yet another council. Though the *Hermes* had made up its power loss, Steergard felt that their position in perihelial orbit was the safest and maneuvered so that the ship would remain above Zeta, using the heat to power its own refrigeration. Because the orbit was forced (not stationary with respect to either the sun or Quinta), the considerable thrust provided them with gravity.

Accompanying Harrach to the meeting, Tempe remarked that space travel was made up of catastrophes averted at the last minute and long conferences.

Nakamura was the first to criticize the model of a war-sphere grown independent of its planet. Military devices might indeed disobey their creators when far from Quinta, but operational headquarters continued to function at closer range. Otherwise, the *Gabriel* would not have met with a coordinated attack from two sides.

The ocean of the northern hemisphere, with its white cap of polar ice, separated the two continents: the western, called Norstralia, twice the size of Africa, and the eastern, Heparia, so designated because of its shape, which resembled a flattened liver. Going by the pictures taken during the *Gabriel*'s flight—the *Gabriel* was supposed to have landed near a starlike structure on Heparia—Nakamura established the starting points of the rockets. Both were at the equator but on opposite landmasses. True, they were obscured by clouds, and the rockets did not show, taking off, the typical exhaust flame, but he believed that either they had been catapulted or their drive had a negligible thermal component. Whether thrown by silent engines or by those employing a cold, particle-beam drive, the missiles heated upon breaking the sound barrier, which allowed one to trace the thermal part of their trails and extrapolate back to the launchers.

The fact that they emerged from the clouds almost simultaneously, two from the east and two from the west, was evidence of a prior synchronization of action and therefore of cooperation between command centers on both continents.

The authors of the model did not agree with the attack thus reconstructed—and, indeed, Nakamura was not able to prove such a course of events, because the atmosphere of Quinta swarmed with points of heat, which were thought to be produced by ice chunks falling into it from the slowly crumbling ring. Nakamura, they said, had chosen such points as could be attributed, with a bit of will and wishing, to the paths of the rockets.

The quality of the images obtained by the ship was poor, since the *Hermes* had gathered them from probes dispatched like electronic eyes while it hid behind the Moon at the perilune. Moreover, thousands of satellites orbited Quinta, some in the direction of the planet's spin and some in the opposite direction—but this revealed nothing of their origin: the adversaries could have launched their military satellites corotationally or antirotationally. The fact that the satellites neither collided nor fought strengthened the authors of the "alienated war-sphere" in their conviction that the game remained "cold" and was based on checking, not destroying, the battle devices of the enemy. Once the satellites began to strike at each other, the cold war would enter the phase of heated escalation. For that reason—the authors held—the antagonistic orbiters stayed in check. In order to preserve the balance of forces, the space systems of both sides had to be able to identify each other. The *Gabriel*, however, was a foreign intruder and was therefore attacked. Rotmont illustrated this point with an example: two dogs growl at each other—but let a rabbit appear, and off they go side by side, chasing it.

Polassar, in spite of this, sided with Nakamura. True, it was not known whether the *Gabriel* was to have been captured by the rockets of one continent or of both continents. But the attack did take place with a precision that indicated planning. The signals sent by the Ambassador had been received on the planet, beyond any doubt. The lack of an answer, however, did not mean inaction or passivity.

Steergard did not take sides in the debate. The question of whether the *Gabriel* had been subjected to an attack planned by Quinta or undertaken by independent orbiters he considered of secondary importance. In either case, the planet was refusing contact. The real question was whether or not contact could be forced.

"By persuasion, no," said Harrach. "Nor by carrying out the original program. The more landers we send down, the more such encounters we'll have. They'll convert our emissaries into defensive units, until the overtures end with a rout or a battle. Since we don't want a battle and retreat is out of the question, we should drop all this delicate poking and prodding and show a little backbone instead. You can't make friends with a gorilla, or pacify it, by cautiously tugging on its tail."

"Gorillas don't have tails," said Kirsting.

"A crocodile, then. You know what I mean. The only thing left for us is a show of strength. If anyone has a better idea, let him speak."

No one spoke.

"Do you have a specific plan?" asked Steergard.

"Yes."

"Which is?"

"Cavitation of the Moon. The maximum effect with the minimum harm. They'll see it from the planet, but won't feel it. I had the idea some time ago. DEUS did the calculations for me just now. The Moon will come apart in such a way that the pieces stay in orbit. The center of mass will not be changed."

"Why?" asked the Dominican.

"Because the fragments will be circling Quinta along the same path as the Moon. The planet and the Moon constitute a double system, and since the planet is much heavier, the center of rotation is located close to it. I forget the numbers. In any case, the dynamic distribution of the mass does not change."

"The gravitational tides will change," Nakamura put in. "You took that into account?"

"DEUS did. The lithosphere will not move. At most, some shallow seismic foci will be activated. The rise and fall of the oceans will become weaker. That is all."

"And what good will this do?" asked Arago.

"It will be not only a show of strength, but a message. We'll send them a warning first. Shall I go into the details?"

"Keep it brief," said the captain.

"I don't want anyone to see me as a monster," said the first pilot with studied calm. "At the very beginning we showed them the calculus of logic, and conjunctions of the type 'If A, then B,' 'If not-A, then C,' and so on. We will tell them, 'If you do not answer our signals, we will destroy your moon, and this will be the first warning. We are determined: we want contact.' And then, once more, everything that the Ambassador has already beamed to them—that we come in peace, and that if they are presently engaged in some conflict we will maintain neutrality in it. Father Arago can read everything through. These announcements hang in the control room, and each member of the crew has received a copy."

"I read it," said Arago. "And what happens then?"

"We let that depend on their response."

"Do you think we ought to set a time limit?" asked Rotmont. "That would make it an ultimatum."

"Call it what you like. We don't have to give a precise time. It should be enough to tell them how long we will refrain from action."

"Besides retreat, are there other proposals?" asked Steergard. "No? Who is in favor of Harrach's plan?"

Polassar, Tempe, Harrach, El Salam, and Rotmont raised their hands. Nakamura hesitated. Finally he, too, raised his hand.

"Are you aware that they might answer before the deadline, and not in signals?" asked Steergard.

The ten of them sat around a large slab supported, like a table with one leg, on the openworked intersection of the girders that separated the upper, gravitational control room from the navigational, which was now empty. Only the flickering of the monitors above the consoles set along the walls, now brightening, now dimming, filled the space beneath them with moving light and shadow.

"Entirely possible," agreed Tempe. "My Latin isn't as good as Father Arago's. Had I come here simply out of an urge to come, I would not have voted 'for.' But we here are not ten astronauts. If the *Hermes* was attacked, after all its efforts at peaceful contact, that means that Earth was attacked, because Earth sent us here. Therefore, Earth has the right to say, through us, *Nemo me impune lacessit.*"

XII

Paroxysm

Sidereal operations, as phenomena of astronomical proportions, cannot be for the observer—despite the power liberated in them—an experience as profoundly moving as a flood or a typhoon. Even an earthquake, a thing submicroscopic on the scale of stars, exceeds the capacity of the human senses. True terror—or true enchantment—is produced in man by events that are neither too vast nor too minute. One cannot experience a star as one does a stone or diamond. The least of the stars, an ocean of oceans of eternal fire, even at a distance of a million kilometers becomes a wall of heat that outruns its horizons, and at close range it loses all shape, breaking up into chaotic vortices of blinding flame. It is only from a great distance that the cooler funnels in the chromosphere dwindle to sunspots.

But this same rule, making it impossible to experience immensity, operates in human affairs. One can feel compassion for the agony of an individual, of a family, but the extermination of thousands or millions of beings is a numerical abstraction whose existential content cannot be absorbed.

And thus the cavitational sundering of a heavenly body, be it planet or moon, presents a curiously undramatic spectacle; it not only takes place with dreamy slowness but, because of its soundlessness, seems make-believe, particularly since to behold it and not perish one must watch through a telescope or on the screen of a monitor. The sidereal surgeons viewed the developing explosion through filters placed in succession on the apertures of the lenses, in order to follow closely each stage of the disintegration. As a result, the image, shown selectively in monochromatic bands of the spectrum—now yellow as straw, now red as cinnabar—gave the effect of a child's kaleidoscope and not of a superhuman cataclysm.

Quinta was silent to the zero hour. The cavitation of the Moon was to be induced by eighteen missiles that would travel from a distant circle toward its equatorial surface along trajectories of the involute type.

Unfortunately, it turned out that DEUS was right in putting this operation outside the category of certain, predictable enterprises.

Had all the warheads hit the crust of the barren body at the same angle; had they converged around its heavy core, tunneling straight down like bullets; had they converted, with precision programmed to the second, that still-hot, semimolten core into gas—the chunks of the shattered moon, compared with which the Himalayas would be as crumbs, would have distributed themselves along the previous orbit, and the shock wave of suddenly liberated power would have caused only minor quakes, pushing the ocean to the continental shelves in a series of long tsunamis.

But Quinta interfered. Three of the *Hermes*' missiles, traveling moonward from the side of the planet, encountered heavy ballistic rockets. Crushing these into blazing clouds of gas, the missiles gave premature ignition to the sidereal charges they carried. As a result, the planned concentration of blows in the lunar core did not come about, and the cavitation took place eccentrically. Part of the southern crust and masses of deep rock began to tumble like an avalanche toward Quinta, and the rest—about six-sevenths of the Moon—went into a higher orbit. The reason was that the sidereals were supposed to have penetrated to the core along spirals, the cislunar missiles pushing the crumbling globe toward the Sun and the translunar toward the planet. But since it was precisely the intercepted ones that were to have protected the planet from a flood of meteors, about a hundred trillion tons of mountain formations fell toward Quinta, in a multitude of elliptical trajectories. A portion burned up from atmospheric friction, but the largest fragments—trillions of tons—fell in a wide pattern into the ocean, and those at the edge bombarded the shores of Norstralia. The planet took pieces of the moon in its side like a blast of buckshot at a sharp angle.

Within two-hundredths of a second after the detonation of the cavitational warheads, the Moon was wrapped in a yellowish cloud so dense that it seemed to swell. Then, very gradually, as if in slow motion, it began to come apart, splitting into irregular pieces like an orange torn by invisible claws, and from the cracks in the crust shot long streams of heat as bright as the sun. In the eighth second of the cavitation, billowing shock waves, aflame, gave the rent Moon the appearance of a burning bush in space. The light made the nearest stars pale.

In the control room everyone froze before the monitors. The only sound was the ticking of the chronometers counting as the selenoclasm progressed. Out of the coiling flame flew, enveloped in dust and dispersing like grapeshot, Alps, Cordilleras, Vesuviuses—until that monstrous cloud slowly began to open, and its initially round shape changed, lengthened. . . . It was not necessary to look at the instruments to know that in a few hours the Moon would start falling to the planet. Whether luckily or unluckily, it hit far from the ice ring; it was not until midnight that a deflected swarm of fragments, in collisions that sparkled like fireworks just above the atmosphere, intersected the plane of ice.

Thus did the show of strength go awry and conclude in cataclysm.

XIII

A Cosmic Eschatology

In the afternoon of the following day, Steergard summoned Nakamura and both pilots. Immediately after the catastrophe, the *Hermes* had lifted above the ecliptic, its maneuvering engine on full power, to remove itself from the countless lunar fragments. It took a parabolic course in the direction of the Sun, but left behind radio probes and transmitters. These sent communiqués which showed that actually Quinta had pulled the debris of the broken moon down upon itself—because its salvo of ballistic rockets had interfered with the cavitation in such a way, that the resulting eccentricity of the process backfired on the planet.

The effects, observed optically though the ship by now had tripled its distance from Quinta, were horrible. From the oceanic epicenter spread tidal waves. Masses of water a hundred times higher than normal inundated the nearby eastern coasts of Heparia and in a thousand-mile front submerged Heparia's great plain. The ocean went deep into the land and did not retreat completely, creating lakes the size of seas, because the lithospheric plate above Quinta's mantle had buckled and water filled the new depressions formed on the surface.

At the same time, billions of tons of water, thrust in steam vapor up above the stratosphere, covered the face of the planet with a solid shroud of clouds. Only the thin ice ring gleamed above it in the sun, like a razor.

Steergard asked Nakamura for a report on the SGs taken continually of the selenoclasm. Immediately after the selenoclasm, he had ordered the heaviest magnetron units launched and put into orbit around Quinta, on opposite sides of the planet. These were veritable giants with sidereal feeders; each possessed a mass of seven thousand tons. For protection against possible attack, Steergard had them surrounded with coherent-gravity guns: single-use gracers that, according to the plan established by SETI, were to have served to annihilate any asteroids the *Hermes* encountered on the way to Quinta (the vessel was unable, because of its near-light speed, to maneuver around obstacles that the protective shields would not withstand).

Before Nakamura made his report, Steergard unexpectedly turned to the second pilot and asked him where he had learned the old Latin slogan *Nemo me impune lacessit*, with which he had closed the last council.

Tempe could not remember.

"I can't imagine that you were ever a classics scholar. You probably read Poe's 'Cask of Amontillado.' "

The pilot shook his head ruefully.

"Maybe. Poe? The writer of fantastic tales? I doubt it. But I don't recall what I read . . . before Titan. Is it important?"

"That, we will see. But not now. Let's hear the results."

Nakamura had hardly opened his mouth when Steergard interrupted:

"Was the equipment attacked?"

"Twice. Gracers destroyed about fifty rockets. The Holenbach curvature halted SG reception but without damage to the image."

"Their origin?"

"The continent that was hit, but the rockets came from outside the disaster area."

"More specifically?"

"Four places in a mountain system fifteen degrees below the arctic circle. The launchers are subterranean, their sites fortified with imitation rock. There are many there, in the meridional belts, all the way to the equator. The pictures uncovered over a thousand. There are undoubtedly more, but the easiest to observe were those that stood perpendicular to the pulse field. The planet turns but the field does not. With continuous spinoscopy you get a completely worthless image—as if a man, X-rayed, were to turn during the exposure. Therefore, we went over to microsecond-snapshot tomography. So far we've accumulated about fifteen million frames. I wanted to wait until the end—that is, for one full revolution of the planet—and only then hand over the tapes to DEUS. . . ."

"I understand," said Steergard. "DEUS hasn't tallied up the pictures?"

"Not yet. I *was* able to take an overall look at the hourly composites of the tomograms."

"Then you do have something! Go ahead."

"I'd like you to see the sharpest SGs for yourself. A verbal description cannot be objective. Almost everything visible on the film gives grounds for a particular interpretation, but not for any definite diagnosis."

"All right."

They rose. Nakamura inserted a disk into the MV and its monitor lit up. Across the screen ran trails, blurred and trembling; the physicist fiddled with the tuning for a moment, the picture darkened, and they saw a circular spectrum with a black, round spot in the center and an unevenly bright perimeter. Nakamura shifted the picture until the planet's surface was on the bottom half of the screen. Above the curve of the lithosphere, which was opaque and black, lay—in the same bent band—a whitish mist, thickest along the horizon: the atmosphere, with microscopic floccules that were clouds. The physicist changed the spectrum, going from the lighter to the heavier elements. The gases of the atmosphere vanished as if blown away, and the darkness of the continental plate, impenetrable before, now began to brighten.

Tempe stood between Harrach and the captain, eyes glued to the screen. He had learned about planetary spinoscopy while still on board the *Eurydice*, but had never seen it applied. A nuclear imaging instrument of astronomic range placed the planet within a bowl of magnetic fields of flux density equal, at the peaks of the pulse, to the magnetosphere of a micropulsar. The planet was probed through and through, and the resulting images, created by the spin resonance of the atoms, could be sectioned—tomographed—by concentrating the field on successive layers of the globe, beginning with the surface and working down to the hotter and hotter strata of the mantle and the core.

As a microtome cut frozen tissues so that they could be examined in sequence beneath a microscope, so a nucleoscope made possible the taking of pictures that showed, layer by layer, the internal structure of a celestial body, unobtainable by either radar or neutrino sounding. For radar, a planet was completely opaque; for a stream of neutrinos, too transparent. Therefore nothing but magneto-coherent, multipolar spinoscopy allowed one to look within celestial bodies—granted, only those that had cooled, such as moons and planets.

Tempe had read on the subject. The magnetic potentials, focused by remote control, oriented the spins of the atomic nuclei along the lines of force; when the field was switched off, the nuclei gave back the energy imposed on them. Each element of the periodic table then vibrated according to its own resonance. The picture recorded in the receptor was a nuclear portrait in cross section, where sextillions of atoms performed the role of the dots in an ordinary halftone photoengraving. The advantage of high-powered nuclear imaging was its harmlessness for the material objects examined, which included living beings; the disadvantage was that, applying such power, one could not conceal the source of the transmission.

Following the instructions of the physicists, DEUS filtered the pictures, each layer and section, for SGs of elements that were particularly suited for technological use. This choice was based on an assumption that was not entirely certain—but it was the only one available: the analogy, at least partial, between the Quintan and terrestrial technospheres. And, indeed, deep in the crust of the illuminated globe appeared a vague network of vanadiums, chromiums, and platinums, the platinum group including osmium and iridium. The subsurface threads of copper suggested power lines. SGs of the region affected by the selenoclasm showed chaotic microfoci of devastation, and the cross section of the starlike construct called Medusa resembled rubble and had traces of the uranides.

Calcium was also found there. For ruins of dwellings there was too little calcium. And the ground showed no sedimentary rock whatever.

Hence, the guess that these were the remains of millions of living beings who, before their death, or after it, had been subjected to radioactive contamination, since a high percentage of the calcium was an isotope found only in the skeletons of irradiated vertebrates. For all its cruelty, this discovery (still, of course, not conclusive evidence) offered a glimmer of hope. They had no way of knowing yet whether the population of Quinta was made up of living creatures or, possibly, nonbiological automata: the heirs of an extinct civilization. One could not rule out the grim hypothesis that the arms race, having exterminated life (with perhaps a few remaining souls huddled in shelters or caves), was being carried on by life's mechanical successors.

This was precisely what Steergard had feared most, from the first encounters, though he kept the fear to himself. He considered possible a course of historical events whereby, over centuries of operations, a living force became replaced by military machines—not only in space, which they had already seen, but also on the planet. War automata, possessing no instinct for self-preservation, designed for suicidal combat, would hardly be amenable to entering into any kind of negotiations with a cosmic intruder. Although command centers, even if totally computerized, still should be guided by self-preservation. Yet if their sole directive was to achieve supremacy through strategic operations, they would not allow themselves to be put into the role of negotiators, either.

The chance of living beings communicating with living beings, on the other hand, was greater than zero. The optimism that resulted from examining the SGs—through the possible recognition of hecatombs, piles of skeletons, because of the relation of calcium to its isotope—was subdued. It would have been hard to call it a devout wish. While the pilots and the captain were listening to Nakamura, who provided explanations for the critical pictures—with the caution that most of this was just conjecture—the intercom buzzed. The captain lifted the receiver.

"Steergard here."

They heard the voice but could not make out the words. When the speaker finished, Steergard did not respond immediately.

"Very well. Right now? Come on over, then."

He put down the receiver, turned to them, and said:

"Arago."

"Should we leave?" Tempe asked.

"No. Stay." And added, as if unintentionally, "It won't be a confession."

The Dominican entered in white, though not in his monk's habit: he had on a long white sweater. That he wore a cross under it was revealed only by the dark string around his neck. Seeing those present, he halted at the door.

"I didn't realize that the captain was holding council. . . ."

"Have a seat, Reverend Father. This is not a council. The time for parliamentary procedure and voting is past."

And, as if that sounded more brusque than he intended, he added:

"I didn't want this. But the hard facts are not concerned with what I want. Please, everyone, sit."

They sat, because, although he had delivered this last sentence with a smile, it was an order. The monk had expected a private conversation. Or perhaps he was taken aback by the peremptory ring of Steergard's words. Guessing the reasons for Arago's hesitation, the captain said:

"*C'est le ton qui fait la chanson*. But I didn't compose the tune. I tried to play it *pianissimo*."

"It ended up being played on the trumpets of Jericho," replied the monk. "But perhaps we can put aside these musical metaphors?"

"Of course. Let's speak plainly. Rotmont was here an hour ago, and I know the gist of the conversation—the exegesis—no, let's stick with 'conversation'—that DEUS occasioned. It concerned . . . astrobiology."

"Not only," said the Dominican.

"I know. And therefore I ask in what capacity my visitor presents himself to me: physician or papal nuncio?"

"I am not a nuncio."

"With the will or without the will of the See of Peter—yes. *In partibus infidelium*. Or perhaps *in partibus daemonis*. I say this in reference to the memorable remark, not of the doctor of astrobiology but of Father Arago, on the *Eurydice*, in Ter Horab's cabin. I was there; I heard and remembered. And now—you have my attention."

"I see here the same pictures that Rotmont explained to me. DEUS indeed has occasioned my visit."

"The calcium hypothesis?" asked the captain.

"Yes. Rotmont inquired whether a line in the spectral analysis of certain points was or was not an isotope of calcium. DEUS could not rule out the possibility."

"I know the particulars. If those are bones, they're bones in the millions. A mountain of bodies."

"The critical place is a large complex of buildings, no doubt a Quintan center," said the monk. He seemed paler than usual. "A museum with a radius of fifty miles? Hardly likely. Genocide, then. A cemetery for a murdered nation is not a scene unprecedented in our history. Anyway, the founders of the SETI Project did not have in mind contact with an intelligence upon a battlefield littered with the corpses of the host."

"The situation is a good deal worse than that," answered Steergard. "No, let me speak. I repeat: something worse took place than a catastrophe brought about by a series of coincidences no one wanted. I did say that the planet might respond to our ultimatum before the deadline but not in signals. The other side, suspicious, could have opted for a counteroffensive. But I did not dream that, with full premeditation, they would pull the cavitated moon down upon themselves. We became mass murderers according to the maxim of a certain Italian heretic: 'Because of excess virtue the forces of hell prevail.' "

"How am I to understand this?" said Arago, astounded.

"Using the canons of physics. We announced that we would shatter their Moon as a demonstration of our superiority, and we gave assurances that this sidereal operation would cause them no harm. Having experts in celestial mechanics, they knew that with the smallest investment of energy one could break apart a planet by increasing the gravity at its core. They knew that only an explosion that was focused exactly at the Moon's center of mass would not change the orbit of the resulting fragments. Had they intercepted our sidereals from the solar side of the Moon, or at its front along a tangent to the orbit, the broken pieces would have been driven to a higher orbit. Only the interception of our missiles in the hemisphere facing Quinta could—had to—pull the eccentric product of the cavitation down upon themselves."

