

GENESIS

POUL

ANDERSON



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**BY POUL ANDERSON
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GENESIS

Poul Anderson



A TOM DOHERTY ASSOCIATES BOOK
NEW YORK

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To Greg Bear, Gregory Benford, and David Brin,
Killer Bees and cosmic craftsmen

PART ONE

To follow knowledge like a sinking star,
Beyond the utmost bound of human thought.

-ALFRED, LORD TENNYSON

I

The story is of a man, a woman, and a world. But ghosts pass through it, and gods. Time does, which is more mysterious than any of these.

A boy stood on a hilltop and looked skyward. The breeze around him was a little cold, as if it whispered of the spaces yonder. He kept his parka hood up. Gloves didn't make his fingers too clumsy for the telescope he had carried here. Already now, before the autumnal equinox, summer was dying out of the Tanana valley and the nights lengthening fast. Some warmth did linger in the forest that enclosed this bare height: he caught a last faint fragrance of spruce.

The dark reached brilliant above him, the Milky Way cleaving it with frost, the Great Bear canted and Capella outshining Polaris in the north, ruddy Arcturus and Altair flanking steely Vega in the west, a bewilderment of stars. Though the moon was down, treetops lifted gray beneath their light.

A spark rose among them, a satellite in a high-inclination orbit. The boy's gaze followed it till it vanished. Longing shook him. To be out there!

He would. Someday he would.

Meanwhile he had this much heaven. Best get started. He must flit back home at a reasonable hour. Tomorrow his school gyrobball team was having practice, he wanted to work out a few more Fourier series—if you just told the computer to do it, you'd never learn what went on—and in the evening he'd take a certain girl to a dance. Maybe afterward he'd have nerve enough to recite her a poem he'd written about her. He hastily postponed that thought.

His astronomical pursuits had gone well past the usual sights. This time he savored their glories only briefly, for he was after a couple of Messier objects. There was no need to spoil the adaptation of his eyes. He spoke a catalogue number to the telescope mount. It found the RA and dec, pointed the instrument, and commenced tracking. He bent over the eyepiece and touched the knobs. Somehow it always felt better to focus for himself.

The thing swam into view, dim and misty. He hadn't the power to resolve more than a hint of structure. But it wasn't a nebula, it was a galaxy, the most remote he had yet tried for, suns in their tens of billions, their births and deaths, whirling neutron globes, unfathomable black holes, clouds of star-stuff, surely planets and moons and comets, surely—oh, please—living creatures, maybe—who could say?—some that were gazing his way and wondering.

No. Stupid, the boy chided himself. *It's too far. How many light-years? I can't quite remember.*

He didn't immediately ask for the figure. Down south he had seen the Andromeda

glimmer awesome through six lunar diameters of arc, and it was a couple of million off. Here he spied on another geological era.

No, not even that. Lately he had added geology to his interests, and one day realized that magnolias were blooming on Earth when the Pleiades kindled. It strengthened his sense of the cosmos as a unity, where he too belonged. Well, that star cluster was only about a hundred parsecs away. (Only!) It was not altogether ridiculous to imagine what might be going on there as you watched, three and a quarter centuries after the light now in your eyes had departed it. But across gulfs far less deep than this that confronted him, simultaneity had no meaning whatsoever. His wistfulness to know if any spirit so distant shared his lifetime would never be quenched. It *could* not be.

The night chill seemed to flow through aperture and lens into him. He shivered, straightened, glanced around in a sudden, irrational search for reassurance.

Air tingled through his nostrils. Blood pulsed. The forest stood tall from horizon to horizon. Another satellite skittered low above it. An owl hooted.

The ground stayed firm beneath his feet. A nearby boulder, weathered, probably glacier-scarred, bore the same witness to abidingness. If human science asked its age, the answer would be as real as the stone.

We're not little bits of nothing, the boy thought half defiantly. We count too. Our sun is a third as old as the universe. Earth isn't much younger. Life on Earth isn't much younger than that. And we have learned this all by ourselves.

The silence of the stars replied: You have measured it. Do you understand it? Can you?

We can think it, he declared. We can speak it, Can you?

Why did the night seem to wait?

Oh, yes, he thought, we don't see or feel it the way we do what's right around us. If I try to picture bricks or something side by side, my limit is about half a dozen. If I'd been counting since I was born and kept on till I died, I wouldn't get as high as twenty billion. But I reason. I imagine. That's enough.

He had always had a good head for figures. He could scale them down till they lay in his mind like pebbles in his hand. Even those astrophysical ages—No, maybe it didn't make sense either, harking clear back to the quantum creation. Too much that was too strange had happened too fast. But afterward time must have run for the first of the stars as it did for him. The chronology of life was perfectly straightforward.

Not that it had an exact zero point. The traces were too faint. Besides, most likely there wasn't any such moment. Chemistry evolved, with no stage at which you could say *this* had come alive. Still, animate matter certainly existed sometime between three and a half and four billion years ago.