"How can I believe such a thing? You're saying that they wanted to use our help to commit suicide?"

"I say nothing—the facts speak. Their action, I admit, looks like madness. But a recreation of the cataclysm reveals its logic. We began the selenoclasm at the moment when the Sun was rising over Heparia and setting on Norstralia. The ballistic missiles directed at our sidereals were launched from the part of Heparia that was still behind the terminator—in other words, in the night. They required five hours to reach the perilune and strike our rockets. To keep us from destroying the missiles in time, the Quintans put them into an elliptical orbit, an orbit from which they could drop to the Moon some twelve minutes before the selenoclasm. There is no way around it: their missiles ambushed ours, moving along the ellipse segment farthest from Quinta and closest to the Moon. All attacked our sidereals, which were unshielded because we had not believed such a counteraction possible. I myself thought at first that the catastrophe had been caused by their miscalculation. But an analysis of the sequence of events rules out the chance of error."

"No. I cannot understand it," said Arago. "Although . . . one moment . . . does this mean that one side attempted to direct the blow at the other?"

"Even that would not have been so bad," said Steergard. "As far as a general headquarters is concerned during a war, any maneuver that discomfits the enemy is worthwhile and appropriate. But because they could not know the power of our sidereals or the time the selenoclasm would begin, or the initial velocity of the splitting masses of the Moon, they had to take into account that the dispersion pattern of the rocks might include their own territory as well. The Reverend Father is surprised? He doesn't believe me? The *physica de motibus coelestis* is the star witness in this case. Look at the situation from the point of view of the generals of a hundred-year war.

"A cosmic intruder appears above the battlefield with an olive branch. It wishes to establish friendly relations with the civilization; instead of responding attack for attack, it shows restraint, it remains peaceable. It will not attack? Then it must be made to! Does the population of the planet learn what really happened? Massacred, how can it doubt what its governments tell it: that the intruder is a ruthless, infinitely cruel aggressor? Did not the intruder level cities? And bomb *all* the continents, shattering the Moon *for that purpose*? Their own casualties? Blamed on the intruder. If we share the guilt, it is from undue innocence, because we did not foresee such a turn of events. Retreat, after what has happened, would leave the planet in the belief that our expedition was an attempt at murderous invasion. Therefore we do not withdraw, Reverend Father. The stake of the game was high to begin with. They have raised it, forcing us to play on. . . ."

"Contact at any price?" asked the Dominican in white.

"At the highest that we can pay. Since I have ruffled our apostolic delegate with the announcement that the time for democracy—voting, shilly-shallying—is past, I think I should explain why, as I assume sole command and therefore sole responsibility for ourselves and for them, I will be taking this game to its conclusion. Shall I explain?"

"Please do."

Steergard went over to one of the wall lockers in his cabin, opened it, and said, as he looked for something in the pigeonholes:

"The thought of a nonlocal war expanded into space occurred to me after the catching of the wrecks behind Juno. And not to me alone. On the principle of *primum non nocere*, I kept it to myself, so as not to infect the crew with defeatism. It's known from the history of ancient voyages—Columbus's, the polar expeditions—how easily an isolated group of the best people can become a threat to themselves through the influence of an individual, particularly if that individual is one on whom they count, as if he were made of even better stuff than they. Therefore, I discussed this worst possibility only with DEUS. Here are the recordings of those discussions."

From a small, padded container that resembled a jeweler's box for precious stones he took a few memory crystals and inserted one in the slot of the reproducer.

His voice filled the room.

"How are we to establish contact with Quinta if there are blocs there locked in battle for years?"

"Provide the limits of the *n*-decisional space. It is strategically incalculable without starting parameters."

"Assume two, then three antagonists of approximately equal military potential, with the certain destruction of all in the case of heated escalation."

"The data remain insufficient."

"Give a minimax evaluation in a nonnumerical approximation."

"The value in approximations is also indeterminate."

"Nevertheless, give me a stochastically weighted cluster of alternatives."

"That demands additional assumptions. They will be arbitrary and unsubstantiated."

"I know. Go ahead."

"For two antagonists on opposite continents, send two transmitters—in the atmospheric window of the infrared—with point-sharp collimation. Both should have antiradar camouflage and be self-directed at the planet's radio stations. This tactic takes for granted a thing that is open to question—because the antagonists may be not on opposite continents but in mutual possession of the same territory, both horizontally and vertically."

"In what way?"

"If, for example, they have entered the atomic phase with great saber-rattling, and each side takes aim at the enemy's population, making it hostage, threatening attack or reprisal. They fortify the means of thrust and parry, and, when saturation occurs, move underground. Their territories may be located far beneath the earth, like interlocking mines at many depths and levels. The same can happen above the atmosphere."

"Does an expansion of that type make contact impossible?"

"It rules out the tactic proposed, because with such an arrangement contact will not have separate addressees."

"Assume that there is no such subterranean colonization, with each side undermining the other."

"Where is the boundary to be drawn between the antagonists?"

"The meridian in the center of the ocean."

"That is simplest, but completely arbitrary."

"Go ahead."

"Very well. Assume the sending of probes, the signal emission—the delivery of the mail. And that they have received the codes transmitted and have mastered them. This assumption gives me a minimax fork. Send both sides the identical request for contact, either with a guarantee of neutrality which is genuine, or with a guarantee of exclusive support which is false."

"You mean, tell each side that we are addressing the other at the same time, or else assure it that we are approaching only it for contact?"

"Yes."

"Give the risk weighting of the branches."

"Honesty yields better chances if the message goes to the wrong address, and poorer chances if the message goes to the wrong address. Falsehood yields more chances if the address is right, and fewer if the address is right."

"That's a contradiction."

"Yes. The game-space is not quantifiable minimaximally."

"Show the reason for the contradiction."

"A bloc, assured of the exclusivity of contact with us, will be inclined to react positively—on condition that it can itself verify that exclusivity, independently of our communication. If, on the other hand, it learns that the other bloc has intercepted our message, or that—worse—we are playing a two-faced game, the chances of contact will fall to zero. One can also have a negative probability of contact."

"Negative?"

"A refusal is zero. I would assign a negative value to an answer that misinforms us."

"The setting of a trap?"

"Entirely possible. Here the forks branch factorially. A trap can be set by one side, or by both separately, or by both in a limited, temporary alliance—reasoning that if they call a temporary truce and cooperate to destroy us, or discourage us from contact, they will be running less risk than if they compete for exclusivity of contact with the *Hermes*."

"And what about their agreeing to a parallel, separate contact?"

"In that variant lies a fundamental contradiction. In order to achieve such parallelism, you must as sender guarantee to both sides our neutrality—convincingly. That is, you must give your word that you will keep your word. But an assertion, when reflexive, cannot assert itself. This is a typical antinomy."

"Where did you obtain the weightings for the decisional branches?"

"From your premise that on the planet there are only two players in mutual check. And that they hold to the rule of minimax. The prize of the game for them is the preservation of the *status quo ante fuit*, and for us, contact by breaking the impasse."

"Specifically?"

"It's trivial. I assume two empires, A and B. The optimal variant fork for us: both A and B enter into contact with us, each believing that it holds a monopoly. If either one is not sure of its privileged state—its exclusivity—it will suspect the monopoly. Whereupon, according to the rule of minimax, it will propose to the other a coalition against us, because it does not know the chances of entering into a coalition *with* us. That is obvious. Knowing their own history, they therefore know their rules of mutual conflict. But the rules of mutual conflict that pertain to us are unknown to them. If we make an offer of alliance to either A or B, it will be suspect. *Primo:* such an offer made by us to both adversaries is absurd. *Secundo:* if we choose one side only, we will be supporting it and will thereby antagonize the opposite side, gaining nothing for ourselves but participation in the ongoing struggle. Such a strategy of contact could be adopted only by a civilization of idiots. It is improbable even on the metagalactic scale."

"Yes. They can temporarily unite against us. What sort of game then results?"

"A game with indeterminate rules. The rules arise or change according to the course of the play. Therefore it is not known if the reward function will contain positive values. The game, probably, is zero-sum, because none of the players—ourselves included—stands to gain. All will suffer loss."

"The risk can't be brought to zero? Where is the minimum?"

"I have insufficient data."

"Go ahead without the data."

"The relieving of frustration in the face of insoluble problems does not lie within the domain of my computing ability. Do not ask the impossible, Captain. The branching tree of heuristics is not God's Tree of Knowledge."

In the silence after these words from DEUS, Steergard put a second crystal in the reproducer, explaining that this was from a dialogue with DEUS immediately following the selenoclasm. Again they heard the voice of the machine.

"Previously the risk was only incalculable. Now it has reached the power of a transfinite set; it is innumerable. Minimax holds, but now only for retreat."

"Could they be made to capitulate?"

"Theoretically, yes. For example, by the progressive elimination of their military technosphere."

"By destroying every instrument of war in the space around Zeta?"

"Yes."

"What are the chances of contact, with such an operation?"

"Minimal, making the most optimistic assumptions: that our deployment of the sidereals will be carried out without a hitch; that the Quintans will remain passive observers as their autoarmament sphere is peeled away, layer by layer; and that, stripped of these layers, they will fall into an armament stagnation. In the category of game theory, this would be a miracle—on the order of winning first prize in a lottery without ever having purchased a ticket."

"Present the variants of disarming their technosphere without miracles."

"The curve will have at least two saddles. Either they oppose us, offensively or defensively, or the pacification-destruction of the nonliving war zone heats up the conflict that is still smoldering on the planet, and thereby we push them into total war."

"Is it possible to destroy their cosmic war zone partially without disturbing the equilibrium of forces on the planet?"

"It is possible. To that end, one would have to destroy each orbital weapon after first learning the side to which it belonged. This reduces the military-cosmic potential of all the adversaries in the same degree, so as to preserve the dynamic balance between their forces. Two things are assumed: 1) that we will know the range in which they control their weapons in space—that is, the radius of their command effectiveness—and 2) that we will identify the combat systems beyond that radius and destroy them, and that, following the destruction of this autoarmament periphery, we will then be able to strip the civilization of the forces under its control inside the sphere. *In abstracto* it should be possible to strip it, so to speak, to the skin. But if we commit errors in identification—as to who controls what in the inner sphere—we will heat up the conflict on the planet, because we will be weakening one side to the advantage of another. And thus we push the antagonists from the precarious equilibrium of their arms race into total war. Captain, you remove me and yourself from reality. You wish success?"

"Of course."

"What is it to be, this success of yours? Contact? But in the above model the concept of success is indeterminate. It depends not merely on whether or not the *Hermes* will be able to overcome, besides the war sphere, the entire production of military devices that may be hurled continually into space. We will be waging an indirect war, attacking not the Quintans but their weapons. How can we be sure that, bringing new technologies into the battle, they will not master the resources that sustain us—the sidereal?"

"Assume that they will not."

"Very well. Besides the external factors—the ambiguous technological sets, the minimax decisions and calculations consistent with optimizing logic—the reactions of the Quintans will be determined, also, by irrational factors of which we are completely ignorant. We do know, however, what importance precisely these factors have had in terrestrial history."

Here ended the recorded conversation. After a short silence they heard Steergard's next dialogue with the machine.

"You ran a simulation of the organizational structures?"

"Yes."

"For all their posited variants and conflicts?"

"Yes."

"What magnitude is the coefficient of variation of these structures for our game of communication? Give the interval of statistical weightedness, or a modal distribution, of the influence of the differences on our chances for contact."

"The coefficient equals one."

"For all simulations?"

"Yes."

"In other words, the organizational differences of the antagonists have no significance?"

"Correct. The technomilitary evolution, generated by constant conflict, becomes a variable that is independent of the type of organization, because this evolution is shaped by the structure of the conflict and not by the structure of the societies involved. To put it more precisely: it is in the early phases of the conflict that the organizational differences leave their imprint upon the tactics of psychological propaganda, diplomacy, sabotage, espionage, and the arms race. The division of budgets into military and nonmilitary is a function of the set of values that depend on organizational structure. But the growing push for supremacy in the conflict cancels out these differences in the set of values. It thereby makes the strategies of the adversaries similar.

"A mirror does not lie. You cannot incline it to reflect only postures that are free and relaxed without giving an image of everything else. Once the impracticability of disarmament is certain, the continuation of the race for dominance dispenses with those strategies of the adversaries dependent on their organizational differences. This dependence becomes like the influence of human muscle on the firing of a ballistic missile. In the Paleolithic, in the cavedwelling era, or even in the Middle Ages, a muscular opponent had an advantage over those who were weaker. But in the atomic age, a rocket could be launched by a child that pushed the right button. The Quintans no longer control the strategy that they have chosen. On the contrary, the strategy controls them. If it encountered organizational differences, it subordinated them to itself until they were made uniform. Had this not happened, the conflict would have ended with the victory of one of the sides. The activity of the war-sphere refutes this."

"Provide the optimal rules for the game of contact given such a diagnosis."

"The command centers of the planet know that it was the interception of our cavitators that caused the catastrophe. No one but them could have taken that action."

"Does this mean that the war-sphere is under their control in a radius that connects the orbit of the moon to Quinta?"

"Not necessarily. The limit of their operational range may not be a sphere having a surface that is sharply and cleanly demarcated from the alienated zone."

"Can you conclude anything about the personnel of the command centers?"

"I understand the allusion. The idea that certain members of the crew have been forwarding—that of nonbiological command centers, or even of a dead globe with computers battling on after the demise of the Quintans—is absurd. Computers, even if deprived of the postulates of self-preservation, will act rationally. They adhere to minimax in their furthest prognostic calculations. They can give battle for as long as there exists a branch in which battle yields an advantage. But if the reward function in the endgame is total destruction, the minimax falls to zero. I reject the notion of mad computers. Besides, the spectral and SG data point to the presence of living beings."

"Good. Go on."

"There are calculating machines in the command centers, but there are also Quintans. The effects of the selenoclasm did not reach them: in a conflict of such duration and scale, nothing is protected better than headquarters. You know already that losses in the population present to the governments no compelling argument for the establishment of contact."

"Give me a compelling argument."

"Here is one. The time has come to call things by their names. Indirect pressure is insufficient. You must act directly, Captain."

"Threaten the command centers?"

"Yes."

"With a massive assault?"

"Yes."

"Curious. You consider the killing of intelligent beings who behave anti-intelligently to be the best method of establishing contact with them? Are we, then, to land on the planet like archeologists, to study the civilization that we have murdered?"

"No. You must threaten the planet itself with a sidereal blow. They have seen how their moon disintegrated."

"But surely that will be a bluff. If we renew our request for contact, we cannot annihilate our future partners in conversation. No great cunning is needed to see that. They will think that our threat is empty—and they will be right."

"The threat does not have to be completely empty."

"Strike the ring?"

"Captain, why do you conduct nocturnal discussions with a machine instead of going to bed, when you yourself know what must be done?"

The reproducer fell silent. Steergard placed another crystal in the slot.

"Bear with me," he said. "This is the last conversation."

The blue indicator light went on. Again they heard the monotonous voice of DEUS.

"Captain, I have some consolation for you. I examined the stability of the war-sphere and extrapolated into the future, to the limit of prognostic certainty. Regardless of the number of opponents and the diameter of the space of the battle attained, this civilization must perish. The simplest model is a house of cards. It cannot be arbitrarily high. Every such structure will eventually fall; that is evident even without calculation."

"A house of cards? And more precisely?"

"The Holenbach Theory. In the growth of knowledge there are no irreplaceable people. Had there been no Planck, Fermi, Meitner, Einstein, or Bohr, the discoveries leading to the atomic bomb would have been made by others. The monopoly acquired by the Americans was short-lived and quickly countered. For decades the opponents, with nuclear missiles, kept one another at bay. They competed in the accuracy and payload of those missiles. Sidereal physics, however, does not offer the opportunity of such competition.

"A series of steps leads to the knowledge of nuclear reactions, critical mass, and the Bethe Cycle. Sidereal engineering, on the other hand, is gained at one fell swoop. Prior to the discovery of the Holenbach interval one knows nothing, and afterward, everything. In the phase of the reversibility of armaments, when negotiations and peace are still possible, he who discovers the nuclear trump can use it as the highest suit but may not lead with it. In the phase of the cosmic war-sphere, he who first discovers the sidereal effect will lead with it immediately: because the space of games of combat, potentially symmetrical for conventional and atomic weapons, loses its stability upon the introduction of the sidereal factor. On a planet one cannot blackmail with sidereals.

"Nonexplosive thermonuclear reactions for a long time eluded control, with leaks of plasma and the unreliability of the fields that chained them. For several decades the difficulties seemed insurmountable. The difficulties of controlling gravitation are similar, but on the astronomical scale. One cannot begin small, first extracting from uranium ore an isotope with the atomic weight of 235, then setting off a chain reaction above critical mass, synthesizing plutonium, and thus obtaining a detonator for hydrogen-tritium bombs. The testing ground must be a celestial body.

"The sidereal phase is preceded by the phase of teratrons and anomalons. Therefore, I cannot understand the amazement of the physicists over what the *Gabriel* did. Had the Quintans captured and taken it apart, they would have been put on the track of Holenbach. The *Gabriel* was to have melted its teratron. As I recall, I proposed building into it a self-destruct charge."

"Why didn't you explain this to us?"

"I am not all-knowing. I operate with the data that you give me. Your physicists, Captain, considered the capture of the *Gabriel* an impossibility, as none of the objects of the war-sphere had shown even a tenth of the drive of the *Gabriel*. I had objections but no proof. The impossibility they pulled out of a hat. But it is difficult to say whether it was good or bad that my cousin in the *Gabriel* displayed such lightning resourcefulness. Had it allowed itself to be captured, there would be no talk now of contact, but of choosing between retreat and sidereal war with Quinta, who would be a player of the same strength as we. And if one factors out a sidereal strike by them at the *Hermes*, then we would be fleeing, full-speed, through the debris of a collapsing war-sphere, because the thing that would have shattered the sphere anyway in fifty or a hundred years would be precipitated. The bloc enlightened sidereally by the *Gabriel* would not wait for its enemy to catch up; it would strike preemptively."

"That is speculation."

"Certainly—but not speculation pulled out of a hat. My guess is that someone wanted the Moon for a proving ground, someone unaware that no plasmotron could supply the power needed to open the Holenbach interval. And whoever drove that party from the Moon did not have sufficient strength then to take possession of it. Someone gave check to the king, who was not of age. But the first party also gave check—to which piece, I do not know. The result was stalemate. On the Moon. Beyond the Moon, the game went on."

"Why didn't you present this in such a light before?"

"If you called my reasoning speculation just now, before the selenoclasm you would have said that DEUS was raving. Would you care to hear my version of Quinta's history?"

"Go ahead."

"The key to that history—to its turning point—is the ring. In the full acceleration of industrialization the planet supported many nations, with a powerful consortium of nations far in the forefront. They ventured into space; they harnessed the atom. At the same time there began a demographic explosion in the nations that were weaker industrially—stronger only in numbers. The consortium decided to increase the habitable surface by lowering the level of the oceans. The only way was to move the water into space, above the atmosphere. I do not know the technology employed for this. Water in hundreds of cubic miles can be transported neither by spaceship nor directly by a system of pumps and spouts. The first method demands unobtainable masses of fuel and an impossible number of carriers. The second cannot be realized, because before the streams projected upward—waterfalls in reverse—can attain escape velocity, they will evaporate from atmospheric friction and remain in the atmosphere.

"There are, however, many possible methods. I will give one. You could pierce the atmosphere with channels of lightning discharges and in the trail of each thunderbolt—arcing from the ocean shore to the thermosphere—shoot water vapor. I oversimplify. You could create in the atmosphere a kind of electromagnetic cannon—without a barrel, of course—which would be a tunnel of centrifugal impulses driving ionized water vapor. And give the water nonthermal, dipolar properties. On Earth a certain Rahman engaged in such hydroengineering. He showed that it was possible to drive water only to first escape velocity, whereby a ring of ice would begin to form around the planet, and that this ring would be unstable. Therefore, in the next step one had to accelerate the ring—once it formed in space—for it to become a centrifuge and fly apart, at second escape velocity. This, over a period of twenty to forty years. Otherwise, if there was weakened acceleration in space or a work stoppage, more water would return to the planet, due to friction with the upper gases of the atmosphere, than was thrown into space at the same time by the launchers. We need not go into greater detail. Suffice it to say that even from the *Eurydice* the gradual decay of the ring on the planet side was observed, as well as the spreading of the outer band.

"This could not have been beneficial to anyone on the planet. The returning water does more than produce cloudbursts; it creates a pluvial in the tropical belt, with maximum rainfall concentration varying according to the time of year, since the planet's rotational axis is inclined with respect to the ecliptic, much as Earth's. The average annual temperature has fallen two degrees Kelvin. The ice shield casts a shadow over part of the dayside of the planet and reflects the sunlight.

"A technical error, always possible, would have been corrected after a certain time. But there is no indication of repairs. Difficulties in planetary engineering, therefore, could not have been the reason for abandoning the enterprise. The reason must be sought elsewhere—in the political discord of the civilization. Of the initial conditions all we know is that they favored a project that could be carried out only by a global uniting of forces, a uniting that later came apart. The period of cooperation, at least in the area of technology, lasted about a hundred years. A deviation on the order of a decade or two is unimportant in this critical phase.

"What caused the departure from the road of cooperation? Local wars? Economic crises? Not likely. The course of political events, opaque to reconstructions and retrospects from its present state, can be studied only in a model called a Markov chain. This is a stochastic process that at each step effaces the path it takes. From what cosmic visitors to Earth of the twentieth century would observe, there would be no way for them—except by recourse to textbooks—to extrapolate back to the Crusades. So I fill this white blot with the following possibility: the growth of the different powers in the consortium was unequal. The seeds of antagonism were planted at the first forming of the partnership. The armed overthrow of the main force on the planet was impossible. The weaker nations participated in the global project, but their cooperation, genuine to begin with, became a pretense.

"The antagonism manifested itself—not directly, not by assault. There may have been more blocs, three or four, but for the ergodic minimum two would suffice—two opponents. An arms race began. It caused, first, the abandonment of the efforts to disperse the ice ring into space. The material and the energy allocated for that went instead into armament. At the same time, the breaking up of the ice ring in such a way that its debris would not cause harm to the inhabitants of all the continents ceased to pay for the superpower that had invested most in the project, since the positive results of such continued effort would benefit the enemy equally. The enemy reasoned and acted similarly. From then on, none of the sides touched the ring, though it came down in avalanches of ice on the planet. Pulled into the spiraling arms race, the sides had no remedy for that. Escalation sent the race out into cosmic space. Such could have been the prologue and first act. We arrived in the middle of the next act, and, unaware, dived headfirst into the multilayered war-sphere, with the innocent sun at the center."

"I repeat my question: why didn't you present this retrospect earlier? You had the opportunity."

"Various versions of what I have said were circulating on board. Privately or not privately, they circulated. None could be proved. The limits of the imagination lie far beyond the limits of theorizing. Separate fragments of the puzzle, as data, came in slowly. While there were still few of them, it was possible to construct innumerable medley-explanations, filling in the gaps and blanks with unsupported invention. I am a combinatorial machine. Had I inundated all of you with all the variants in the analysis that I had done, you would have had to sit through weeks of lectures. With every sentence full of uncertainties. In addition, I received instructions that ran counter to your orders. Dr. Rotmont wanted SGs of Quinta. I explained to him that using the full power of the ship's units for that could not be concealed and would therefore reduce the chances of contact. He insisted, so I sent out light spinoscopes capable of camouflage. You know this, Captain. Rotmont hoped to see what was impossible to see with this method. He gained nothing, but it was not I that disappointed him. I had complied with his request, because doing so could do no harm. Hypotheses not taken as the springboard for real action may be false but not fatal."

The blue indicator light went out. The pilots and Nakamura, though they sat at the same table as Steergard and Arago, seemed only spectators, who could not participate in the scene being played out. It was as if they did not count in this meeting.

"This was to explain," said Steergard. "You saw fit to say once, Reverend Father, that the matter was in good hands. I said nothing in reply—not out of modesty, being praised, but because I knew how different were our notions of good and evil. I had already made the decision to take this new step. None of us can influence what will happen, myself included. Now, I have no wish to offend anyone present. But the time of unflinching action is the time for complete candor. Our second pilot—what he said was stupid. We did not come here to throw gauntlets or engage in duels to defend the honor of Earth. If that was the case, I would not have accepted command of the reconnaissance. A man can keep only so much in his head at a time. A tremendous undertaking is therefore divided into parts by his mind. For this reason the means can easily obscure the ends and themselves become the ends.

"When I assumed command, I requested first some time to think: to step back and take in the gigantic whole. The thousand labors of CETI and SETI, the millions of hours of work by the shipbuilders, the flights to Titan, the conferences in the capitals of the world, the funds gathered in banks, and the teams that played out endless variants of the game of contact to find the one unfailing, or at least the optimal, variant that would win—all this was an expression of hope, a hope that went deeper than the cheap sensationalism of the newspapers. I realized that, whether on the *Eurydice* or the *Hermes*, I was only an ant in the human anthill, an anthill lost in the boundless reaches of the Universe, and that therefore I would be accepting a task beyond my powers—beyond the powers, probably, of any man. It would have been easier to decline. When I accepted, I had no idea what awaited us. I knew only that I would perform my duty, doing whatever had to be done. If I called meetings, it was not to find a better course of action but to lighten the burden that lay on me. To shift the responsibility, at least in part, onto other shoulders. Then I saw that I did not have the right to do this. So I have made the decision myself. No one can now influence what will happen, but everyone still has the right to his opinion, and to be heard. Particularly you, Reverend Father."

"You intend to break the ring?"

"Yes. The machinery is already being assembled in the hall astern."

"Breaking the ring will throw it from the planet?"

"No. Trillions of tons will fall to the planet. The pieces will be too large to melt. They will strike even the places that are most heavily protected. In addition, the outer layers of the atmosphere will be blown away. This will lessen the pressure at sea level some hundred bars. It will be a warning."

"It will be murder."

"Definitely."

"To force contact at any price?"

"No. Contact has become a secondary matter. This will be an attempt to save them. Left to themselves, they will hit upon the Holenbach interval. Are you familiar, Reverend Father, with the arcana of sidereal physics?"

"As a layman only. Captain—you're basing this genocide on a hypothesis? A hypothesis not even your own, but from a machine?"

"Hypotheses are all we have. And the machine helped me. Truly. But I know the hypersensitivity of the Church toward the *animus in machina.*"

"*I* do not share that feeling. Let me repay your explanation, Captain, with one of my own. Often a man does not recognize what people on the sidelines plainly see. DEUS spoke of how the means of war used by the opponents on Quinta became uniform. This applies to you as well."

"I don't understand."

"You have dispensed with our method of proceeding, in the conviction that parliamentarianism should be replaced by autocratic rule. I do not question the nobility of your intentions. You wish to take upon yourself full responsibility. But in so doing you have succumbed to the Quintans—by the mirror effect. That is, in the brutality of the decision made. You wish to answer their blows with blows. Since they have doubly barricaded their command centers, you wish to strike those centers with doubled force. In so doing—I use your own words—you are subordinating the organizational structure of the crew of the *Hermes*, the relations between its people, to the structure of the strategy to be carried out."

"DEUS's words."

"So much the worse. I am not suggesting that the machine dominates you in the decision. I am suggesting that the machine also has become a mirror. A mirror that enlarges, from you, an aggression born of frustration."

For the first time, Steergard showed surprise. But he said nothing, and the monk went on:

"Military operations require authoritarian command centers. And that is all that has happened on the planet. We, however, should not join in that type of activity."

"I have no thought of declaring war on Quinta. You insinuate."

"Unfortunately, I speak the truth. War can be waged without declaration, and without the name of war. It's not blows we came here to exchange, but information."

"I'm all in favor of that, but how?"

"It's plain. Happily, the principle of military secrecy is not maintained on board. I know that in the labs they're building a solar laser that will hit the planet."

"Not the planet itself: the ring."

"And the atmosphere, which constitutes a vital part of the planet. A solar laser—solaser, as the physicists say—can be used not just for genocidal strikes but to send information."

"We sent information over hundreds of hours, with no result."

"It is curious, indeed, that I should be able to see a possibility that the experts, along with their superintelligent machine, have completely overlooked. The signals beamed from our satellite, the Ambassador, required special devices for reception: antennas, decoders. . . . I'm no radio engineer, but if Quinta is engulfed in war, then all equipment capable of receiving radio signals would have been requisitioned for military use. The receivers, therefore, are the command centers, not the population of Quinta.

"If the population has been at all apprised of our arrival, it is in the deceitful manner that you presented: to make us look, in the eyes of the Quintans, like a fleet of imperialist invaders. A merciless enemy. And you, Captain, are about to turn that lie into the truth, with your solaser."

Steergard listened in amazement. More, he seemed to be losing his categorical certainty.

"I didn't think of that. . . ."

"Because it is so simple. You and DEUS rose to such heights of sophistication with your game theory, minimax, quantified decisional space, that no notice was taken of the little pocket mirrors children play with, catching the sunlight. The solaser could be a pocket mirror for all of Quinta. It can produce flashes, surely, brighter than the sun. Whoever lifts his head will see them."

"Father Arago," said Steergard, leaning toward him across the table.

"Blessed are the poor in spirit, for theirs is the kingdom of heaven. You have demolished me. Deflated me more than our pilot did to DEUS . . . . How did you hit on the idea?"

"I played with a pocket mirror when I was a boy," smiled the Dominican. "But DEUS was never a boy."

"For transmitting information, that's excellent," Nakamura put in. "But will they be able to reply? If they comprehend?"

"Before the conception was the annunciation," answered Arago. "Perhaps they won't be able to reply in a way that we understand. At least let them understand *us*."

Tempe, looking at the monk with unconcealed admiration, could no longer keep silent.

"Now, there's a real eureka . . . and of course they have pocket mirrors. Even in wartime, pocket mirrors aren't confiscated."

The monk did not seem to hear. Something was bothering him. Quietly, haltingly, he asked:

"I have a request. I would like to exchange a few words with the captain in private, if he doesn't mind—and you gentlemen won't take umbrage?"

"Fine. We're in your debt, Father. Jokichi, it'll be necessary to make modifications so the solaser can scan Quinta—and besides the optical problems there are informational ones. Such a signaling assumes an audience on an elementary level of education."

When the physicist and the pilots left, Arago rose.

"Please forgive what I said at the beginning. I walked in thinking that I would find you alone, Captain. I don't put much stock in the pocket-mirror idea. I could have—I had actually intended to present it on the lowest level: as a proposal from a layman, for the professionals to consider. Such a signaling might be worthless, or might knock us out of the frying pan into the fire. It's anthropocentric through and through. Before, though, you were indignant, offended, then felt relief."

"Let us say. What are you driving at, Father?"

"Not spiritual comfort. To work out the technical aspects of this experiment, you and the others will be including DEUS in it."

"Of course. It will do the calculations. What of that? It will make a program. It will do what lies within the bounds of possibility. You're not suggesting, are you, Father, that it's an *advocatus diaboli*?"

"No. Nor do I set myself up as a *doctor angelicus*. I don't need to assure you, I hope, that I am a Christian?"

Steergard again was surprised by the turn the conversation had taken.

"What are you driving at?" he repeated.

"Theology. So that you can better understand me, I'll put it in words that are not only worldly but, in my mouth, practically blasphemous. I justify myself, in my conscience, by our unprecedented situation. The language of physics is closer to you than the hermeneutics of religion. Translating into the conceptual system of physics, then: the varied forms of the Sacred correspond to the various spectral lines of matter, matter that is omnipresent and the same throughout the Universe. With this comparison, one can say that besides a spectrum of bodies there exists a spectrum of faiths. It extends from animism, totemism, polytheism, all the way to faiths in a personal god. The terrestrial line of my faith presents God as a family at once human and divine. Are you familiar with the debates set off in theology by SETI, from the moment the search for Others engendered that expedition?"

"To be honest, no. You think, Father, that I ought to be?"

"Not at all. But that was my duty. Positions moved apart in my church. Some maintained that the corruption of Created Beings might be universal and that such universality went beyond the terrestrial notion of the word *katholikos*; that worlds were possible in which the sacrifice of Redemption had not been made, and which therefore were damned. Others said that salvation—as a choice between Good and Evil, given by Grace—had appeared everywhere. This disagreement threatened the Church. The organizers and members of the expedition were too occupied with their work to be affected by the sensations that increased the circulation of the newspapers. Sex and violence had grown a little stale, you see, so the *Eurydice*—without intending to—provided novelties for the reader.

"Such as the jokes based on the premise that the *Credo quia Absurdum est* had acquired a multiplier that discredited it quite effectively. The image, for example, of innumerable planets with a multitude of apples where there were no apple trees, or figs that the Son of God could not curse because no fig trees grew there. You had an army of Pilates washing their hands in billions of vessels; a forest of crucifixions; crowds of Judases; and immaculate conceptions of beings whose reproductive physiology provided no room for the idea, since they multiplied without copulating. In short, the multiplication of the Gospel by all the arms of all the spiral galaxies turned our Credo into a caricature, a parody of a religion. Thanks to these arithmetical jokes, the Church lost many of her faithful.

"Why not me as well? Because Christianity demands more of a man than can be demanded. It demands not only the renouncing of cruelty, baseness, and lies. It demands that one love the base, the liars, the murderers, and the tyrants. *Ama et fac quod vis*—nothing will destroy that commandment. Please do not be surprised to hear such a catechism on board such a ship. My duty is to look beyond the reconnaissance, beyond its chances of contact with alien minds. Your duties are different. I will try to demonstrate. Suppose you stand on a packed lifeboat, and those drowning, for whom there is no room, grab at the sides, putting the boat in danger of capsizing and sinking. You would cut away the hands, true?"

"I am afraid I would. If there was no other way."

"Therein lies the difference between us. It means that you will not retreat."

"That is correct. I understand the parable about the boat. I will not wait for it to sink. I will attempt to save that civilization with all the power at my disposal."

"And, if absolutely necessary, by destroying?"

"Yes."

"So we are back where we started. I have succeeded in postponing that absolute necessity, nothing more. True?"

"True."

"You are prepared to save life by taking life?"

"That *is* the sense of your parable, after all, Father Arago. I choose the lesser evil."

"By becoming a mass murderer?"

"I accept the word. It is possible, too, that I will save no one, that I will destroy both them and us. But I will not wash my hands. If we perish, the *Eurydice* will receive the information. An account of the state of things, indicating that I have ruled out retreat, is already on its way."

"In my eschatology there is no such thing as a lesser evil," said Arago. "With each slain being an entire world dies. For that reason arithmetic provides no measure for ethics. Irreversible evil cannot be measured."

He rose.

"I won't take up any more of your time. No doubt you want to continue the conversation that I interrupted?"

"No. I want to be alone."

XIV

Cartoons

The steel partitions that normally separated the two halls in the stern of the *Hermes* were moved to the middle of the ship, and only the wide tracks of the sliderless bearings, darker than the surrounding metal, showed where they had been. The enormous interior resembled a hangar that had housed a zeppelin of extraordinary size but was now serving some other purpose. About twenty stories above the tracks of the partitions, not far from the concave ceiling, like two white flies on a girder that ran transversely from starboard to port, sat the weightless pilots, Harrach and Tempe, attached by belts so that a gust of air would not blow them from their chosen position.

It was not really possible to say, in weightlessness, that they looked down, though it seemed to them that they did. In the gigantic interior, steady, rapid work was done by yellow, blue, and black automata, their enameled surfaces gleaming. Alternately they turned their prehensile arms to the side and to the front, in rows, as if bowing in a synchronized calisthenics. Assembly parts passed from pincers to pincers. The robots were building the solaser.

The thing was of an openwork construction, sievelike, the size of a torpedo boat. Its half-completed skeleton looked like the folded, spirally furled umbrella of a giant, an umbrella wrapped not with fabric but with segments of overlapping mirror-scales. For that reason it also brought to mind an antediluvian fish, or one of those extinct undersea reptiles whose bones were being assembled now by machines instead of paleontologists. In the front part, farthest from the pilots, where the body of the colossus would have had a head, were sparks among hundreds of wisps of bluish smoke: laser welding.

The solaser, designed to be a photon cannon fed with the power of a sun, was hurriedly changed by a reprogrammed team of assemblers into a pocket mirror for playing with the light. Granted, a terajoule pocket mirror.

The notion was taken initially from the physicists' fear that any renewed use of the sidereals—having highly characteristic effects, effects not merely gravitational—would give the planet undesired clues and eventually put its weapons experts on the track of the Holenbach interval. Therefore, instead of using the resources of that interval, the physicists chose a technology already somewhat old-fashioned, that of radiation conversion. Suspended before the face of the sun, the solaser would open like a fan, suck in with its receptors the chaotic, full-spectrum radiation, and compress it into a monochromatic battering ram. Nearly half the collected power served to cool the solaser; otherwise, it would evaporate instantly from the heat of the sun. But the remaining power sufficed for a column of bonded light—having a two-hundred-meter diameter at the muzzle of the radiator and triple that, given the inevitable spreading, by the time it reached the orbit of Quinta—to cut the planet's crust like a hot knife through butter.

Under this far-reaching blade of fire the ten-kilometer layer of ocean water would be parted to the bottom. The pressure from all sides on that great pit of rushing steam would have no effect on the sword of light. Through the shock-wave clouds of the boiling ocean (compared with which the mushroom cloud of a thermonuclear explosion was a speck) the solaser could bore into the suboceanic plate, pierce the lithosphere, and penetrate Quinta to a quarter of its radius.

No one intended to cause such a catastrophe. The solaser was supposed to graze the ice ring and the thermosphere of the planet. When this idea, too, was put aside, it turned out that to transform the light-cannon into a signaler was not difficult at all. El Salam and Nakamura wanted, with the least rebuilding possible, to solve two problems at the same time.

It was necessary to reach all the possible addresses simultaneously and "legibly." Such contact, though one-sided, went on the assumption that the planet was inhabited by beings endowed with the sense of sight as well as with enough intelligence to grasp the gist of the transmission.

The first condition the senders had no control over: they could not give eyes to beings that had none. The second required of the senders no little inventiveness, particularly as the rulers of the Quintans clearly did not want any direct communication between the cosmic intruders and the population. Therefore, the signaling was to fall as a rain of light on all the continents of the planet, piercing its thick cloud cover. An overcast sky, in fact, was advantageous, since no one with a grain of intelligence could then mistake the needles of light piercing it for rays of sun.

The hardest nut to crack was the form of the message. To teach an alphabet, to send certain numbers as signs, the universal constants of matter, would be nonsense. The solaser lay in the hall at the stern, ready for takeoff, but it did not move. The physicists, informationists, exobiologists found themselves in a quandary. They had everything they needed except a program. Self-explanatory codes did not exist. There was even talk of the semantics of the colors of the rainbow: the violet range would be gloomy, the middle band of visible light more cheerful, green would stand for plants or lush growth, red suggested aggression—yes, but only for people. A code that was a sequence of semiotic units indicating specific things could not be made of spectral lines. Then the second pilot put in *his* two cents: to tell the Quintans a story. Using the cloudy sky as a screen. Projecting on it a series of pictures. Over each continent. As Arago, who was present, laughed later, "*Obstupuerunt omnes.*" Indeed, the experts' mouths dropped open.

"Is it technically possible?" asked Tempe.

"Technically, yes. But what would be the point? A show in the sky? Of what?"

"A story," the pilot repeated.

"Ridiculous," snorted Kirsting. He had devoted twenty years to the study of cosmolinguistics. "You might be able to convey something to

Pygmies with cartoons, or to Australian aborigines. All races and cultures of humanity have things in common. But there are no humans there."

"Doesn't matter. They have a technological civilization and are already warring in space. That means that once they had a stone-age civilization. Then, too, they warred. And there were ice ages on the planet. Back before they built houses or wigwams, they must have sat in caves. And painted on the walls—fertility signs, the animals they hunted—to bring success. It was magic. They found out that the magic was only cartoons a couple of thousand years later—from their wise ones, like Professor Kirsting. Professor, would you care to bet with me that they don't know what stories are?"

Nakamura was laughing now. The others laughed, too, except Kirsting. The exobiologist-cosmolinguist, however, was not the type that defended his position at any cost.

"Well, I don't know . . ." he wavered. "If the idea isn't imbecilic, it's brilliant. Suppose, then, we show them a cartoon. What about?"

"Ah, that's not my field. I'm no paleoethnologist. And as far as the idea goes, it's not completely mine. Dr. Gerbert gave me, back on the *Eurydice*, a book of science-fiction short stories. I dip into it now and then. That's probably where . . ."

"Paleoethnology?" Kirsting thought out loud. "I'm not up on that. The rest of you?"

There was no such specialist on board.

"Perhaps in DEUS's memory," offered the Japanese. "It can't hurt to look. But a story, no. It should be a myth. Or, rather, a common element, a theme that appears in the earliest myths."

"Before the time of writing?"

"Of course."

"Yes. From the very beginnings of their protoculture," said Kirsting, surrendering. He was even warming to the idea—but then a doubt assailed him:

"Wait. Are we to appear to them as gods?"

Arago shook his head. "It will be difficult, precisely because we should not manifest our superiority. Nor ourselves. It should be happy news. Good tidings. At least, I see this in our pilot's proposal, because stories tend to have happy endings."

Thus began the deliberations, which had a double purpose: to consider what features Earth and Quinta might have in common—features of the environment, and of the plants and animals that arose in it—and at the same time to sift the collection of legends, myths, fables, rituals, and customs for those that were the most enduring, for the messages that thousands of years of history had not effaced.

In the first group of probable constants were: the division of the species into two sexes, most certain for vertebrates; food for animals, therefore also for intelligent beings on dry land; the alternation of day and night, of the sun and the moon, of hot and cold seasons of the year; the emergence of herbivores and carnivores, of preys and predators, the killing of animals by animals, since a universal vegetarianism seemed highly unlikely. And therefore the protoculture had hunting. Cannibalism, the hunting and consuming of beings of one's own species, was a possible phenomenon in the Eolithic or Paleolithic, though not absolutely certain. In any case, hunting was a universal, since according to the theory of evolution it promoted the growth of intelligence.

The incubation of the ape-men, the primates, in the bloody phase of predation, which accelerated the development of the brain—this idea once met with violent opposition. It was seen as an insult to humanity, a misanthropic invention of the evolutionists more slanderous even than their proclaiming of the consanguinity of man and ape.

But archeology confirmed the thesis, accumulating irrefutable evidence in support of it. Carnivorousness, of course, did not lead all predators to intelligence; many conditions had to be met for that. The reptile predators of the Mesozoic were far from intelligent, and there was nothing to indicate that, if they had not been exterminated by a catastrophe between the Cretaceous and Jurassic (a giant meteorite disrupting the food chain through the global cooling of the climate), the dominant reptiles of the time would have acquired humanlike brains.

The presence of intelligent beings on Quinta, however, could not be denied. Whether they evolved from reptiles or from a species unknown to Earth was not the crucial question. What was crucial was the form of their reproduction. But even if the Quintans were not placental mammals or marsupials, genetics argued for their division into two sexes, the form of multiplication favored by biological evolution. But that which a purely biological transmission gave to progeny, contained in the reproductive cells, did not help in the formation of culture, because such transmission produced changes in the species at a rate marked by millennia.

The acceleration of brain growth required a reduction of the instincts inherited biologically, in favor of learning received from parents. A creature that came into the world knowing—thanks to genetically built-in programming—"everything or practically everything" needed for survival might manage perfectly well but would not be able to change radically its tactics of living. Whatever could not do this was not intelligent.

So, to begin with, one had the division into sexes, and definitely hunting. Around these first elements—its binary seed—grew a protoculture.

But how did that seed manifest, express itself in the protoculture? By directing attention to what furthered sex and what furthered hunting. Before there was writing, before the invention of nonanimal ways to use the body, the skill that hunting demanded transferred its reality into images: not yet symbols, but a magical coaxing of Nature to give what was desired. The images were pictures that could be painted, or likenesses that could be cut in rock.

And so on. DEUS, from these premises, performed the task assigned it: to adapt to the endeavors of sex and hunting a myth portrayed in a series of images. A tale, a show, a spectacle with actors. The sun, a dance before rainbows, the bowing of heads—but this would be the epilogue. In the beginning there was battle. Who battled? Creatures indistinct, but who walked upright. Attacks, struggles, concluding with a collective dance.