The boy's mind jumped, as if a meteor had startled him. *Let's split the difference and call the date three-point-six-five billion B.C.E., he thought. Then one day stands for ten million years. Life began when January the first did, and this is midnight*

December the thirty-first, the stroke of the next new year.

So ... along about April, single cells developed, nuclei, ribosomes, and the rest. The cells got together, algae broke oxygen free into the atmosphere, and by November the first trilobites were crawling over the sea floor. Life invaded the land around Thanksgiving. The dinosaurs appeared early in December. They perished on Christmas Day. The hominids parted company with the apes at noon today. Primitive Homo sapiens showed up maybe fifteen minutes ago. Recorded history had lasted less than one minute. And here they were, measuring the universe, ranging the Solar System, planning missions to the stars.

Where will we be by sunrise? he wondered for a dizzying moment.

It passed. The upward steepness was an illusion, he knew. To go from worm to fish took immensely longer than to go from fish to mammal because the changes were immensely greater. By comparison, an ancient insectivore was very like an ape, and an ape nearly identical with a human.

Just the same, the boy thought, we've become a force of nature, and not only on this world. It's never seen anything like us before. Our little piece of extra brain tissue has got to have taken us across a threshold.

But what threshold, and what's beyond it?

He shivered again, pushed the question away from him, and turned back to his stargazing.

II

Strictly speaking, he was mistaken. In no particular was humankind unique. Nearly all animals had language, in the sense of communication between each other; among some, parts of it were learned, not innate, and actual dialects could develop. Many were technologists, in the sense of constructing things. A few used tools, in the sense of employing foreign objects for special tasks. A very few made tools, in the sense of slightly reshaping the objects; three or four species did this with the help of something besides their own mouths or digits.

Yet none came near to humans in any of these ways. In no other lineage did language grow so rich and powerful, for in them it sprang from an unprecedented capability of abstraction and reason. They had been toolmasters *par excellence* since before they were fully human; fire, chipped stone, and cut wood became conditions of their further evolution. At last the scope of their technology was such that natural selection no longer had significant effect on them. Like social insects and various sea dwellers, they were so well fitted to their surroundings that they bade fair to continue unaltered for millions of years. In their case, however, they themselves created—or were—their own environment. We can, if we like, say they had crossed a threshold.

Then we must say that another, more fateful one lay ahead.

For technology was never static. It continued to develop, at an ever more furious pace. Technological evolution was radically different from biological. It was not Darwinian, driven by contingency, competition, and a blind urge to reproduce. It was Lamarckian, driven by purpose. Its units of inheritance were not genes but memes—ideas, concepts, deliberately mutated or kept intact according to foreseen needs.

Knowledge also grew, in a fashion more nearly organic and haphazard until technology made science, the systematic search for verifiable information, possible. Thereafter the two nourished one another and the pace accelerated further.

More and more it was as though technology took on a life of its own, acting independently and ruthlessly. Gunpowder brought whole societies down. The steam engine forced basic change upon whole civilizations. Its internal-combustion successor turned the planet into a single quarrelsome neighborhood, while powering an agriculture that fed billions but starved what was left of the natural world. Computers remade industry, economics, and the everyday well-nigh beyond recognition, undermined liberty, and opened a road to space. The Internet, founded as a link between military centers, spread across the globe in a matter of years, revolutionized communication and access to knowledge like nothing since movable type, curbed tyrannies, and vexed governments everywhere. Automation made traditional skills useless, raising resentment and despair side by side with new wealth and new hopes.

“Artificial intelligence” was the name given the qualities of the most advanced

systems. Certain of these went into the business of enhancing artificial intelligence. Soon the business was entirely theirs.

The boy became a man. For a while he adventured on Earth, then he went into space as he had dreamed.

The machines evolved onward.

III

Long afterward—almost unimaginably long afterward—Christian Brannock recalled that day. For it had been somehow both an ending and a beginning.

He did not see this until he looked back on his life and his afterlife in fullness. At the time, he was wholly caught up in the there and then. It was not even day, except by a clock set to North American hours; and at the moment Earth was some hundred million kilometers to starward, while night still lay over Clement Base.

Morning approached, but slowly. Between sunrise and sunrise, 176 terrestrial rotations passed. Not that the men here had ever gazed directly at a sunlit landscape on Mercury. Though a darkened pane might bring the brightness down to something enduring, other radiation would strike through. Their machines above ground ranged for them. Most of these were robots, with different degrees of autonomy. One was more.