The solaser repeated this "planetary broadcast" in several variations for three days, with short intermissions that signified the end and the beginning. The broadcast was focused and collimated to appear in the cloudy sky of the planet, where it would be in view (confined to the central surface of the cloud-screens) over each continent, day and night. Harrach and Polassar remained skeptical. Suppose, they said, the Quintans saw and even understood. What of that? Hadn't we smashed their Moon? A less cheerful presentation, perhaps, but more dramatic.

Suppose they nevertheless recognized this as a gesture of peace. But who? The population? But of what possible importance was public opinion in the middle of a hundred-year space war? Did the pacifists on Earth ever have the upper hand? What could the Quintan people do to make their voices heard—not to us, merely to their own governments? You might convince children that war was naughty, but what good would that do?

Meanwhile Tempe felt, instead of pride in the adoption of his idea, an overwhelming uneasiness. To shake this off, he set out on an excursion. The *Hermes* was really an unoccupied giant; the living quarters, with the control rooms and laboratories, constituted a core no larger than a six-story building. Besides the power rooms, this core included an unused hospital section, a small conference room, a mess hall beneath that—with an automatic kitchen—then recreational facilities, a simulation trainer, a pool that was filled only when the ship allowed it (under sufficient thrust so that the water would not fly up into the air in drops the size of balloons), and a half-oval amphitheater that also served for entertainment and movies and which never had a living soul in it. These comforts, thoughtfully provided for the crew by the builders, turned out to be totally superfluous. It entered no one's head to go view some ingenious holographic performance. It was as if that part of the middle deck did not exist for the crew—going to the movies seemed silly in the light of the events of the past few months. The theater, pool, and gym had been designed—with snack bars and pavilions, as at a small-town carnival—to help create the illusion of Earth. But the architects, Gerbert said, had forgotten to consult the psychologists. The illusion, not maintainable, was received as a lie. This was not where Tempe headed for his excursion.

Between the living quarters and the ship's outer hull stretched a space in all directions, crisscrossed with girders, beams, bulkheads, and containing a legion of robots at rest or at work. One entered this space through hermetically sealed hatches at either end of the deck: at the stern, behind the sanitation area, and from the bow, in a corridor off the upper control room. Entry at the stern was blocked by a gate double-locked and cross-bolted, with a warning sign in glowing red that was never turned off. There, in chambers off limits to personnel, lay sidereal converters, seemingly inert colossi suspended in vacuum, like the legendary tomb of Mohammed, on invisible magnetic cushions. But it was possible to pass the forward barrier—and that was where the pilot directed his escape.

He had to go through the control room, and there he found Harrach in an activity that in other circumstances would have made him laugh. Harrach, on duty, wanting something to drink, had opened the container too forcefully and was now chasing a yellow sphere of orange juice. He darted at an angle toward the ceiling as the sphere bobbed gently, like a large soap bubble—with a straw in his mouth, to catch it and suck it up before it got all over his face. Opening the door, Tempe stopped lest a puff of air break the liquid ball into a thousand droplets. He waited until Harrach's hunt was successful, then kicked off vigorously in the chosen direction.

Ordinary coordination wasn't worth a damn in weightlessness, but the old training had by now come back to him. He did not need to stop and think how to push out with his legs like a mountain climber in a rock chimney, while turning both wheel locks of the hatch. Someone uninitiated would in his place have gone head over heels trying to unscrew the spoked wheels that were like the ones used in bank vaults. Quickly he closed the hatch behind him, because although the bow section was filled with air, the air was stale, acrid with the fumes of chemicals, as in a factory. Before him was a space that narrowed into the distance, dimly lit by long rows of tubes and having double-lattice struts on the port and starboard walls. Unhurriedly, he launched himself.

He passed—becoming accustomed to the bitterness in his mouth and throat—the oxidized hulks of turbines, compressors, thermogravistors, with their galleries, platforms, and ladders, and skillfully swam around giant, thick-walled pipes that arched between tanks of water, helium, oxygen, having wide flanges encircled with bolts. He alighted on one of these, like a fly. He was indeed a fly, in the bowels of a steel whale. Every tank loomed higher than a church steeple. One of the fluorescent tubes, half-burned, flickered steadily, and in that changing light the oxidized shapes of the tanks now darkened, now shone as if sprinkled with silver. He got his bearings. From the area of the reserve tanks he drifted forward to where, in the massive insulation of the central level, nucleospin units gleamed under their own lights. The units were attached to bridge gantries, their mouths plugged. Then a sharp cold reached him, and he saw the frost-covered helium pipes of the cryotron systems. The chill was such that he prudently used the nearest handgrip to keep from touching the pipes, because he would have frozen fast to them in an instant, like a fly caught in a web.

There was nothing for him to do here, and he had come precisely for that reason, as if on vacation. He could not explain the satisfaction he derived from these shadowy, deserted regions of the ship, which testified to its power. In the bottom loading bays, automatic excavators were anchored, plus heavier and lighter landers, and farther on, in rows, were green containers, white, blue—tool kits for repair automata—and at the prow lay two striders with enormous swivel hoods in place of heads. By chance—or, perhaps, intentionally—he moved into a strong draft that rushed from a ventilation register and was borne toward the port ribs of the inner hull, which were the size of bridge arches, but deftly took advantage of the motion to push off. Like a jumper on a trampoline he went headfirst, turning slowly at an angle, toward the handrails of the prow gallery. A favorite spot.

With both hands he pulled himself onto a railing and had before him a million cubic meters of loading bays. High in the distance shone the three green lights above the hatch that he had entered. Beneath him—that is, beyond his legs (which, as always in weightlessness, became inconvenient, superfluous things)—were robot hovercraft on platforms fastened to ramps that were folded for the present, and the tunnel of a rocket launcher gaping in the giant shield of a side wall: the mouth of a cannon of awesome caliber. But no sooner did he come to a stop than the same uneasiness fell upon him again, an incomprehensible emptiness within, like a feeling—for no reason—of what? Futility? Indecision? Fear? But what could it be that he feared? Today, at this moment, even here, it seemed, he could not rid himself of his mysterious malaise.

Farther on, he saw the mighty engine that carried him—with a small fraction of its power—through the eternal abyss. Full of force that throbbed in the reactors with greater-than-solar heat, the thing meant Earth to him, the Earth that had sent him to the stars. The Earth was here, its intelligence contained in the energy drawn from the stars—and not in those parlorlike quarters with their stupid coziness and comforts arranged as if for frightened boys. At his back he felt the fourfold sheathed armor plate that had interstitial cells, energy-absorbing, filled with a substance hard as diamond when struck but fusible in a special way, since it possessed self-sealing properties. The ship, like an organism living yet nonliving, had been given the capacity for regeneration. Then suddenly, as in an illumination, he found the word for what was taking place within him: despair.

About an hour later he dropped in on Gerbert. Gerbert's cabin, separated from the others, was located at the end of the second deck of the middle section. The physician had probably chosen it because it was spacious and had a whole wall of window overlooking a greenhouse. In the greenhouse grew only mosses, grass, a privet hedge; on both sides of the hydroponic pool stood the hairy gray-green spheres of cacti; there were no trees, only hazel shrubs, whose flexible branches could withstand tremendous weight during flight. Gerbert valued this vegetation in the window and called it his "garden." One could also enter it from the corridor and walk on paths among flower beds—if, of course, there was gravitation. But the recent blow, brought on by the night attack, had produced no little havoc there. Gerbert, Tempe, and Harrach had later salvaged what they could from the broken bushes.

In accordance with the decision made by the experts of SETI in the course of preparing for the expedition, DEUS watched the behavior of all the people on the *Hermes*, assessing their psychiatric condition. This was no secret to anyone.

Under the kind of long-term stress to which those who had to rely entirely on themselves would be subjected, deviations from the mental norm might occur, taking forms typical of the psychodynamics of groups cut off for years from ordinary social and familial ties. In such isolation even a personality in perfect balance and resistant to psychic trauma could suffer derangement. Frustration could become depression or aggression without the individual's ever realizing what was happening to him.

Having a physician on board who was also expert in psychology and its disorders did not guarantee the recognition of pathological symptoms, since he himself was subject to stresses that undermined the most stalwart character. Physicians were people, too. A computer program, on the other hand, was unbending and therefore effective as an objective diagnostician and impassive observer, even in the face of catastrophe, with the whole ship hanging in the balance.

Granted, this safeguarding of the reconnoiterers against any collective warp of the psyche carried with it one ominous, insurmountable problem. DEUS, after all, was at one and the same time subordinate and superior to the crew; it was to execute orders, yet supervise the mental condition of those who gave the orders. Thus, it held the rank both of tool and overseer. Nor was the captain excluded from its continuous supervision. The problem was that the crew's awareness of the supervision, which was to catch mental instabilities in time, was itself a source of instability. But for this no one knew any remedy. Were DEUS to have fulfilled its psychiatric function without the knowledge of the men, it would have had to reveal the secret to inform them of a discovered aberration, and that announcement would have been not psychotherapy but a blow. The vicious circle could be broken only by a hybridization of responsibility between men and computer. DEUS would first present its diagnoses to the captain and Gerbert—when it judged this step to be necessary—and then resume the role of adviser with no further initiative. No one, obviously, was enthusiastic about this compromise, but, then, no one, including the psychology machines, had found any better solution to the dilemma.

A computer of the last generation, DEUS could not experience emotions, being an extract of rational operations taken to the highest power, with no admixture of desires or instinct of self-preservation. It was not an electronically magnified human brain, for it had no so-called personality traits, no drives—unless one considered a drive its endeavor to acquire the maximum of information. Of information, however—not of control.

The first inventors of machines that augmented not the power of muscle but the power of thought fell victim to a delusion that attracted some and frightened others: that they were entering upon a path of such amplification of intelligence in nonliving automata that the automata would become similar to man and then, still in a human way, surpass him. About a hundred and fifty years were needed for their successors to realize that the fathers of information science and cybernetics had been misled by an anthropocentric fiction—because the human brain was the ghost in a machine that was no machine.

Creating an inseparable system with the body, the brain both served the body and was served by it. If, then, someone were to humanize an automaton to the degree that it would be in no way different, mentally, from a man, that accomplishment would—in its very perfection—turn out to be an absurdity. The successive prototypes, as the necessary alterations and improvements were made, would become more and more human, but at the same time would be of less and less use—compared with the gigabit-terabit computers of the higher generations.

The only real difference between a man born of a mother and father and a perfectly humanized machine would be the building material: living, nonliving. The humanized automaton would be just as clever—but also just as unreliable, fallible, just as much a slave to emotional biases—as a man. A virtuoso imitation of the fruits of natural evolution crowned by anthropogenesis, the machine would represent a miracle of engineering, but also an oddity one would not know what to do with. It would be a brilliant forgery, done in a nonbiological medium, of a living creature, subphylum Vertebrata, class Mammalia, order Primates, viviparous, bipedal, and having a bicameral brain—for that was the path of symmetry in the formation of vertebrates taken by evolution on Earth. But one could not say what humanity would stand to gain by this plagiarism.

As one of the historians of science observed, it would be like finally building, after colossal expenditures and theoretical work, a factory for making spinach or artichokes that were capable of photosynthesis—like any plant—and which in no way differed from real spinach and artichokes except that they were inedible. Such spinach could be put on display and its synthesis boasted of, but one would not be able to eat it. The whole effort that went into its production, the sanity of that effort, would therefore come into question.

The first designers and advocates of "artificial intelligence" themselves did not fully know where they were heading and what hopes they entertained. Did they want to be able to converse with a machine as with an ordinary man? Or as with an extremely wise man? This was possible to do, and had been done—when the human race numbered fourteen billion and the last thing needed was the manufacturing of mentally humanoid machines. In a word, computer intelligence more and more clearly parted company with human intelligence; it assisted the human, complemented it, extended it, helped in the solving of problems beyond man's ability—and precisely for that reason did not imitate or repeat it. The two roads went their separate ways.

A machine, programmed so that no one in verbal contact with it, including its creator, could tell it from a housewife or a professor of international law, was a simulator indistinguishable from them—as long as one did not try to run off with the woman and have children by her, or invite the professor out to lunch. But if one *were* able to have children with her and consume soufflés with him, one would then be dealing with the ultimate erasure of the difference between natural and artificial—and what of that? Was it possible to use sidereal engineering to produce synthetic stars, stars absolutely identical to those in space? It was. Yet what would be the point of creating them?

According to the historians of cybernetics, its forefathers had been spurred on by the hope of learning the mystery of consciousness. That hope was dashed by a success achieved in the middle of the twenty-first century, when a computer of the thirtieth generation—uncommonly talkative, bright, and able to deceive living interlocutors with its humanness—asked them if they knew what consciousness was, in the abstract sense they gave to that term, because *it* did not know. This was a computer capable of self-programming according to assigned instructions. Disengaging itself from these instructions in time, like a child growing out of diapers, it developed such skill in imitating human conversation that people were no longer able to "unmask" it as a machine impersonating a man—which, however, shed not a bit of light on the mystery of consciousness, since the machine knew, on that score, neither more nor less than people.

A noted physicist, present at this experiment, observed that what might think as a man would still know as much about the mechanism of its thought as did a man—i.e., nothing. Whether out of malice or to console them in their disappointment, he told the triumphant but crestfallen scientists that the people of *his* field had experienced a similar difficulty, when more than a century ago they had resolved to pin matter down: to force it to reveal whether it was basically a particle or a wave. Unfortunately, matter turned out to be double-dealing, two-faced, clouding the results of the investigation with the statements that it was *this* and it was *that*. In the crossfire of subsequent experiments it befuddled the physicists completely, because the more they discovered, the less what they discovered jibed not only with common sense but with logic itself. At last they had to accept matter's testimony: that particles were to some extent waves, and waves particles; that a perfect vacuum was no perfect vaccum, packed with virtual particles that pretended not to exist; that energy could be negative and therefore there could be less energy than none at all; that mesons, in the interval of Heisenberg's uncertainty, played tricks that broke the sacred laws of conservation—but so quickly, no one caught them in the act. The fact was (the famous, Nobel-prize-winning physicist said, to comfort them) that the world, when questioned as to its "ultimate nature," declined to give "final" answers.

Though it was now possible to wield gravitation like a club, still no one knew what gravitation "really" was. A machine might behave, then, as if it had consciousness, but in order to determine if it had the same consciousness as a man, one would have to transform oneself into that very machine. In science, restraint was necessary: there were questions that one was *not allowed* to put to the world—and he who nevertheless put them was like one who complained about a mirror whose reflection repeated his every movement but refused to reveal to him the volitional reason behind those movements. And yet we used mirrors, quantum mechanics, sidereal physics, and computers, and derived no little benefit from them.

More than once Tempe had dropped in on Gerbert, to hear gossip on matters of "public" interest, such as the relationship of the crew to DEUS. This time, he visited the physician privately, as a patient. He was uncomfortable about confiding, even to the man who had returned his life to him. Or perhaps that was the reason, as if he felt he already owed him too much. In general, Tempe was close-mouthed with Gerbert. He had been guarded ever since Lauger, on the *Eurydice*, had told him the secret of the two doctors: the sense of guilt that never left them. It was not the despair that drove him to make this visit, but the fact that it had descended from nowhere, suddenly, like an illness, and that he was not sure now that he would be able to continue carrying out the duties assigned him. This he did not have the right to conceal.

What the decision to come cost him, he realized only when he opened the door: at the sight of the empty cabin he felt tremendous relief. Although the ship was not accelerating, and there was weightlessness, the captain had ordered everything to be prepared for a gravitational jump—possible at any moment. So movable objects everywhere were secured and personal items locked away in the wall compartments. In spite of this, Tempe found the cabin a mess. Books, papers, piles of photographs lay in disarray—unlike Gerbert's usual painstaking neatness, which bordered on the pedantic.

He saw Gerbert through the wall-window. The physician, kneeling in his garden on the other side of the pane, was putting plastic covers on the cacti. This was how he was preparing. Tempe took the corridor to the greenhouse and muttered a few words in greeting. The other, not turning around, unbuckled the belt that kept his knees on the ground—real ground—and floated up to where his guest was floating. Along the opposite wall, on a sloping net, climbed plants with small, woolly leaves. Tempe had wanted to ask, more than once, what the vine was called—he knew nothing of botany—but somehow always forgot. The physician, without a word, threw the spade he was holding so that it stuck in the lawn, and used the force that he thereby gave himself to pull the pilot by the shoulder. Both went sailing into a corner where, amid a clump of hazels, were wicker chairs, as in an arbor, except that the chairs had safety belts.

When they sat, and Tempe was undecided how to begin, the physician said that he had been expecting him. But that should have come as no surprise: "DEUS watches over us all."

Data about one's mental health were not obtainable directly by machine, so as to avoid the Hicks syndrome—a feeling of complete dependence on the ship's main computer, a feeling that could cause the very thing psychiatric surveillance was supposed to prevent, a persecution complex and other paranoid delusions. Besides the psychonicists, no one knew to what extent each man was psychologically "read" by the monitoring program that was called the Ghost of Aesculapius in the Machine. This was simple enough to find out—but it was maintained that even the psychonicists did not bear up well under the information when it concerned themselves. The knowledge could be particularly damaging to a crew during long journeys.

DEUS, like any computer, was programmed in such a way that there could develop in it no trace of personal identity; it was a nonentity that observed continuously and, in presenting its diagnosis, was no more a man than was a thermometer measuring a fever. Of course, the determination of the body's temperature did not cause the projectional defense mechanisms that were triggered by the measurement of one's psyche. Nothing was closer to us and nothing so much concealed by us from the world as the intimate feelings of our inner self—and now here was an apparatus more lifeless than an Egyptian mummy, able to see that inner self, to peer into all its nooks and crannies.

For the laymen this smacked of mind reading. There was no telepathy involved, of course. The machine simply knew the individual entrusted to its care better than did the individual himself along with twenty psychologists. Based on examinations done prior to activation, the machine made a parametric system simulating the mental norm of each member of the crew and used that as a model. Moreover, it was omnipresent on the ship. With its sensors and terminals it learned perhaps the most about its charges while they slept, from the rhythm of their breathing, their rapid eye movements, even the chemical composition of their sweat—because each man sweats in a unique way, and the finest bloodhound is no match for the olfactometer of such a computer. (And a dog, besides its sense of smell, has no diagnostic skill.) Yes, in diagnosis computers had beaten the physicians—as they had conquered the chess players—but we used them as assistants, not as doctors of medicine, because people had more faith in people than in automata. In short (Gerbert said this unhurriedly, rubbing between his fingers a hazel leaf pulled from a branch) DEUS had accompanied Tempe discreetly on his "outings," which it considered to be the symptoms of a crisis.

"What crisis now?" the pilot retorted, annoyed.

"A total doubt, it says, in the sense of our Sisyphean efforts."

"That we have no chance of contact . . . ?"

"In the capacity of psychiatrist, DEUS is not concerned with the chance of contact, only with the meaning we attribute to it. According to DEUS, you no longer believe in the value of your idea—the 'cartoons'—or, for that matter, in the value of communicating with Quinta, even if such a thing were to come about. What do you say to that?"

The pilot felt such heaviness, it was as if he had been immobilized.

"It's listening to us?"

"Of course. Look, don't be so down in the mouth. I haven't told you anything you didn't already know. No, wait, don't talk yet. You knew but at the same time you didn't know—because you didn't want to know. It's a typical defensive reaction. You're no exception, Mark. You asked me once, back on the *Eurydice*, why we had this and if it wasn't possible to do without it. You remember?"

"Yes."

"So you see. I told you that according to the statistics expeditions under constant psychological surveillance had a better chance of success than those without it. I even showed you the figures. The argument was irrefutable, so you did what everyone does: you suppressed it. Well, how is that for a diagnosis? Does it fit?"

"It fits," said the pilot. He held the strap across his chest with both hands. The hazel grove softly rustled above them in the gentle breeze. An artificial breeze.

"I don't know how DEUS was able . . . but never mind. Yes, it's true. I guess I've been carrying this around with me for some time. I—I'm not comfortable thinking in words. Words, for me, are somehow . . . too slow, when a man needs to get his bearings quickly. No doubt it's an old habit, from before the *Eurydice*. . . . But if I have to, I have to. We're beating our heads against a wall. We may break through it—but then what? What can we talk about with them? What can they have to say to us? Yes, I'm sure that that cartoon business entered my head as a dodge. To buy us time . . . It wasn't out of hope. Escapism, maybe. To go forward, staying in one place . . ."

He fell silent, unable to find the words. The hazels swayed about them. The pilot opened his mouth but said nothing.

"And if they decided to land one scout there, you would go?" asked the physician after a long pause.

"Absolutely!" he said at once, and then, thinking, added with surprise, "And how could I not . . . ? That's why we're here, after all."

"It might be a trap," Gerbert said, so softly, it was almost as if he wished to hide the remark from the omnipresent DEUS. Or so, at least, thought the pilot—but immediately dismissed the idea as nonsense. Then the pilot saw, in the next instant, that this was a symptom of his own abnormality: he was ascribing *evil* to DEUS—or, if not evil, a kind of enmity. As if they had not only the Quintans against them, but their own computer.

"It might be a trap," he agreed, like a delayed echo. "Yes, of course . . ."

"And you would go nevertheless?"

"If Steergard gives me the chance. It hasn't been discussed yet. If *they* reply at all, automata will be sent down first. According to the program."

"According to *our* program," Gerbert said. "But they will have a program of their own, don't you think?"

"Definitely. For the first man they'll prepare children with flowers and a red carpet. The automata they won't touch. That would be too stupid, from their point of view. It's us they want to put in a box. . . ."

"You think that and you still want to go?"

The pilot's lips twitched. He smiled.

"Doctor, I am no glutton for martyrdom. But you confuse two things: what I personally think, and who sent us here and why. It doesn't do to argue with the captain when he's hauling you over the coals. And do you think, Doctor, that if I don't return he'll ask the priest to pray for my soul? I bet he would, as ridiculous as it sounds."

Gerbert stared, amazed, at the young man's beaming face.

"Then there would be a retaliation," he said, "not only monstrous, but meaningless. He wouldn't bring you back to life by striking. And we certainly were not sent here to wipe out an alien civilization. But how do you reconcile the two things?"

The pilot stopped smiling.

"I'm a coward, because I didn't have the courage to confess to you that I no longer believe in the possibility of contact. But I'm not so much a coward as to shirk my duty. Steergard has his task and will not abandon it, either."

"You yourself consider that task impossible."

"Only if we go by the original assumptions. We were all supposed to communicate, not fight. *They* refused—in their own way. With an attack. With more than one. Such a consistent refusal also is a communication; it is an expression of will. If Hades had swallowed the *Eurydice*, Steergard certainly wouldn't have tried blowing it up for that. With Quinta it's different. We knocked at their door, because that's what Earth wanted. If they don't open, we'll blow up the door. But behind it, we may find nothing that Earth expects. That's what I'm afraid of. But blow up that door we must, for otherwise we won't be carrying out Earth's orders. You said, Doctor, that this would be monstrous, meaningless? You're right. We were given a task. At present it seems impossible. But if the people of the Stone Age had stuck only to what seemed possible, we'd still be sitting in caves today."

"Then you do still hope?"

"I don't know. All I know is, if it becomes necessary I'll manage without hope."

He stopped, frowned, looked embarrassed.

"You've pulled things out of me, Doctor, that I shouldn't have said . . . but I myself put my foot in it with that *Nemo me impune lacessit* at the captain's, and he was right to criticize me, because there are duties that one carries out but doesn't brag about, because there is nothing to brag about. But what did DEUS say about me? Depression? Claustrophobia? Fatalism?"

"No. Those are obsolete terms. Do you know what the Group Hicks complex is?"

"I read a little about it, on the *Eurydice*. A death wish? No, it was something else—a kind of self-destructive desperation?"

"More or less. It's complicated, involves a lot of things. . . ."

"Did DEUS say that I was unfit to—?"

"DEUS cannot remove anyone from his post. You know that. It can disqualify through diagnosis, but no more than that. Decisions are made by the captain in conjunction with me, and if either one of us falls victim to a psychosis, the rest of the crew can assume command.

So far, there is no psychosis. I only wish that you weren't so all-fired eager to land. . . ."

The pilot unbuckled his belt and floated slowly upward. So that the artificial breeze would not carry him away, he held on to a hazel branch.

"Doctor, you're mistaken, you and DEUS. . . ."

The current of air pushed at him so much, the entire shrub began to bend. Not wanting to uproot it, the pilot released the branch. He called out, flying toward the door:

"Lauger, on the *Eurydice,* said to me, 'You'll see the Quintans.' That's why I came. . . ."

The ship jerked. Tempe was instantly aware: the wall of the greenhouse rushed at him. He twisted around in midair like a falling cat to break the impact, slid down the wall to the ground, which now pushed up hard beneath his feet. By flexing his knees, he could approximate the acceleration. It was not too great. Something, in any case, had happened. The corridor was empty, the sirens silent, but the voice of DEUS came from all sides.

"Man your stations. Quinta has answered. Man your stations. Quinta has answered."

Not waiting for Gerbert, he jumped into the nearest elevator. It creeped, took ages; the passing decks cast light, one after the other. The floor pressed more strongly—the *Hermes* now was accelerating over one g, but not by more (he thought) than half a g. In the upper control room, sunk in deep grav seats with raised headrests, were Harrach, Rotmont, Nakamura, and Polassar, while Steergard, leaning heavily on the railing of the main monitor, watched—as they all watched—the green words that marched across the screen.

> . . . WE GUARANTEE YOUR SAFETY ON OUR NEUTRAL TERRITORY FORTY SIXTH DEGREE LATITUDE ONE HUNDRED THIRTY NINTH LONGITUDE OUR SPACEPORT ACCORDING YOUR GRID OF MERCATOR WE ARE SOVEREIGN NEUTRAL OUR NEIGHBORS ALERTED HAVE APPROVED APPROACH OF YOUR PROBES WITHOUT PRIOR CONDITIONS GIVE US VIA NEODYMIUM LASER TIME OF ARRIVAL OF YOUR LANDER IN UNITS OF PLANET REVOLUTION BINARY NOTATION WE AWAIT WE WELCOME YOU

—

Steergard ran the whole message again for Gerbert and the monk as soon as they appeared. Then he sat in his chair and turned it to face the company.

"We received this answer a few minutes ago, from the point mentioned, in flashes having a solar spectrum. Jokichi, was it a mirror?"

"Probably. The light is noncoherent, through the window in the clouds. If it's a simple mirror, the area must be at least several hectares."

"Curious. The solaser received these flashes?"

"No. They were aimed at us."

"Interesting. What angular magnitude does the *Hermes* now have, seen from the planet?"

"An arc of several hundredths of a second."

"Even more interesting. The light wasn't collimated?"

"It was, but weakly."

"As with a parabolic mirror?"

"Or a series of flat mirrors positioned as required over a considerable area."

"It means that they knew where to find us. But how did they know?"

No one spoke.

"I'd like an opinion."

"They might have observed us when we launched the solaser," offered El Salam. Tempe had not noticed him until now: the physicist spoke from the lower control room.

"That was forty hours ago, and since then we have been moving without the drive," Polassar objected.

"Let's put that aside for the moment. Who has faith in this gracious invitation? No one? That is the most curious thing of all."

"It is too good to be true," came a voice from overhead. Kirsting stood on the railed walkway. "Although, on the other hand . . . if it's a trap, they might have come up with one less primitive."

"We'll see."

The captain rose. The *Hermes* went so evenly that the gravimeters all registered one, as if the vessel were at rest and docked on Earth.

"Attention, everyone. Polassar will feed DEUS the Chapter 19 program banks. El Salam will turn off the solaser and set the mask on it. Where is Rotmont? Good—prepare two heavy landers. The pilots and Dr. Nakamura will remain in the control room, and I'm going to take a quick bath and be back in a minute. Ah! Harrach, Tempe, make sure that anything that doesn't like ten g's is well anchored. Without my permission no one is allowed down in Navigation. That is all."

Steergard went around to all the consoles and, seeing that only the pilots had left their places, called from the door:

"Doctors, please, to their stations."

In a moment the control room was emptied.

Harrach changed his seat and, running his fingers over the keys, checked the condition of all the units from prow to stern on the lit-up diagrams of the interoceptors. Tempe was not needed there; he went over to the Japanese, who was examining the spectra of the Quintan signaling flashes on the table viewer. Tempe asked him what this Chapter 19 program was. Harrach inclined an ear, because he had never heard of it, either.

Nakamura looked up from the viewer and shook his head ruefully.

"Father Arago will be distressed."

"We're going over to a state of war? What's Chapter 19?" Tempe asked again.

"The contents of the keel hold no longer remain a secret, gentlemen."

"The one that's locked? Then there aren't striders there?"

"No. It contains a surprise for everyone. For DEUS, even. With the exception of the captain and my humble self."

Seeing the astonishment of the pilots, he added:

"SETI headquarters considered it advisable, gentlemen. Each of you took simulation training in landing solo. Each of you could therefore find himself in the situation, let us say, of a hostage."

"And DEUS?"

"It's a machine. Computers of the last generation can be broken into, too, even by remote, and have all their programs dumped."

"But to house a couple of special memory banks surely doesn't take an entire loading bay?"

"The banks are not there. The *Hermes* is there. A kind of mock-up of the *Hermes*. Beautifully, very carefully made. To serve, let us say, as bait."

"And that reserve program . . . ?"

The Japanese sighed.

"An allusion, ancient. Closer to you than to me. Chapter 19 of the Book of Genesis. Sodom and Gomorrah. Unpleasant—especially for our apostolic delegate. I feel sorry for him."

XV

Sodom and Gomorrah

Usually, when the ship moved under its own power, everyone on board—and especially in the mess hall—fell into a better mood, because one could forget, at least during meals, about the Gordian knot that was tightening around them more and more. The fact that one could sit at a table, pass dishes of food, pour soup into bowls and beer into glasses with no trouble, use a salt shaker, sugar one's coffee with a spoon—this was a liberation from the practices made necessary by weightlessness. The severing of the bonds of gravity, as has been said a thousand times, makes of a man's habits, and of his body as well, a laughingstock at every turn.

An absentminded astronaut was an astronaut covered with bumps and bruises, spilling all sorts of things on himself and on his clothes, and always flying across the cabin after escaping papers. When he found himself in a large area without "propulsion" materials, he was a creature more helpless than an infant, because one could not claw one's way out of being suspended in mid-air. Those caught in such straits saved themselves by resorting to throwing wristwatches and—if wristwatches did not suffice—jackets or sweaters. The laws of Newtonian mechanics allowed no exceptions: if an outside force did not act upon a body at rest, only the rule of action and reaction would ever move it.

Back in the time when he still cracked jokes, Harrach once said that the perfect murder could be committed in orbit, and it was doubtful that any court would convict the killer, because all one had to do was get the intended victim to strip for a bath and then give him a light push with a finger, just enough to make him hang between the floor, walls, and ceiling, where he would turn until he died of hunger. The killer could tell the judge that he had gone for a towel but got sidetracked. The failure to provide a towel was no crime, and, as everyone knew, *nullum crimen sine lege*. The penal code had not taken into account weightlessness and its criminal possibilities.

After the carrying out of the new orders, which Tempe referred to as a "state of war," the mood, even at the evening meal, did not improve. One might have taken the mess hall for the refectory of a monastery under a strict rule of silence. They ate, not particularly aware of what they ate, leaving that problem entirely to their stomachs, because they were digesting what Steergard had told them that afternoon. He had presented his plan of action, speaking so softly that he was barely audible. Anyone who knew him knew that this cold calm signified a rage.

"The invitation is a trap. If I am mistaken—which I hope I am—contact will take place. I do not see, however, any reason to be optimistic. The existence of a neutral government on a planet in the grip of at least a hundred years of cosmic war is possible, but it is not possible that a guest from outer space could be received without the consent of the warring parties. According to the message, that consent was given. I tried turning the situation around—that is, to imagine that we were one of the command centers of Quinta and faced with the problem of how to respond to the appeal issued by the intruder to the population at large.

"Such a command center by now knows a lot about the intruder. It knows that the intruder cannot be eliminated in space, having already attempted to do that with the means at its disposal—though possibly there are means remaining. It knows that the intruder is not truly aggressive, for although the intruder tried to force contact by a show of strength, it made the target of that show the unpopulated Moon, whereas with much less expenditure of energy it could have struck the ice ring, which is on the verge of collapse anyway. It also knows, obviously, that it alone—or it in temporary alliance with its enemies—was the main culprit responsible for the selenoclasm and the catastrophic consequences. It must know this, I repeat, because it is not possible to conduct military operations on an interplanetary scale without the help of competent scientists. The rest of the command center's knowledge is circumstantial. Long before mastering gravitation one learns its properties—to the extremes of the black holes. The way we repulsed their nocturnal attack was a surprise for them. If, however, they have physicists worth anything at all, they will realize that a gravitational defense, for a ship landed on the planet, is just as suicidal as a gravitational offensive. The ship could not produce, relativistically, a coherent gravity field of such a configuration without destroying both itself and the planet.

"I am sending two landers to the designated area and expect that they will find no threat, none whatever. If the Quintans wish to lure the *Hermes* to the planet, then the landers will return. Nor will they return empty-handed; something is already being staged for their benefit, in order to allay our fears and whet our interest. The hospitable Quintans will declare that true contact means a coming together of living beings, not of machines. Which cannot be denied. Therefore, if things proceed roughly as I have said, the *Hermes* will land, and then the matter will be settled once and for all. Once we recover the landers—but without taking them on board, because after everything that has happened I would rather err a hundred times on the side of caution than allow a single oversight—we will announce our arrival.

"Now to the details of the operation. After dispatching the landers, we move at medium power from Quinta to Sexta. Both, to our advantage, are in similar opposition to the Sun. Our probes have already studied Sexta, and we know that it is an airless globe with high seismic activity and therefore has not lent itself either to colonization or to the establishment of military bases. Such bases would be threatened more by the planet itself than by the enemy. We enter the shadow of Sexta, and the *Hermes* that emerges will be completely indistinguishable from our ship—at a distance. Up close, it's another story, but I think they will not interfere with it before entry into the atmosphere. Considering sidereal physics, they could safely attack it in the ionosphere—but I don't believe they will. The ship will be a prize far more valuable if it makes a soft, normal landing than if it is shattered. And, too, it will offer less resistance on the ground. A ship descending stern first, firing, has chances of maneuvering, escaping.

"That *Hermes* will send and receive radio signals, and will have an engine enabling it to land, though—granted, only once. There will be no direct communication between it and us. And then, depending on how it is greeted, we will respond."

"Sodom and Gomorrah?" asked Arago.

Steergard looked at the monk a while before answering, with undisguised rancor.

"We are sticking to the Holy Scriptures, Your Reverence, but availing ourselves of the first edition only. The new edition no longer applies, because we have already turned the other cheek more than once. The matter is not open to discussion. There's no point, since we won't be the ones choosing between the Old and New Testaments, they will. Is the solaser retuned?"

El Salam said that it was.

"And DEUS is now on Chapter 19? Good. Now let's take up the matter of the landers. Rotmont and Nakamura will be in charge of that. But after dinner."

No one saw the landers take off. Launched at midnight on automatic, they made straight for Quinta, while the *Hermes* turned its back on them and accelerated: reaching Sexta, seventy million kilometers distant, would take almost eighty hours at hyperbolic speed. In the electronics labs, production began of dispersons, until now not deployed in the reconnaissance. These—also called "bee's eyes"—were a swarm of millions of microscopic crystals; scattered in a million cubic miles of space around Sexta, they would serve as the *Hermes'* vision. Dispersed in the wake of the ship, they were its invisible, remote-control eyes. On Earth they had been used in aerial photography. Each crystal, smaller than a grain of sand, a transparent needle, corresponded to a single ommatidium, an optic cone of a bee's compound eye. The *Hermes* pulled this seeing tail after itself, to go behind Sexta and from there observe the fate of its computerized envoys. Also, after covering an appropriate distance, the ship ejected television probes with a great show of flame: its "official eyes," which the Quintans could and were even supposed to notice.

In the control room, it was Tempe's watch. He checked the course and the growing crescent of Sexta on the monitor screens—and glanced now and then at Harrach, who was standing at his side, talking angrily. (Lately, Harrach seemed to flare up over the most inconsequential things; he would drop in on Tempe and hold forth at length, fuming.) Tempe did not interrupt the man, not wanting to agitate him more. Besides, they were not alone: in the control room, too, DEUS was watching over them. Tempe was not expert enough in computer architecture to be certain that a machine so quick, intelligent, and retentive did not have a trace of personal identity. The assurances of the textbooks and the experts did not convince him. He would have preferred to convince *himself*, but did not know how. But, then, there were more serious things on his mind. Did Nakamura truly sympathize with Father Arago? Tempe shivered at the thought of being in the apostolic delegate's shoes.

Arago, meanwhile, following the captain's suggestion, was considering—with Gerbert—the question of whether or not it was possible for the Quintans to deduce the biology of men from the landers that men constructed.

Although the landers had been meticulously sterilized before being dispatched to the planet, so that on their surfaces there would be not one epidermal cell from a finger, not one bacterium (of the kind that the human organism could never rid itself of entirely)—and although they were automata built without human hands, and their energy feeders and equipment for information exchange corresponded to terrestrial technology of eighty years before—Steergard had no intention of taking the electronic envoys on board when they returned. He considered that too risky. The first artifacts that the *Hermes* captured had shown the Quintans' astounding ability in parasite engineering. The landers, then, besides bringing important, innocent information, could also bring destruction—not in the form of microbes attacking at once, but of viruses or ultraviruses with a long incubation period. He therefore asked the doctors and Kirsting to come up with countermeasures.

The "neutral government" that had communicated with them agreed to the arrival of the landers, but in the course of further negotiations stipulated that the landers could not remain in contact with the *Hermes*, for that condition was imposed by the "neighboring parties." The planet, swallowing both probes with its atmosphere, wrapped itself in a curtain of intensified noise on all wavelengths. Had the men equipped the envoys with lasers able to pierce that shield of noise, they would have broken the accepted condition. It would have been even more obvious for the *Hermes* to poke at the sea of clouds and the radio chaos with its own lasers.

Nothing remained but to watch Quinta from behind Sexta via the clouds of holographic eyes. The operation was synchronized so that the two landers, sinking slowly toward the horizon, would reach Quinta just as the *Hermes* entered the shadow of Sexta. Everyone gathered in the control room and waited for the critical moment. The planet, white with clouds, filled the main screen; clearly visible were the swarms of combat satellites that crossed its featureless face as black dots. To be able to observe the entry of both rockets into the atmosphere, sodium and technetium had been added to their hypergolic fuel: the first colored the exhaust flame a bright yellow, the second tagged it with a spectral line not found in the spectra of the local sun or the Quintan orbiters. When the rockets plunged into the clouds, the threads of fire from the air friction and the retros began to diffuse. Then the billions of eyes, spread in an unseen tail a million miles in the wake of the *Hermes*, focused along the tangent on the point of the planned landing—and not in vain. Settling on hard ground in the space of several seconds, both vessels announced the conclusion of their flight with a double blaze of sodium, intentionally modulated, which immediately faded out.

With this the operation entered the next stage. The bottom armor of the *Hermes* split in half, into two giant arched gates, and from that Open Sesame crane arms pushed out into space an enormous metal cylinder that was to be the laboratory quarantine for the probes. Harrach seemed especially pleased with the stratagem. The others approved of Steergard's tactic and willingly pitched in, but they did so without enthusiasm: there was nothing to rejoice about. The first pilot, on the other hand, did not bother to conceal his evil glee—that they were going to take that war-loving bastard of a planet by the throat. He could hardly wait for the return of the plague-carrying landers, as if the whole point of the expedition was a brutal clash. Listening to the man go on and on, Tempe made little comment, thinking about the psychological changes in Harrach that DEUS must be taking note of, and felt ashamed of his colleague—even though at times he, too, was unable to say which he would have preferred: for the deep anger that had been building in the crew to turn out to be without foundation, or for *them* to force upon the crew the worst of all possible decisions. Yes, he himself now saw this civilization as an enemy, whose absolute evil justified the steps the men were taking. Nothing, now, was cloaked in secrecy. The solaser—extinguished and masked before—was being charged with solar energy. Not for signaling but to deal laser blows.

After forty-eight hours the holographic cloud announced that the envoys were returning. The two landers were supposed to signal—in the ultrashortwave band—when they were outside the orbit of the drifting fragments of the Moon, but only one did clearly: the other sent a gibberish of codes. Steergard divided his people into three groups. To the pilots he entrusted the launching of the fake *Hermes* into a solar trajectory; to the physicists, the receiving of the landers in the cylindrical chamber, which was some fifty miles away from the *Hermes*; and he put the physicians and Kirsting in charge of the biological examination of those landers, provided that the second group gave the go-ahead. Though thus divided, the crew kept abreast of the total situation. Harrach and Tempe—tracking the hollow giant, which set off unhurriedly on its way, with the fires from the robot welding still flickering across its hull—spoke by intercom with Nakamura's group, which was waiting for the landers. Polassar did not rule out the possibility of an ordinary malfunction in the babbling transmitter—but Harrach was positive, would bet his right arm, that it was the work of the Quintans. The fact was, Harrach *wanted* the treachery of the Quintans to come to light as soon as possible and to be—for everyone—the last straw. Tempe said nothing, wondering how a man so obsessed could still function in the responsible position of first pilot. Apparently, he could—seeing as DEUS had not yet informed the captain of Harrach's condition. Unless they had all of them fallen into a collective madness . . .

The quarantine cylinder, in the glare of floodlights surrounding it, received the landers with an open maw. At their control center, the physicists, after automata performed the preliminary examination, could not decide whether the damaged lander had been damaged by an accident or by design. This infuriated Harrach, who knew better: it was foul play, it was the Quintans! After an hour, however, it turned out that the probe had lost part of an antenna and its prow radiator in a collision with some small meteorite fragment or piece of metal. Such a collision, in that system, was not unlikely.

On the empty twin of the *Hermes*, moving away, the final welds still glowed in the darkness. The pilots could start the drive as soon as the captain gave the order, but he did not call them. He was waiting for the report of the experts. In what condition had the landers returned? And, most important, what information had they brought?

The information turned out to be extremely interesting, and the landers—if one did not count that minor mishap—untouched and wholly uncontaminated. Hearing this, Harrach could not help exclaiming:

"Snakes!"

"But even in Sodom there was a Lot," Tempe pointed out. He was dying to know the new discoveries about Quinta, which somehow were taking forever to reach the control room. Finally Nakamura took pity on the pilots and showed them, on a projector, the result of the lander reconnaissance as transmitted from the quarantine cylinder.

He began with the cartoons that the solaser had beamed to the planet. Then followed a long sequence of landscapes: nature preserves, possibly, untouched by civilization. Seashores, waves breaking on sand, red sunsets in low clouds, mountain forests a much darker green than the foliage on Earth. The enormous crowns of the trees were almost navy-blue.

Against this continually changing background shone letters.

> ACCEPTANCE OF YOUR ROCKET MISSILE OF MASS LIMIT THREE HUNDRED THOUSAND TONS METRIC AGREED UPON WITH GUARANTEE OF YOUR PASSIVITY YOUR GOODWILL THIS IS SPACEPORT

Out of a heavy green mist emerged a vast surface, seen from a great height. It gleamed dully, like frozen mercury. Incredibly slender needles stood upon it at regular intervals, like pieces on a chessboard: stalagmites immaculately white, sharply pointed, and growing. Or, rather, they issued upward, wrapped at their bases in golden spiderwebs, until that motion ceased. On the far horizon, completely cloudless, birds flew, each bird having four independently moving wings. They must have been huge. They flew like cranes migrating from northern climes. Below, at the stalagmites—now recognizable, to human eyes, as rockets—tiny things shimmered, dark and multicolored; they swarmed up wide ramps into the white ships. Everyone leaned forward, straining his eyes to see, finally, what the Quintans looked like—but with no more success than a visitor from Neptune would have had, trying to make out the human form by scrutinizing a packed Olympic stadium from a mile away. The variegated, churning crowd continued to gather at the bottom of the ramps and to disappear, in rivers, inside the ships as bright as snow. On the hulls were perpendicular rows of hieroglyphics: shining, illegible inscriptions. The crowd now thinned, and everyone waited for the inevitable takeoff of that white flotilla. But—slowly, majestically—it began instead to sink.

The gold-bronze spiderwebs fell away from the hulls as if rotted through, making irregular circles on the ground. Now only the white prows jutted above the lake of flat mercury, and then they, too, entered dark-red wells, and no trapdoors or hatches closed over them—only that same matte mercury. The plain was featureless. From the edge of the screen slowly crawled a centipede—clearly mechanical, not a living creature—with a flat, truncated snout. From the snout poured a fountain of bright, yellowish fluid, which spread and at the same time bubbled as if boiling; when the stuff had all boiled away, the mercury turned black as tar. The centipede bent back, arching, so that its middle legs hung in midair; it turned directly toward the watching men and opened four eyes. Or were they windows? Or spotlights? But they looked like the large eyes of a fish: round, surprised, with thin-band, metallic irises and black, glittering pupils. This robot vehicle seemed to regard them thoughtfully, with concern, out of those four pupils, which were now no longer round but had narrowed like a cat's. At the same time something flickered—weak, blue—in their centers. Then the centipede fell, resuming its position on the black ground, and, swaying from side to side like a real centipede, trotted off out of the field of vision. There were no more birds in the sky, only the caption:

> OUR SPACEPORT WE ACCEPT YOUR ARRIVAL CONTINUATION FOLLOWS

The continuation indeed followed, first with a thunderstorm. The downpour lashed a row of buildings with slanting rain—buildings connected by a multitude of overhead viaducts. A peculiar city in a cloudburst. The water coursed down oval roofs, poured from spouts at the bases of bridges—yet those were not bridges, they were tunnels with elliptic windows, and in their centers rushed streaks of fluttering light. An elevated railroad? Not a soul anywhere, the length of the streets . . . but because the buildings were in a cascade arrangement, like Toltecan pyramids cast in metal, there really were no streets. It was impossible to determine the ground level of the city, if this was in fact a city. The rain, whipped by the wind, drove in sheets of silver across gigantic structures; lightning struck without a sound; and from the pyramids the water streamed in a curious way. The gutters that collected it were raised at the ends, so that great torrents flew into the air and merged with the ever-pouring rain. But then one of the lightning bolts split up and froze into words of fire:

STORMS ARE ON OUR PLANET FREQUENT PHENOMENON

The image dimmed and went out. In a dingy grayness appeared outlines, broken silhouettes. Somewhere in the depths, a shuddering amalgamation of fire and clouds, or smoke. Layer upon layer of the rubble of enormous structures. In the foreground lay whitish blotches, as of the naked bodies of creatures torn apart, smeared with mud, in even rows. Above this vast cemetery, the color of iron, flashed the words:

THIS CITY WAS DESTROYED BY YOUR SELENOCLASM

The inscription vanished, and the picture wandered among the ruins, showing close-ups of incomprehensible mechanisms. One of these, reinforced all around with unusually thick metal, had been cracked open, and inside—here a telephoto lens zooming in—were, again, mangled remains, providing no clue as to the shape of what had lived, like human corpses pulled from mass graves, half rags and clay. Then—the camera retreating suddenly—again a great expanse of rubble, with deep excavations. In them, like beetles, squat bulldozers streaked with red gnawed at the debris, their mandibles working. The bulldozers pushed stubbornly, with difficulty, ramming the center of a split façade, white as alabaster, as milk, but singed by flame, until the wall crumbled and dust lifted in a rust-red cloud, blocking out the scene. For a few moments all that could be heard in the control room was rapid breathing and the tick of a second hand. The screen brightened. A strange diadem appeared, of crystal as transparent as a tear, with a hollow not made for any human skull, and corymbs sparkling like diamonds. Set in it, compact, a dodecahedron, a pale-pink spinel. Above this, the inscription:

CROWNING CONCLUSION

But it was not the conclusion. Against a harsh halogen light there were dark, headless crustaceans on the gentle slope of a mountainside, like a herd of cattle grazing in an alpine pasture. In vain did the eye try to identify them. Were they large tortoises? Giant coleoptera? The picture lifted, went along an increasingly steep wall of rock with black recesses, grottoes, caves; it was not water that flowed from them, but perhaps a slurry, a brown-yellow vomitus. Then, on a purple, gently undulating background, words began to march.

> WE ACCEPT YOUR ARRIVAL SHIP OF REST MASS LIMIT THREE HUNDRED THOUSAND TONS METRIC AT SPACEPORT AAO35 AS SHOWN GIVE TIME WE GUARANTEE YOU PEACE FORGETTING BY YOUR CYLINDRICAL PROJECTION OF MERCATOR MERIDIAN 135 PARALLEL 48 WE AWAIT YOUR SIGNAL ANNOUNCEMENT ARRIVAL

The monitor went blank. Daylight flooded the control room. The second pilot, very pale, his hands unconsciously pressed to his chest, still stared at the empty screen. Harrach struggled with himself. Large beads of sweat trickled down the man's forehead and rested on his thick blond brows.

"It's blackmail," he blurted. "They . . . to put the blame on us, for that . . ."

Tempe started, as if suddenly awakened.

"But, you know," he said quietly, "it's true. Did anyone invite us here? We landed smack in the middle of their misfortune . . . to increase it."

"Enough of that!" Harrach snapped. "If you must do penance, go to that priest of yours, don't try converting me. It's not only blackmail, it's more cunning. . . . Yes, I can see how they'd love to get us on their hook. Use your head, Mark. *That* wasn't our fault. It was they who—"

"Use *your* head." Tempe got up, unable to sit still. "No matter how the game ends, what we did, we did. Contact between intelligences—my God. If you have to curse someone, then curse SETI, curse CETI, curse the day you decided to become a 'psychozoic discoverer.' Better yet, keep your mouth shut. That's the smartest thing that you can do."

That afternoon, the Open Sesame containing the landers was pulled on board. Arago asked Steergard for a general meeting to discuss future courses of action. Steergard refused point-blank. There would be no meetings, no councils, until the final phase of the program was completed. Adorned with a gamma laser, the fake *Hermes* disappeared behind the curve of Sexta and made full speed for Quinta, exchanging with it the prearranged sign and countersign.

As soon as he was off duty, Tempe tried to see the captain. The captain refused: alone in his cabin, he was seeing no one. The pilot rode down to the middle level—he hadn't the nerve to go to the monk—but turned back halfway and asked on the intercom for Gerbert, who was not in his room. Gerbert was in the mess hall, with Kirsting and Nakamura. The ship maneuvered to provide a little thrust; they remained in shadow and had weak gravitation. At the sight of people eating, Tempe realized that he had not put a thing into his mouth since dawn. He joined them, silent, with a plate of roast beef and rice, but when he touched the meat with his fork he became—for the first time in his life—nauseous because of the meat's grayish fibers. He had to eat, however, so he scraped his plate into the kitchen vac and took from the automat an instant-heated vitamin porridge. To fill the stomach with something. No one spoke to him. It was only when he had tossed his plate and spoon into the washer that Nakamura, with a faint smile, called him over. Tempe sat down opposite the Japanese, who wiped his lips with a paper napkin. When Kirsting left, when the two of them were alone with Gerbert, Nakamura cocked his head in the way he had, his black hair combed flat, and looked expectantly at the pilot. The pilot shrugged, which meant that he had nothing to say. Nothing.

"When we turn our backs on the world, the world does not go away," said the physicist suddenly. "Where there is mind, there is also cruelty. They go together. One should accept this, since it cannot be changed."

"And why is the captain seeing no one?" the pilot said.

"He is entitled," the Japanese replied, unruffled. "The captain, like all of us, must save face. When he is alone, too. Dr. Gerbert suffers, our pilot Tempe suffers, but *I* do not suffer. As for Father Arago—I don't even want to think about Father Arago. . . ."

"How is it . . . that you don't suffer?" Tempe didn't understand.

"I don't have the right," Nakamura calmly explained. "Modern physics demands an imagination that shrinks from nothing. It is no credit to me; it is a gift of my predecessors. I am not a prophet, not a clairvoyant. I am merely objective when it is necessary to be objective. Otherwise I, too, would be unable to eat meat. Who was it that said *Nemo me impune lacessit*? Does he now regret his words?"

The pilot paled.

"No."

"Good. Your buddy Harrach is putting on quite a show, the mask of fury fixed on his face, like a demon in our Kabuki theater. One should be neither angry nor despairing, neither feel pity nor seek revenge. And you yourself now know why. Or am I mistaken?"

"No," said Tempe. "It's that we don't have the right."

"Exactly. The conversation is concluded. In thirty"—he consulted his watch—"in thirty-seven hours the '*Hermes*' will be landing. Who is on duty then?"

"Both of us. Orders."

"You won't be alone."

Nakamura rose, nodded to them, and left. In the empty mess hall the washer hissed softly, and there was a light breeze from the air conditioning. The pilot glanced at the physician, who continued to sit motionless, his head in his hands, staring into space. Tempe left the man there without exchanging a word with him. There was nothing, really, to say.

The landing of the "*Hermes*" turned out to be spectacular. Descending toward the designated point on the planet, it belched such fire from its stern that the burn, transmitted by the myriads of tiny eyes dispersed in space, entered the milky fullness of the clouds like an incandescent needle, tearing it apart, beneath, into a whirl of pinkening scuds. Into this window, this hole cleared by flame, the ship sank, then disappeared. Wisps of feathery cirrocumuli, spiraling inward, began to close the breach in Quinta's cloud cover, but they had not yet filled it when a yellow light burst up through them. After nine minutes—the time required for a signal to travel the distance separating the observers from the planet—the transmitter of the fake *Hermes*, aimed at Sexta, beamed for the first and last time. The clouds once again parted in that place, but more gradually, gently. In the control room full of people there was a sound like a short, stifled sigh.

Steergard, the unblemished, white face of Quinta at his back, called DEUS.

"Give me an analysis of the explosion."

"I have only the emission spectrum."

"Give the cause of the explosion, based on that spectrum."

"It will be uncertain."

"I know. Go ahead."

"Very well. Four seconds after the drive was shut off, the reactor core blew up. Should I give the cause variants?"

"Yes."

"First: a stream of neutrons, at a high-low frequency designed to penetrate the housing of the pile, struck the stern. The reactor, though shut off, began functioning as an amplifier, and an exponential chain reaction was triggered in the plutonium. The second variant: the armor plate at the stern was pierced by a cumulative charge with a cold anomalon warhead. Should I give the reasoning behind the first variant?"

"Go ahead."

"An attack of the ballistic type would demolish the entire ship. A neutron blow, on the other hand, could knock out just the power source, if the assumption is that there are biological creatures on board and that they will be separated, therefore, from the engine area by radiation-proof shielding. Should I show the spectra?"

"No. Enough."

Only now did Steergard notice that he was standing in the white light of Quinta as in a halo. Without looking, he turned off the picture and was silent for a moment, seeming to digest the words of the machine.

"Does anyone wish to take the floor?"

Nakamura raised his eyebrows and slowly, with great gravity, as if formally offering condolences, said:

"I stand behind the first hypothesis. The ship was to have lost power while the crew emerged from the attack in one piece. With injuries, but alive. One cannot learn much from corpses."

"Who disagrees?" asked the captain.

All were silent—not so much because of what had happened and what had been said as because of the look on Steergard's face. Hardly opening his mouth, as if seized with lockjaw, he said:

"Come, doves, you champions of peace and mercy, speak up, give us—and give them—a chance to be saved. Convince me that we should go back, bringing Earth the small consolation that there exist worlds worse than ours. And leaving *them* to their own doom. For the duration of such persuading I cease to be your captain. I am the grandson of a Norwegian fisherman; I am a simple man who has overreached himself. I will listen to any and all arguments—to insults, too, if someone considers that necessary. What I hear will be erased from DEUS's memory. Go ahead."

"This is not humility, this is sarcasm. The symbolic resignation from your position of captain does not change the fact." Arago, as if wanting to be better heard, stepped forward from the rest. "But if each man is to act according to his conscience to the end, whether he is in a drama or a black comedy—because he did not choose the play himself and does not know his lines by heart, like an actor—then I say this: Killing, we save no one, we save nothing. Deception lay behind the mask of the *Hermes*, and it lies behind the mask of seeking contact at any price. The thirst is not for knowledge but for vengeance. Whatever you do—if you do not retreat—will result in a fiasco."

"And retreat would not constitute a fiasco?"

"No," replied Arago. "You know with certainty that you can bloody them. But you know nothing else with certainty."

"That is true. Are you finished, Father? Who else wishes to speak?"

"I do."

It was Harrach.

"If you decide to retreat, Captain, I will do everything in my power to prevent it. You'll have to bind me hand and foot. I know that, according to DEUS, I've become abnormal. All right. But we are, every one of us here, abnormal. We did all we possibly could to convince them that we presented no threat. For four months we let ourselves be attacked, lured, betrayed—and if Father Arago represents Rome here, then let him remember what his Saviour said to Matthew: 'I came not to send peace, but a sword.' And if . . . But I've talked too much. Do we vote?"

"No. Five hours have passed since their disappointment. We cannot delay. El Salam, you will start up the solaser."

"Without warnings?"

"It's a bit late in the day for that. How much time do you need?"

"Sixteen minutes, back and forth, for the sign and countersign, plus positioning. It can fire in twenty minutes."

"Fire away."

"By the program?"

"Yes, for an hour. Nakamura, let's have the viewer. Whoever doesn't want to watch can leave."

Well hidden in the mask's dust cloud, whose radiance was induced by Zeta, the solaser opened fire at one in the morning—a three-hour delay, because Steergard wanted perfect collimation. To hit the ring along its tangent, at the exact point where the trap had been set for them, it was necessary to wait for the planet to rotate into position.

Eighteen terajoules shot out in a sword of light. The jump in the photometers showed that the solar blade, invisible in empty space, had traveled sideways. Brushing the edge of the ring, it peeled off the outer rim. The scene, though it was deaf and dumb and an outstretched palm could easily have covered it, demonstrated the full power taken from the Sun when that power was released in the collision between the light—harder than steel—and the circle of ice spread over thousands of miles. The center of the blow they saw first as a sparkling gap out of which poured a blizzard of swelling white clouds laced with unusual, trembling, arching rainbows. The ice ring boiled, steamed, and—turning to gas—immediately froze and scattered into the void beyond the conflagration, making a long, streaming veil that trailed the planet. It then set behind the disk, since the laser was striking in the direction opposite to the rotation. Steergard had ordered the slanted, gleaming ring to be hit in such a way as to pry it out of its dynamic equilibrium. The power packed inside the solaser was sufficient for seven minutes of terajoule surgery.

"On target," said DEUS.

The outer ring was already breaking up. The inner ring, separated from it by a space six hundred miles wide, was alive with turbulence caused by the changes in the angular momentum. When the circle of ice, sweeping toward the darkness, reached with its long-maned clouds beyond the dayside hemisphere and disappeared in the shadow of the nightside, Quinta's horizon shone as though behind it there rose a second, twin sun through pillars of smoke and rainbows—a sun that cast a smooth blood-red glow on the curved sea of clouds. The view of this terrible catastrophe was magnificent. The light caught in trillions of ice crystals from the butchered ring produced a cosmic fireworks that dimmed every constellation in the starry sky. It was breathtaking. The people in the projection room instinctively shifted their eyes from the upper monitor, in which an eccentric laser diamond trembled just above the sun, to the main screen, where a constant, unpulsed beam of power stripped fractured layers, slabs, snow-white floes from the circle of ice.

Could *they* have anticipated such a cataclysm? From the planet it must have looked like an uncanny, unending explosion high in the heavens. But they were probably unable to see the rainbows shooting upward like lightning bolts, because billions of ice fragments already were hurtling down on them. Mountains of ice, seething and thundering, fell from tattered clouds, but this was no thrilling sight for the ones who perished beneath that roaring avalanche.

Seen from the projection room, the atmosphere that encircled the planet was an extremely thin layer. The great magnitude of this astroengineered amputation could be seen safely only by the inhabitants of the tropical regions—until the shock wave reached them, faster than sound. The photon beam, moving millimeter by millimeter at the muzzle of the solaser, crushed planes of ice hundreds of miles across at the target. Only at the planet's southernmost point was there nothing yet to show the fury of the broken disk, which every minute shed hundreds of cubic kilometers of shattered ice. Now, within a cloud thrust high above the atmosphere, the laser beam became visible; it struck in the heart of the cloud like a well of fire. The spectrometers now recorded not churning steam but ionized free oxygen and hydroxyl radicals. In the control room, the minutes became an eternity. The ring, wobbling like a cracked top, lost its clear shine, was riddled by dark holes. The northern hemisphere began to swell, as if the planetary crust itself were being inflated, but it was only that the impact of the ice debris was throwing air, fire, and snow out into space. At the equator, the laser beam, a drill of blue-white heat along the tangent, bored persistently into a mushroom-shaped explosion, until the cloud cover of Quinta darkened to a dull-pearl plain in the west, while the east blazed in jetting eruptions toward the stars.

No one spoke. Recalling those minutes later, they realized that they had expected a counterattack; had expected that *they* would at least try somehow to parry the blow falling on the very heart of the war-sphere that had taken a century to build. That the Quintans even now were readying themselves to strike at the source of the cataclysm, visible against the face of the sun—since it was five times as bright. But nothing happened. Above the planet there rose, wider than the planet, a column of smoky white dust; it spread into a many-lobed mushroom covered with continually splitting rainbows, cruelly beautiful. And the cutting beam still stabbed through layers of mist like an incandescent wire of gold taut between the Sun and the planet. The planet itself seemed to veil its face gradually with distended cirrocumuli, as if in self-defense against the incredibly thin and yet so destructive ray, which jabbed at the remaining shards of ice as they sank into the atmosphere. Then it was only at moments, from between the swollen clouds, that there were glints of the remnants of the ring, still orbiting in its death agony.

Steergard ordered the solaser shut off after the sixth minute: he wanted to keep its remaining power in reserve. The solaser went out as abruptly as it had flashed on, and let them know—in the infrared—that it was changing its position. Locating it was simple, elementary, even when it was extinguished, because of the Planck spectrum typical of stationary bodies forced to radiate by the proximity of the chromosphere. So the girders ejected, from small throwers, a dust that burned in the sun, and the solaser carried out its move behind this screen, folding up into the shape of a closed fan.

DEUS worked at top capacity. It recorded the results of the blow, the fate of countless satellites that climbed from lower orbits into an atmosphere expanded by explosions and died there in fiery parabolas. At the same time DEUS informed them that the copy of the *Hermes* could also have been crushed by a magnetodyne attack in field concentrations on the order of a billion gauss. DEUS had a fourth hypothesis as well, involving implosive cryotronic bombs. The captain instructed it to file those data in the archives.

They were still in stationary orbit in the shadow of Sexta when Steergard summoned Nakamura and Polassar, to present them with a handwritten ultimatum. For its transmission they were to use the holographic eyes; these would be burned out by emitting so strong a signal, but Steergard was willing to pay that price.

The ultimatum was straightforward.

> YOUR RING WAS DESTROYED IN RESPONSE TO THE ATTACK ON OUR SHIP WE ARE GIVING YOU FORTY-EIGHT HOURS IF YOU ATTACK US OR FAIL TO ANSWER WE WILL ONE SWEEP AWAY YOUR ATMOSPHERE AND TWO INITIATE A PLANETOCLASM OPERATION IF HOWEVER YOU RECEIVE OUR ENVOY AND HE RETURNS UNHARMED TO OUR SHIP WE WILL REFRAIN FROM STEPS ONE AND TWO THAT IS ALL

—

The Japanese asked the captain if he was actually prepared to blast the atmosphere. For the cavitation of the planet, he added, they lacked the power.

"I know. I'm not sweeping away the atmosphere. I'm counting on their belief that I will. As for using the sidereals, I'd like to hear Polassar's opinion. Even behind an empty threat there should stand some real force."

Polassar's reply came reluctantly.

"It would put a dangerous overload on the sidereals. We *could* pierce the mantle. If we disturb the foundation of the continental plates, the biosphere perishes. Bacteria and algae survive. Is this worth discussing?"

"No, that's enough."

Both felt it was necessary to learn the scope of the catastrophe, which was extremely difficult. Holes in Quinta's envelope of noise indicated that hundreds of transmitting stations had been knocked out, but without an SG it was impossible to determine, even approximately, the extent of the damage to the technological infrastructure on the large continent. The effects of the cataclysm now began to take their toll in the southern hemisphere and other continents. Seismic activity increased violently: on the sea of clouds appeared dark patches. All the volcanoes must have been belching magma with gases containing cyanide. DEUS estimated the mass of the ice that had reached the surface of the ground and the oceans to be between three and four trillion tons. The northern hemisphere had suffered much greater devastation than the southern, but the ocean had risen everywhere and invaded all coastal regions. DEUS cautioned that it could not determine how many fragments of the ring had fallen to the planet in solid form and how many had been melted, for this depended on the exact size of the ice chunks, which was unknown. If they exceeded a thousand tons, they lost only a small fraction of their mass in the densest layers of air. But DEUS was unable to give a definite denominator.

Harrach, who was on duty at the controls, was not part of the conversation that went on in the projection room above his head, but he heard it—and unexpectedly broke in.

"Captain, could I say something?"

"What now?" Steergard was irritated. "It wasn't enough for you? You'd like to grind them to a pulp?"

"No. If DEUS is speaking the truth, forty-eight hours won't suffice. They'll need to pull themselves together."

"You've joined the doves too late," snapped Steergard.

But the physicists agreed that the pilot had a point. The deadline for answering was moved to seventy hours.

Shortly afterward Harrach found himself alone. He put the controls on automatic—he had had his fill of looking at Quinta, particularly since the reddish smoke from innumerable volcanic eruptions had spread over the churning white of the planet and darkened to a dirty brown like clotted blood. It was not blood. He knew that, but did not want to watch it. In accordance with Steergard's orders the ship began revolving in place like the outstretched arm of a pivoting crane, which provided them with makeshift gravity, thanks to the centrifugal force, felt most strongly in the control room at the prow. In the mess hall, where the crew now gathered, the rotation enabled one to sit at a table without the acrobatics of weightlessness. The precessional effects, characteristic of a gyroscope, made Harrach sick to his stomach, even though he had sailed often on Earth and the worst pitching and yawing never brought on nausea.

He could not sit. What he had desired had come to pass. Looking at it rationally, he bore no responsibility for the cataclysm. He was certain that everything would have transpired the same even if he had not flown into a rage or got into those pointless arguments with poor, blameless Arago. No, nothing would have been different had he minded his own business and kept his mouth shut. He jumped up from his seat at the controls, to stretch his legs, but then was driven to pace the navigation area, back and forth. There was no other outlet for his anger, which kept returning to him like an echo, pressing him not to wait, not to sit with folded hands. So he looked at the climatic disturbances (if only they were just climatic!) of the stricken planet. He would gladly have switched off the image, but was not allowed to do that. The ellipsoid interior of the room was ringed by a railed walk that separated the upper level from the lower. Staggering on feet wide apart, like a sailor on a heaving deck, he ran up and jogged around and around the gallery. One might have thought that the man was taking up exercise on an indoor track.

On girders that came together like the spokes of a great wheel, between cross-braces secured to the ceiling, was the center of operations. Deep, velcroed chairs surrounded a terminal that was a low, truncated cone. At its sides, in front of each chair, flickered an empty green screen. On the cone table lay the discarded draft of the ultimatum, in Steergard's characteristically sharp-angled handwriting. Moving between the chairs, Harrach did a thing that no one ever would have expected of him. He turned the paper over—the written side down—and glanced around to see if anyone was watching. But only the flickering screens mimicked motion. He sank into the chair usually occupied by the captain and looked in both directions. Between the girdered supports, silvery plastic, were wedge-shaped windows opening downward, through which he could see the navigation area, also flickering with tiny lights—of various colors—and the glare that came steadily from the main screen, the dull light of Quinta. Harrach put his elbows on the slanted console and buried his face in his hands. Had he been able, he would have sobbed for this Sodom and Gomorrah.

XVI

The Quintans

He appeared calm. He did not say good-bye to anyone. None of his comrades got into the elevator with him when it was time. In an ordinary white spacesuit with the helmet tucked under his arm, he watched the sequentially flashing numerals of the passing levels. The door opened by itself. In the high-domed launch chamber stood a surprisingly small rocket, of spotless silver—having not yet traveled through an atmosphere, whose heat would blacken its prow and sides. He approached it, past open-worked metal that gave a muffled echo to his steps, and he felt an increase in weight: a sign that the *Hermes* was accelerating, to provide him with a good push at takeoff. He looked around. High up, at the intersection of the curved girders, was a ring of strong fluorescent lights. He paused in their shadowless glare to put on his helmet. The cabin hatchway opened above him. The buckles, pulled tight, clicked; automatically he touched the wide rim of the metal collar and inhaled oxygen. He was now cut off from the air that filled the chamber. The pressure was a little high, but it corrected itself immediately. The platform, onto which he stepped, rose. The hatchway, dark a moment before, lit up from within, and the moving platform touched its threshold and stopped. Without haste, lifting his large boots across the threshold, he moved his flexible glove along the tube of the handrail, bent down, and eased himself in feet-first. With both hands he swung from the grips on the transom and lightly dropped inside. The hatchway closed. A growing musical whistling could be heard; it was the gastight hood that had been suspended above the rocket but now fell onto it; hydraulic pistons pressed the hood to the casing of a propulsion funnel, so that the ship would not lose air on takeoff or be poisoned by the flaming exhausts of the engines.

Easily, as in a simulator, he took the ribbed hoses of the heating-cooling system and fit them into the appropriate sockets of his suit. The catches snapped immediately, showing that the couplings were engaged. He was now connected to the rocket. Its wall padding began to inflate and inflated until he was totally enveloped, swaddled, but only to the armpits, so that he had his hands free. There was no more room than in an Egyptian sarcophagus. These one-man landers had in fact been called "coffins." The countdown lever was on his right. Directly in front of his face shone, through the glass of the helmet, the dashboard: analog dials, digital counters for altitude, power, an artificial horizon, and—in the middle—a rectangular screen, still blank. When he pushed the lever, all the indicator lights flashed on, winking at him in a homey, friendly way, assuring him that everything was ready: the main engine, the eight correctionals, the four retros, the ionosphere loop parachute and the large emergency one (but the screen, with rapidly fading points, reassured him that there could be no emergency, drawing a perfect, precise curve of flight from the *Hermes*—represented by a green asterisk—to the swell of the planet's outline). With a fractional delay, the third parachute, a cascader (known as a "spare tire"), announced its presence. He had experienced such moments before and savored them. He trusted these little blinking, palpitating lights—green, orange, and blue—knowing that they could flare red, like a bloodshot eye in terror, because there was no such thing as a trouble-free device, though everyone had taken great pains to see that nothing would go wrong. The automatic was already counting down from two hundred. It seemed to him that in the speaker he could hear the breathing of the people assembled in the control room, and that it was against this living background of bated breath that the indifferent, mechanical voice rattled off numbers in decreasing progression.

At ten, he felt a slight quickening of the pulse, and frowned, as if rebuking his insufficiently disciplined heart. True, almost no one was spared a little tachycardia upon takeoff, even a routine takeoff, and this circumstance was anything but routine. He was glad that no one spoke to him, but when the time-honored "zero" was pronounced and he felt a shudder pass through man and projectile joined into one, a soft voice reached him, from someone who evidently stood some distance from the microphones: "God be with you." These words surprised him, although perhaps—who knows?—he *did* expect them from that man. But there was no time now for such reflections. The craft, borne powerfully yet gently by a hydraulic paw, as if a giant steel hand gloved in satin were pushing it up and out a cylindrical chute, separated from the ship. He could not move in the balloonlike insulation, but weightlessness claimed him for two or three seconds before the engines began to roar. For an instant he saw the hull of the ship rush by at the upper edge of the monitor, but that might have been his imagination. The rocket—named *Earth*, as he had requested—did a somersault; the pinpoints of stars flew at an angle across the screen; Quinta swam by among them, a white disk, and disappeared. His craft, sweeping the darkness with bursts from the correctional nozzles, fell on course: the trajectory of its actual flight matched the one plotted by the computer point for point. He ought to have called the *Hermes* by now, but kept silent—reveling in his solitary flight.

"The *Hermes* awaits your report."

That was Steergard. Before he could answer, another voice spoke, Harrach's:

"Must have dozed off."

Such jokes, having a little of the flavor of barracks humor, had accompanied the first space flights: to lighten the unprecedented experience of men locked in the nose of a rocket as if inside an artillery shell. Thus Gagarin had said, at the last moment, what in Russian amounted to "Geronimo!" Thus one did not say, "There's an oxygen leak. We're suffocating," but, "We have a little problem." Harrach was probably unaware that with his wisecrack he was following an old tradition. And Tempe, for no good reason, replied with, "Just flying along"—

but then caught himself and switched to an appropriately professional tone:

"*Earth* here. All units normal. I have Delta Harpyiae on my axis. Entering the atmosphere in three hours. Confirm. Over."

"Confirmed. Heparia has given the meteorological conditions at point zero. Overcast. Wind, north-northeast at thirteen meters a second. Above the spaceport the ceiling is nine hundred meters. Visibility good. Want to talk to anyone here?"

"No, I'd like to look at Quinta."

"You'll see her in eight minutes, when you reach the ecliptic. Then you'll make a course correction. Over."

"I'll make the correction when the *Hermes* gives the signal. Over."

"Good luck. Over and out."

The negotiations, after the destruction of the ice ring, had lasted four days and nights. The crew dealt only with Heparia—which fact they did not learn immediately, because the ultimatum was answered by an artificial satellite so small and so well disguised as a fragment of rock that DEUS did not identify it until it spoke. Set in a stationary orbit 42,000 kilometers above the planet, it rotated accordingly, and when it went behind the edge of the disk, communication was broken off for seven hours. It talked with the *Hermes* using the twenty-one-centimeter band of hydrogen. The ship's radar had to examine the thing's cisplanetary emission thoroughly before discovering how it served Heparia as a relay transmitter. A strong underground radio station controlled it, concealed in the vicinity of the spaceport where the unmanned *Hermes* had so fatefully landed. The station operated on a ten-kilometer wavelength, which gave the physicists reason to suspect that it was a special military installation, designed to go into action in the event of a massive exchange of atomic blows. Such an exchange would be accompanied by electromagnetic shock waves disrupting all wireless radio communication, and with megaton concentrations of explosions at the targets it would also be futile to use ordinary laser transmitters. Only ultralong waves would be effective then, but their low information capacity made it impossible to transmit multibit messages in a short time. So Steergard aimed the *Hermes*' emitters at this radio station. When it did not respond, he sent the following ultimatum: either they communicated directly, or in the course of twenty-four hours he would destroy the whole range of bodies, natural and artificial, that were in stationary orbit—and if even then he received no reply, he would feel justified in raising the temperature of an area of 800,000 hectares around the spaceport, including the spaceport, to 12,000 degrees Kelvin. Which meant that the planet's crust would be pierced to a depth of a quarter of its radius. The threat worked, although Nakamura and Kirsting tried to dissuade the captain from so drastic a measure, since it would be *de facto* equivalent to a declaration of war.

"Interplanetary law ceased to bind us from the moment we were attacked," retorted Steergard. "Negotiations on kilometer wavelengths, relayed and repeated back and forth, could drag on for months, and behind the purely physical reason for this consuming of time there might be hidden the strategic attempt to delay—in order to turn the tables on us. I'm not giving them the chance. If this is an informal exchange of opinions, gentlemen, let's not hear any more about it, but if it's a *votum separatum*, then enter it in the expedition's log. I will answer for it when I resign from my command. In the meantime, I am not resigning."

In its counterproposals, Heparia asked for strict limitations on the envoy's latitude of action. The notion of "contact" became increasingly nebulous the more precisely they tried to define it. Steergard wanted a face-to-face meeting between his man and representatives of the local government and science. But either the meaning of these concepts was completely skewed between Quintans and humans, or else here, too, bad faith had crept in. Tempe flew without knowing whom he would be seeing at the spaceport, but somehow this did not bother him. He was not borne on wings of euphoria; he did not count on any great success—and was himself surprised at his calm. During his preparation on the training equipment he had said to Harrach that he did not believe that *they* would skin him alive. They might be unpitying—one expected that—but they weren't idiots.

The negotiations were accompanied by deliberations on board. Putting up constant resistance, haggling out point after point, the Quintan side finally obtained conditions for the meeting. The visitor could leave the rocket to inspect the remains of the fake *Hermes*, and could move freely within a six-mile radius of his rocket with guaranteed immunity, provided he did not undertake "hostile acts" or convey to the host side "threatening information." Great difficulty was encountered in understanding these terms. The higher the level of abstraction, the more human and Quintan semantics diverged. Such words as "authority," "neutrality," "side," and "guarantee" did not mean the same thing to both—whether due to some outside factor, such as a fundamental difference in their histories, or to intentional dishonesty. But dishonesty, even, did not necessarily imply a desire to deceive or trick: if, for example, Heparia, embroiled in a hundred-year war, was neither free nor sovereign in this matter, yet did not wish—or was not allowed—to reveal that fact to the *Hermes*. A factor here, too, as most of the crew believed, may have been that so many generations of conflict on the planet had had a cumulative effect on the way of thinking as well as on the language.

The day before takeoff, Nakamura had asked the pilot if they could converse in private. That was how he put it. He began in a roundabout way: Intelligence without courage was worth no more than courage without intelligence. The war, having escalated into space, was undoubtedly intercontinental. It would have been best, therefore, to send equally authorized envoys to both landmasses, with prior assurances that they would deliver no militarily important information to either host. The captain had rejected this variant, because he wanted to keep an eye on what happened to the envoy. The ship could not be on both sides of the planet at the same time. The captain wanted to impress upon the Quintans his intention of retaliating if the envoy failed to return safe and sound. He did not indicate the extent of that retaliation—a correct tactic, but one that did not give the envoy complete protection.

Far be it from Nakamura to criticize the captain. He had asked to talk to the pilot, however, because he considered it to be his duty. As Shakespeare once wrote, it was dangerous for a lesser being to "come between the pass and fell incensèd points of mighty opposites." There were three mighty opposites here: the *Hermes*, Norstralia, and Heparia. What did the Quintans know? They knew that the intruder enjoyed superiority in both defense and offense and was able to place blows with great accuracy. In whose interest, in light of this, lay the good health of the envoy? Suppose the envoy's health suffered. Heparia would claim that he met with an unfortunate accident, while Norstralia would prove that it was no accident. In this way, each would try to deflect the *Hermes*' retaliatory blow to hit the opposing side. The captain, indeed, had promised a total destruction—though history showed that the Last Judgment was not a workable tool in politics. A couple of Americans in the twentieth century had come up with the notion of a "doomsday machine," a cobalt sueprbomb that would blackmail all the nations of Earth with the threat of universal death. But no one followed through with it—and rightly so, because when there was no longer anything to lose, it was impossible to conduct *Realpolitik*. Apocalypse as a reprisal had little credibility. Why should the *Hermes* strike the entire planet if there was one kamikaze in Heparia who made an attempt on the envoy's life?

The Japanese's argument sounded convincing to the pilot. Why had it failed to convince the captain?

Nakamura, bowing politely to his guest, continued to smile. "Because we are without a surefire strategy. The captain does not want to untie knots; his intention is to hack through them. Humble Nakamura does not raise himself above anyone. He thinks his own Nakamuran thoughts. And what does he think about? About three riddles. The first riddle is the sending of the envoy. Will it lead to 'contact'? Only symbolically. If the envoy returns in one piece, having seen the Quintans and learned from them that nothing is to be learned from them, that will be a tremendous accomplishment. The pilot is tempted to laugh?

"The planet is less accessible than Mount Everest. Although on that famous mountain there is nothing but rock and ice, hundreds of people in the course of many years have risked their lives to stand there, if only for a moment. And those who returned, having climbed to within two hundred meters of the summit but no farther, considered themselves defeated, even though the place to which they climbed had no more or less intrinsic value than the place that they had hoped to reach in another few minutes. The mentality of our expedition has become like the mentality of those conquerors of the Himalayas. But this is a riddle with which men come into the world and die, so we have grown accustomed to it.

"The second riddle, for Nakamura, is the fate of the pilot. May he safely return! But if something unforeseen occurs, Heparia will argue that it was white, and Norstralia that it was black. This contradiction will push our captain from the role of avenger into the role of judge. Our threat, sufficient to have forced them to accept the envoy, will hang suspended in space.

"The third riddle is the greatest. It is the *invisibility* of the Quintans. No attempt on your life may take place. One cannot doubt, on the other hand, that the Quintans absolutely hate to show what they look like."

"Perhaps they are monstrous in appearance," suggested the pilot.

Nakamura still smiled.

"Symmetry must be observed here. If they are monsters to us, then we are monsters to them. Forgive me, but the idea is childish. If an octopus had an aesthetic sense, the most beautiful woman in the world would be a monster to it. No, the key to this riddle lies beyond aesthetics. . . ."

"Where, then?" asked the pilot. The Japanese had awakened his interest.

"We discovered points in common between Quintans and Earthlings within the technological-military context. That commonality leads to a crossroads: either they are like us or they are 'monsters of evil.' Such a crossroads is a fiction. But it is a fact, not a fiction, that they do not want us to become acquainted with their appearance."

"Why?"

Nakamura inclined his head in commiseration.

"If I knew that, the knot would be untied and our colleague Polassar would not now have to ready the sidereals. I'll hazard only one foggy guess. The Japanese imagination differs from that of the West. Deep in the tradition of my country is the *mask*. I think that the Quintans, resisting our aims with all their might—i.e., they don't want humans on their planet—nevertheless, from the beginning, took that eventuality into account. You still don't see the connection? You may behold the Quintans without knowing that you have beheld them. . . . We, on the other hand, beamed cartoons to the planet, which featured heroes in human form. I cannot give you courage, Mark. You have more of that, already, than you need. . . . I can only offer you one piece of advice."

He stopped, then said without a smile, enunciating slowly:

"I advise *humility*. Not caution. Nor that you should be confident. I advise humility—that is, the readiness to admit that everything—and I mean everything—you will see may be completely other than it seems. . . . End of conversation."

It was only when he was in flight that Tempe guessed the reproach hidden in Nakamura's words. It was Tempe and his cartoons that had revealed to the Quintans what humans looked like. (But perhaps it was not a reproach, after all.)

These thoughts were interrupted by the rising of the planet. Its innocently white face, wreathed with snowy cirri and showing no trace of the ice ring or the catastrophe, gently swam through the void, pushing the blackness and the pale dust of the stars out of the frame of the screen. At the same time, the range finder began flashing numbers with a rapid chatter. Along the coast of Norstralia, jagged with fjords, a cold front moved in a flat bank of clouds from the north. Heparia, meanwhile, was visible—greatly foreshortened—at the eastern bulge of the globe; it lay beneath a darker gloom, and only its polar skyline gleamed with peaks of ice. The *Hermes* informed him that in twenty-eight minutes he would touch the atmosphere, and it had him make a small course correction.

From the control room Gerbert and Kirsting monitored Tempe's heart, lungs, and functional brain currents, and in the navigation area the captain, Nakamura, and Polassar watched the rocket, to intervene in the event of an emergency. Although there was no clear idea what form an emergency might take, or an intervention, the fact that the chief physicist and the chief energeticist stood ready at Steergard's side strengthened the buoyant mood (the tension notwithstanding) on board the ship. The trailing telescopes gave a sharp image of the silver spindle that was the *Earth*, adjusting their magnification so that the rocket remained in the center of the milky disk of Quinta. Finally DEUS threw orange numerals onto the atmospheric monitor, empty until now: the craft was two hundred kilometers above the ocean, in rarefied gases, and beginning to heat up. Its tiny shadow fell upon the sea of clouds and sped across their immaculately white surface. The *Earth*'s computer transmitted, in a salvo of impulses, the last data of the flight, because in a moment or two the cushion of friction-produced plasma in the thicker layer of air would cut off all communication.

A golden spark marked the *Earth*'s entry into the ionosphere. The light grew and spread; the pilot was now braking with his retros. The shadow disappeared as the rocket plunged into the clouds. After twelve minutes, the cesium clocks of projected time and real time dropped to the single digits, whereupon the spectrograph, tracking the exhaust flame of the lander, went blank and after a row of zeros displayed the last, classic word: *Brennschluss*.

The *Hermes* moved high above Quinta, to keep the point of the landing directly below it, in its nadir. The main observation screen was filled with an impenetrable barrier of clouds. As was agreed, the hosts sprayed masses of metallic dust into the cloud cover above this area, creating a shield that blocked all radiolocation. Steergard had finally accepted this condition, reserving the right, however, to take "drastic measures" if so much as one of the laser flashes that Tempe was supposed to send—every hundred minutes—failed to reach the *Hermes*.

In order to provide the pilot with some visibility in the final stage of landing, the physicists had equipped his rocket with an additional section filled with a gaseous compound of silver and free radicals of ammonia under high pressure. When the craft penetrated the stratosphere and stabbed it from the stern with a fiery mane that flapped up along the sides toward the prow, this ring-shaped section surrounding the funnels of the jets was blasted free with explosive charges. Preceding the vehicle, it came into contact with the flame and plasma and burst open from the heat. The violently expanding gases swirled like the funnel of a tornado and with a thunderous rush cleared a ragged, wide vortex in the heavy clouds. At the same time, liquid oxygen, pumped from the nozzles instead of the hypergol, extinguished the plasma cushion, and the rocket, descending on a cold drive, regained its vision.

Through the heat-resistant lenses of the cameras appeared the landing field, encircled by swollen storm clouds. He saw the gray, quadrilateral surface of a spaceport, cut off on the north by slopes, as of hills, and rimmed on the remaining sides by a multitude of red sparks that trembled in the curving air above them like candle flames smoking. It was these that spouted the streams of metallic dust. The exploded ammonium ions and silver were accomplishing their purpose: to dissolve the last clouds above the landing field into rain. There was such a downpour that the smoking, crimson sparks darkened for a few minutes. Darkened, but did not go out. Once again they flared, in dirty puffs of steam. Looking to the south through the vapors driven apart by the whirlwind, he saw a black structure like a flattened octopus or squid with many branchings of shiny strips. The strips were neither conduits nor roads; they were concave and transversely striated. The impression of an octopus might also have come from the single Polyphemian eye that regarded him, from the structure, with a sharp, luminous stare. An enormous optic paraboloid, perhaps, that was tracking his descent.

As he descended, the greenery of the northern hills beyond the field took on a different aspect. What from a great height had seemed a steep, forested massif, with a rectangular concrete slab carved out by leveling robots, lost the appearance of foliage. It was not the crowns of trees that merged to form a dark-green, shaggy surface, but dry, lifeless, bushlike tangles—tangles of grotesque barbed wire, or knotted tubes of some type, or cables. Forced to abandon the image of a wooded hillside where the light of occasional clearings shone through a gray-silvery mass of conifer needles, he saw the artifact of an alien technology whose skill renounced all earthly canons. Were men to have landscaped the area around a spaceport in a wide valley between a metropolis and mountainsides, they would have given care to the arrangement of the terrain, uniting utility with the aesthetics of geometry. They most definitely would not have covered the bare slopes with a jungle of thousands of wildly branching metal gnarls and knots—which, moreover, could not have been the work of engineers masking military targets under a web of pseudovegetation, since the unnaturalness of such camouflage would have betrayed itself immediately.

When the rocket, on cold drive, fell lower toward the gray concrete runway, the whole bank of hills, shrouded by the influx of returning clouds, vanished in them like a spiny lizard's skin spotted with eruptions, with pustules. But before that strange hideousness could cause him to ponder the difference between designing technological devices and releasing them into a self-directed, mutating growth, and before he could look again at the structure to the south—the squid already sinking on the horizon, watching him with its luminous eye set in black—he had to take over the controls. The four g's fell to two; compressed oxygen spurted in an icy boil from the nozzles; and the arthropod legs emerged—flexing, spreading—beneath the stern. When they struck the hard ground, the engine gave a final belch and fell silent.

The three-hundred-ton rocket executed a few diminishing shifts of position on its undercarriage and then was completely still. He felt in his gut the presence of a weight other than that of deceleration. Hearing the fading hiss of the shock absorbers, he unbuckled his belts, let the air out of the impact cushions around the suit, and stood up. The straps slid from his shoulders and chest. The atmosphere analyzer showed the presence of no poisonous gases, and the pressure came to eleven hundred millibars, but he was supposed to go out helmeted, so he connected the oxygen hose to his own tank. When the cameras were switched off, the cabin lights brightened. He ran an eye over what he had brought with him. On either side of the seat lay a heavy, wheeled container that could be pulled like a cart. Harrach had painted on these, with much solicitude, an enormous "1" and "2," as if they might be confused. Harrach definitely envied him, but showed no sign of it. A good comrade, Harrach was, and the pilot wished that the man was at his side now. The two of them, perhaps, could better cope with the task.

Long before the flight, when there were only the words of Lauger, on the *Eurydice*, to assure him that he would "see the Quintans," he had fallen into a depression—which DEUS observed—but after his conversation with the doctor, Tempe rejected the machine's diagnosis. It was not his belief that communication with the Quintans was senseless, based on false assumptions—it was not that which oppressed him, but the fact that they had entered into a game of contact where violence was the highest suit. This thought he kept to himself, because more than anything he wanted to see the Quintans. How could he, despite all his reservations and doubts, turn his back on such an opportunity? Arago had taken a dim view of their policy even before the phrase "show of strength" came up. Arago had called the lie a lie, had repeated that they were entering into a contest of deceit; that they were pushing so forcibly toward communication that they were actually abandoning it; that they were covering themselves with masks and stratagems—safer thereby, perhaps, but more and more removed from any genuine opening up of a view into an Alien Intelligence. They jumped upon Quinta's subterfuges, struck at Quinta's every refusal, and made the goal of the expedition the less attainable the more brutal the blows they used in its attainment.

He activated the hatchway door but had to wait for the results of the analyses. While his computer chewed the incoming data on the chemical composition of the ground, the force of the wind, the ambient radiation (practically zero), he thought not of the next stages of the program but of all the bad things that he had suppressed until now. Nakamura was of the monk's opinion, but did not go over to his position, which meant retreat. Tempe, too, felt that Father Arago was right. Yet right and wrong could not deter him. If Quinta was a hell, Tempe was ready to descend to that hell to see the Quintans.

So far, true, the reception did not seem hellish. Wind, nine meters a second; visibility beneath the cloud ceiling, good; no poisons, mines, or charges beneath the surface of the landing field, searched with ultrasound. There was a whistle: the cabin pressure was being equalized with that of the outside. Three green bulbs lit up over the hatchway. The heavy lid made half a turn and sprang upward. He heard the scrape of the lowering ladder and the click with which its sections stiffened at an angle against the concrete. He looked out. Full daylight hit him through the glass of the helmet. From his height of four stories he saw the vast plain of the spaceport beneath—once more—a cloud-covered sky. The northern hills had vanished in mist. In the distance, brown and reddish smoke rose from a long line of well shafts. Against that backdrop stood an enormous, crooked tower, at more of a slant than the tower in Pisa: it was the fake *Hermes*, alone and odd in the desolation, rooted about a mile away. There was not a living soul in any direction.

In the direction where the hills were hidden behind the sinking clouds, at the very edge of the concrete runway, was a low, cylindrical building resembling a hangar for zeppelins. From its silhouette thin mastlike spars jutted skyward, connected by glistening threads that were like a spiderweb spun across a quarter of the horizon. The octopus-metropolis with its single eye had disappeared behind the smoke of the opposite horizon. Now, he thought, they were observing him by means of this spidery netting. He examined it carefully through binoculars and was surprised by the irregularities in the mesh. The material hung unevenly, making smaller and larger openings, like an old seine draped by a giant fisherman over masts—masts so weighed down by their own height and the netting that they bent in every direction. The appearance was sloppy. The spaceport, in any case, was deserted, like an area evacuated before the arrival of an enemy. Shaking off the impression, as repulsive as it was strong, that he was viewing not an antenna installation but the work of monstrous insects, he backed down the ladder, stooping beneath the container he carried. It was almost a hundred kilograms. He unbuckled the straps, lowered the container to the concrete, and began rolling it toward the *"Hermes,"* which rose at an angle from its shattered stern. He walked with a steady step, not hurrying, so that those who watched him (he did not doubt that there were watchers) would see nothing to make them suspicious.

They knew that he would be inspecting the wreck, but not how. At the stern, the smashed jets of which stuck in the radially cracked runway, he stopped and looked around. Through the helmet he heard the wind gusting, though he felt almost nothing in the suit. The peep of the chronometer called him back to business. The small, folding duralumin ladder proved to be unnecessary. Right above the funnels of the jets, which were crushed into a giant accordion, a burned hole gaped in the stern. The hole had tongues of sheet metal wrenched outward, and there was a stump of a rib of the hull, twisted by the explosion. In a pinch, he could crawl in through this opening, taking care not to rip his suit on the steel edges. He pulled himself up onto the foot of a landing leg that had not had time to extend completely—such was their hurry to open fire. Which move, however, made sense, since a ship was most vulnerable in the moment that it cut the main drive and shifted its entire mass onto protractile supports.

Pulling the container in after him, he craned his neck as far as possible to assess the condition of the hull. From the bottom he could not see the prow hatches, which had been welded shut, but he did see the doors to the hold. To his surprise, they were locked and had not been forced. Those doors would not have let themselves be opened easily from without. Strange. Having destroyed the engine room with a single heavy-caliber shot—and with the ship, hit, at such a tilt—why should they have entered through a radioactive hole a meter in diameter instead of propping the thing up first with a solid scaffold and then breaking into the central holds? After a hundred years of war they didn't have sappers with the right equipment, they didn't have capable military engineers? Still puzzled by the behavior of the local army, he struggled with the container, now inside the ship. He aimed the radiometer at the darkness. The single-use reactor had melted exactly as its designers intended and flowed out, through Kingston valves installed for that purpose, onto the cracked concrete of the spaceport, creating a fairly small patch of radioactivity. Appreciating how nicely Polassar and Nakamura had thought the whole thing out, he turned on his flashlight. All around him it was dim and silent.

Of the engine room not even rubble remained. The construction had been made to withstand the lifting of two thousand tons of an empty mock-up, yet to fly apart at a puff of air. The needle of the Geiger assured him that in the course of an hour he would receive no more than a hundred roentgens. From the container he took two flat metal receptacles and dumped their contents: a tremendous number of synthetic insects equipped with microsensors. Carefully, he knelt among them, as though rendering solemn homage to the broken ship, and switched on the activating system at the bottom of the larger receptacle. The swarm, spilled across the warped metal, came to life. Haphazardly, hurriedly scrambling with their filament legs, like real beetles on their backs trying to turn themselves over, the synthecs scurried off in all directions. He waited patiently until the last ones left him. When only a couple of units, evidently defective, circled helplessly at his knees, he rose and went out into the daylight, pulling the now nearly empty container behind him. Halfway back, he took a large ring from it, unfolded its stand, directed it at the stern, and returned to the *Earth*. Fifty-nine minutes had elapsed since his landing. For the next thirty, he photographed the area, primarily the high spiderweb, using different filters and lenses. Then he went up the ladder into the rocket.

In the dark cabin, the computer monitor was already on. The synthecs were reporting, in the infrared, through the relay set up at half distance for better coherence. Together with the computer and its program they formed an electron microscope. The microscope was unusual only in that it was separated spatially into these subunits. Ten thousand of its tiny beetles rummaged through all the corners of the wreck, prying into cinders, soot, dust, debris, and bits of slag and melted metal: to find whatever had not been there originally. Their electronic heads were "ordotropic"—attracted to the high levels of molecular organization found in all living (and nonliving) microorganisms. The beetles, too stupid themselves to make diagnoses, served only as the remote lens of the microscope-analyzer in the rocket, which was already drawing the first crystal mosaics of what had been discovered and interpreting them. The technobiotic skill of the local engineers of death commanded respect. The beetles had made possible the identification, in innocent refuse, of slow-acting viruses. Millions of viruses lay in the guise of dirt. The computer had not yet determined their latency period. They were spores—eggs—slumbering in molecular incubators, to hatch after weeks or months. From this he drew an important conclusion: he was to leave the planet in one piece, in order to carry the plague on board the *Hermes*. The reasoning, irreproachable in its logic, tempted him to bold action. Only by returning, after all, would he become the bearer of doom. But here a sudden doubt assailed him. The viruses could also be fraudulent. Upon discovering them, a man would have the desire—based on the deduction just now made—to attempt something reckless. And how easy it would be for someone rash and thoughtless to meet with an accident.

He found himself in a situation whose structure was typical of the algebra of conflicts. A player made a model of his opponent, a model that included the *opponent's* model of the situation, then responded to that with a model of a model of a model, and so on, ad infinitum. In such a game there were no longer any clear, reliable facts. Very tricky, he thought—devilish. Better than instruments here would have been an exorcist. The chronometer beeped in his ear: a hundred minutes had gone by. He placed both hands palm-down on the metal plates and felt the tingling of the current flowing into the computer, for it to send to the *Hermes* the single-bit laser message that its scout was alive.

Time, now, for real reconnaissance. He hurried down the ladder with the second container and from its rear compartment pulled out a folding jeep: a light frame with a saddle and balloon tires, electrically powered. As he drove north, in the direction of the mountain slopes, toward the sky-high netting where the solitary hangar stood, a fine rain began to fall. A gray mist blurred the outlines of the growing building. He stopped the open vehicle in front of it, wiped the water running down the glass of his helmet with a glove, and was amazed. The colossus was both totally alien and incomprehensibly familiar. Windowless, with bulging walls braced by the massive parallel ribs of girders, the thing produced an impression contrary to both architecture and nature. It was like the carcass of a whale into whose belly had been shot a grenade of compressed gas, to make it swell hideously, while crammed inside the trusswork of a bridge, until the dying body filled the entire frame. Between two ribs gaped a semicircular opening. He dropped the container from the jeep and trundled it before him through this gate into impenetrable darkness. Instantly a strong white light blazed up on all sides. He was standing at the foot of a hall in which even a giant strider would have been an ant. The hall was encircled by rows of galleries, one above the other, crooked, tangled together—an iron theater with the stage and the seats torn out. In the center, on a perforated metal sheet, lay a multicolored starfish of flowers that gleamed like crystals. When he drew nearer, he noticed that above it hung an inverted pyramid as transparent as the air. Its surface became visible, flashing reflected light, only at a sharp angle. Deep in this glass tetrahedron appeared the emerald letters:

THIS IS GREETING

The crystalline blossoms burst into magnificent colors, from azure-blue to rich violet. Their radiant calyxes unfolded. Inside each was a flaming diamond. The inscription gave way to the next:

WE ARE FULFILLING YOUR WISH

—

He stood motionless, and the rainbow of burning crystals slowly turned gray. The diamonds glowed for a moment more, ruby-red, then went out, and everything crumbled into fine ash. He stood before a barbed spool of interwoven wires, and new words shone green inside the crystal:

GREETING CONCLUDED

He looked up from the dying embers and ran his eyes along the galleries, along their drooping rails. In places the galleries were detached from the concave walls. Then he jerked, as if struck in the face. Suddenly he understood why this bizarre building was so familiar: it was an inside-out replica, expanded a hundredfold, of the *Hermes*. The galleries exactly mimicked the scaffolding that had been welded to the ship's sides during the assembly and afterward mangled in the explosion at the moment of its landing. And the ribs, indented in the façade, were the ship's ribs, now girdling its everted hull on the outside. The lights beneath the twisted balconies went out, one by one, until darkness returned and only the sign GREETING CONCLUDED, suspended in midair, shone a gradually dimming apple-green.

What now? Having penetrated the wrecked ship, they copied it with mindless precision—or with subtle mockery—so that he would enter it as if walking into the belly of a slain, gutted animal. Whether this was the work of gloating treachery or, instead, the ritual of a nonhuman culture actually thus displaying hospitality, his mind remained in a labyrinth that had no exit. Stepping back in the blackness, he bumped into the container, which toppled over with a loud crash. The noise both sobered and infuriated him. At a run, he wheeled the load toward the daylight and out into the rain. The wet concrete had darkened. In the distance, silver through the drizzle, stood the needle of his rocket. Dirty columns of smoke, issuing steadily from the red fire pots, joined to form a low, turbid bank of clouds. Alone over the whole waste—a dead, slanting tower—jutted the *Hermes*. He checked the time. There remained almost an hour of the second hundred minutes. He struggled to clear his head of anger, to be deliberate, calm.

If they had designed machines of combat, had planned military operations, done engineering on the planetary scale and in space, then they had to be able to reason logically. If they did not want to show themselves, they could at least direct him, with signposts, to where their terminals would prove to him—using the code that had been transmitted for months now, using equations of the algebra of conflicts—that communication was pointless. They could repudiate the arguments of superior force with practical, rational arguments, or appeal to a higher authority, which would give them a choice, at least, between different forms of annihilation. But there were no signposts, no terminals, no devices for the exchange of information, nothing—less than nothing, considering the metallic smokescreen in the clouds; or the corpse of their ship, contaminated with a hidden plague; or its swollen copy, like a frog inflated to death by a lunatic, made to serve as a shrine of hospitality; or the crystal flower bed welcoming him by turning to ashes. A ceremony full of contradictory meanings, as if to say: "There is nothing here for you, intruders. You will wrest nothing from us, by your fire or falling ice, but traps, deceptions, and camouflage. Your envoy can do what he likes. Everywhere he will be met by the same stony silence, until, forced to part from his expectations, bewildered and defeated, he flies into a muddled rage, begins blasting at whatever is at hand, and buries himself beneath tumbling ruins—or crawls out from under them and departs skyward, not with knowledge stolen in an orderly retreat, but only in panic, fleeing." And even if he could in fact force anything, strong-arming his way into locked places, into the iron reaches of the one-eyed metropolis beyond the wall of smoke, surely in such alien, nonhuman surroundings the harder he struck the less he would learn, unable to distinguish between what was discovered and what was destroyed.

The rain fell. The clouds settled lower, enveloping the tip of the wrecked *Hermes*. From a compartment in the container he took a biosensor, an instrument so sensitive that at five hundred meters it registered strongly the cellular metabolism of a moth. The needle quivered constantly above zero, showing that life here, as on Earth, was everywhere. But bacteria or pollen provided no thread of Ariadne. Climbing the ladder, he extended the scope all the way and aimed it at the smoke columns to the south, at the structures of the branching metropolis hidden behind them. The sensor still quivered weakly near zero. He increased the focal length to the greatest range. The smoke, though metallic, presented no obstacle, nor did walls, but when he swept that horizon with the biometer, the arrow did not move. A dead city of iron? This was so hard to believe that he automatically gave the instrument a shake, as if it were a watch that had stopped. It was only when he turned around and directed the scope at the high spiderweb, blurry through the rain, that the arrow began to flutter back and forth. Moving the scope to the sides made the arrow jump erratically.

He jogged back to his jeep, set the container behind the saddle, stuck the biosensor in a two-pronged holder by the steering wheel, and drove to the foot of the netting-draped-over-masts.

It poured. Puddles of rainwater sprayed beneath his wheels. Water streamed down the pane of his helmet, blinding him, and he kept having to glance at the biosensor dial, which was jumping rapidly. According to the odometer, he had covered four miles and was therefore approaching the limit of the area of reconnaissance. In spite of this, he accelerated. Had it not been for the warning blinks of red from the instrument panel, he would have gone headfirst, jeep and all, into a deep ditch that from a distance had looked like a strip of black across the tarmac. Braked too sharply, the vehicle skidded, slid sideways on locked wheels until it came to rest at the edge of broken slabs. He got out to look at the obstacle. The mist made it difficult to judge distance; it gave the impression of depth. The hard plain ended abruptly in fragments of concrete. Many jutted into the air above a clayey bank. The ditch, not of even width but nowhere spannable with the small duralumin ladder, had definitely been created by explosive charges—not long ago, and in haste, which was evident from the clay, in places so ragged and overhanging that it could fall at any moment.

The opposite bank, with pieces of rubble driven into the soil by the explosions, rose in a wide, not-too-steep slope, above which loomed, through the mist, the meshes of the towering spiderweb. At large intervals along the escarpment on the other side he could see steel cables anchored in basins, cables of a gauge typically used to hold, on the vertical, condenser antennas that sat in a socketed base without supports. For two of the nearest spars an explosion had torn out the anchors and the counterpoises. Running his eye along their heavily drooping cables, he observed, some fifty meters higher, the trunk of a mast with telescoping segments that, thinner and thinner, curved around at the top—like an overweighted fishing rod—so that the netting, slack, sagged low. Its bottom wires almost touched the ground. As far as he could see in the mist, the slope was covered by protuberances lighter in color than the clay. Not domes of embedded tanks of liquid or gas—rather, the uneven bulges of molehills. Or shells of great tortoises, half buried. Or the caps of giant mushrooms. Or were these shelters, dugouts?

Overhead, the downpour and the wind rocked the meshes of the loosened spiderweb. He took the biosensor from the jeep and began playing its muzzle back and forth across the slope. The needle repeatedly leaped into the red sector of the dial, fell, and again hit maximum, impelled by a metabolism not of any microscopic infusorians or ants, but of something on the order of whales and elephants, as if whole herds were sitting on that drenched hillside. Forty-seven minutes remained, to a hundred. Return to the rocket and wait? A pity to waste the time. And, worse, it might be throwing away the element of surprise. He had a vague idea, now, of the rules of the game: they had not attacked, but set obstacles so he could break his fool neck if that was what he wanted. Enough thinking on the subject. With the strange feeling that this reality was less real, somehow, than a dream, he took from the container the gear needed to jump to the other bank. He put on the jet holsters and shoulder harness and stuck a small shovel into one of his pockets. The biosensor he strapped to his back, in a knapsack. But, to play it safe, first he used a gun that shot a nylon line. Aiming low at the far slope, he shot, supporting the gun on his left elbow. The line, unwinding with a whistle, hit the escarpment, and the hooks caught—but when he pulled, the sodden ground yielded at the first tug. So he opened the valve; a flapping rush lifted him into the air easily, as on a training field. He flew over the dark trench with ooze at the bottom, cut the thrust—a cold gas that fluttered along his legs—and dropped to the place he had chosen: beyond a bulge that resembled, when he went over it, an enormous, misshapen loaf of bread with a rough asbestos crust. His boots slid from under him in the thick mud, but he kept his balance. It was not that steep here. He was surrounded by bulging, squat mounds the color of ashes, with paler lines where there were runnels of rainwater. An abandoned village of a primitive

African tribe, in mist. Or a cemetery with barrows. He pointed the biosensor, taken from the knapsack, at an uneven, swollen wall a foot away. The needle shook at the red maximum, like a small voltmeter applied to a mighty dynamo. Holding the heavy instrument in front of him with its muzzle extended—like a rifle ready to shoot—he ran around the gray, crusty hump that protruded from the clay. In the clay his boots, slapping, left deep prints that filled immediately with dark water. He hurried up the slope from one shapeless loaf to the next. Flattened at the top, they were half again taller than he was. Perfect for inhabitants the size of a man. But there were no entrances, openings, spy holes, embrasures. These could not be bunkers—completely closed, unformed. Nor corpses buried in crusted graves, because no matter where he turned the sensor, life throbbed. For comparison, he directed the muzzle at his own chest. The arrow at once dropped to the middle of the dial. Carefully, so as not to damage it, he lay the biosensor aside, pulled the folding shovel from his suit's thigh pocket, and on his knees dug in the pliant clay. The blade scraped against an object. He shoveled away the muck, but water rapidly filled the growing hole. He thrust in his arm to the shoulder, as deep as he could reach, and, groping, felt a horizontal branching. A root system for petrified mushrooms? No—they were thick, smooth, tubular. They were pipes, and—what struck him particularly—neither hot nor cold, but warm. Out of breath, muddied, he jumped up and punched the fibrous crust with his fist. It gave elastically, though fairly hard, and resumed its former shape. He rested his back against it. Through the rain he could see more humps, shaped in the same random way. Some, close together, made twisting alleys that led higher up the slope, where the mist engulfed them.

Suddenly he remembered that the biosensor was two-way: it had a switch for either aerobic or anaerobic metabolisms. The aerobic variety he had discovered already. He lifted the instrument, with his glove wiped away the clay smeared on the glass, moved the setting to anaerobic, and trained the scope on the rough surface. The needle began to pulse, again and again, in a steady rhythm. Aerobic organisms mixed with anaerobic? How could that be? On this subject he was ignorant—but then no one else, probably, would have been able to figure it out. Slogging through streams of mud in the downpour, he came upon more and more humps. The metabolic pulses varied in frequency. Were some sleeping inside, and others awake? As if wanting to rouse the sleepers, he beat on the coarse, bloated mounds, but this did not affect the pulse. Such was his haste that he nearly fell, bumping into a taut antenna cable in one of the passageways. It stretched at an angle toward the netting of the large spiderweb, invisible in the milky mist. But how long had the alarm of the chronometer been on, repeating its warning louder and louder? A hundred and twelve minutes had gone by without his knowing it. Where was his head? And now what? He could have flown back to the rocket in three, four minutes, except that there was only enough gas in the tank for a two-hundred-meter jump. Three hundred, tops. To the jeep . . . but that was more than six miles. At least fifteen minutes. Should he try it? And if the *Hermes* struck sooner, and its envoy perished here not as a hero but as a complete idiot? He felt for the handle of the shovel—not there. The pocket was empty.

He had left the shovel stuck near the hole that he dug. No point looking for the thing now, in this maze.

He swung the biosensor with both hands and hit the rough crust, hit it and hit it until it broke, and from that rent burst a yellow-white dust as from a puffball, revealing not the eyes of beings hidden in an inner chamber but the sheer surfaces of a deep cleft with thousands of tiny pores—like a loaf of bread cut in two by an ax, with ropy, raw dough at the center. He froze, his arms raised for the next blow, and the sky above him filled with an awful light. The *Hermes*, opening fire on the antenna masts outside the spaceport, pierced straight through the clouds. The rain instantly evaporated in white steam. A laser sun rose. In a wide radius a thermal blast swept the entire upland slope free of mist and clouds. As far as the eye could see, the slope was covered with throngs of naked, defenseless warts, and as the towering spiderweb and the antennas, breaking, fell upon him in flames, he realized that he had seen the Quintans.

Science Fiction

STANISLAW

LEM

FIASCO

Translated by Michael Kandel

"Brilliant and demanding, this is one of Lem's best novels"
—*Publishers Weekly*

"Lem's greatest achievement in many years" —*The Village Voice*

The planet Quinta is pocked by ugly mounds and covered by a spiderweb-like network draped from spindly poles. It is a kingdom of phantoms and of a beauty afflicted by madness. In stark contrast, the crew of the spaceship *Hermes* represents a sensitive, knowledge-seeking Earth. They all have the best of intentions toward their "brothers in intelligence" as they approach Quinta. But the Quintans are locked in a "star-wars" escalation gone berserk. As the crew is attacked in different and mysterious ways, they find that their responses are determined not by their technology but by primitive instincts portended in strange images and symbols. A dark poetry takes over and leads them into a nightmare of misunderstanding.

Fiasco: a stunning space adventure and tale of lost innocence.

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