Gimmick never knew darkness. Across five hundred kilometers, Christian saw by laserlight, radarlight, amplified starlight. He felt with fingers and tendrils of metal, with sensors in the treads as the body rolled across the regolith, with subtle seismics. He tasted and smelled with flickery beams of electrons and nuclear particles. He listened electronically to whispers of radioactivity from the rock around and to the hiss and spatter of cosmic rain. Interior sensors kept him subliminally aware of balances, flows, needs, as nerves and glands did in his own body. Together, he and Gimmick made observations and decisions, like his brain alone in its skull; they moved the machine as his muscles moved himself.

Rapport was not total. It could only be so in line-of-sight. Relay, whether by satellite or by spires planted along the way, inevitably reduced the bandwidth and degraded the signal. Christian remained dimly conscious of his surroundings, the recliner in which he lay connected, meters and instruments, air odorless and a little chilly, tensions and easings—instinctive responses, which sometimes made him strain against his bonds. From the corner of an eye he glimpsed Willem Schuyten seated at a control console, monitoring what went on. That had seldom been necessary elsewhere, Christian thought vaguely. Or, at least, he'd avoided it. But this was a team effort, and on Mercury the unknowns were many and the stakes high.

It was just half a minute's distraction, while Gimmick did some data analysis that he couldn't follow. A certain direction of search seemed promising, and the explorer set off again. Christian's whole attention returned to the scene.

Heaven glimmered and shimmered, its manifold brilliances arcing down to a horizon that on the left was near and sharp. Craters pocked the murky terrain, boulders lay strewn. When he glanced at any, he could tell its age within a few million years, as he could tell the age of a person or a tree on Earth; the clues were countless, the

deductions subconscious. Close on the right a scarp four kilometers high, hundreds of kilometers long, loomed like a wall across the world. The enhancement that was Christian-Gimmick perceived it as more than rock. He noted traces as he went along; brain and computer joined to read the history, the tale of a gigantic upthrust along a fault line long ago when the planet was still cooling and shrinking after its birth.

He spied possibilities in something ahead.

Gimmick was following the cliff southwesterly, back toward the polar region where Clement waited. Rubble scrunched beneath the treads, soundlessly to human ears; dust smoked up and fell quickly down, under low gravity but unhindered by air. It did not cling to the robot, whose material repelled it.

There, Christian thought, that crag yonder. Maybe a good anchor point. We'll have a look. The partnership veered slightly and trundled nearer the heights. Debris lay deep here. Shards slipped aside. Motors labored. He considered deploying the six legs but decided that wasn't needful.

The peak sheered out of a lower slope above the rubble, a rough-edged hundred-meter obelisk. He had seen others as he traveled, though none so large. Probably shock-wave resonances in the age of uplift had split them from the massif.

He visualized this one as an almost ready-made core for a transmission tower, part of the global network that was to collect the solar energy cataracting down onto Mercury's dayside and hurl it out to orbiting antimatter factories—ultimately, to the laser beams that would send the first starships on their way! Passion thrummed in him.

A quick structural exam. The self-robots can map the details later. A disc at the end of an arm snugged tightly. Vibrations through stone returned their echoes, bearing tales.

The stone gave way. Thunder and blindness crashed down.

2

“Wat drommel?” Willem Schuyten cried. He went back to the expedition's English. *“What the hell?”* After a glance at the other man's face: *“Hell indeed.”*

“N-no.” Secured in the system, Christian Brannock could neither lift a braceleted arm nor shake his helmeted head. His voice shuddered. “Hold on. Keep going. Let me try to find out—what's happened—”

Willem nodded and concentrated on his instruments. Grown gray in the artificial intelligence field, he could make inferences from these readings and computations that might well escape an on-site observer.

Shards and tatters of input went through Christian like a nightmare, blackness, deafness, crushing heaviness, powers lost, strength in ebb. Instinct panicked; his flesh struggled against the restraints. But somehow his mind clung to the steadiness that was Gimmick's. Together they tried to interpret what little the sensors gave them.

Those fitful moments of reality turned more and more chaotic. They weakened, too, until he could not make out whatever form they still had.

The linkage is failing fast. Better break it altogether and start work. Christian never knew whether the decision was his alone or rooted also in his partner's calm logic. Nor did he know or care why it ended with: *So long. Good luck.*

"Terminate," he rasped aloud.

"Terminate," Willem repeated. He swept a glance and a judgment across the gauges, deemed that an immediate breakoff was neurologically safe, and pressed the command button. Voice-activated, the communication center could have done everything by itself, but a human in the loop was an added precaution. He could better tell what another human required.

All channels shut down. The neuroconnectors released Christian. He lay for a minute breathing hard, then sat up. Willem stood above him with a tumbler of water. Christian drained it in two gulps. "Thanks," he mumbled. "Dry as yon landscape, my mouth was."

"Terror will do that," his companion replied. "I saw your involuntary reactions. Want a levozine?"

Christian half grinned, without merriment. "What I really want is a stiff drink. But we're in a hurry. Yes, I'll take a pill."

Willem gave him one. Some were always on hand, in case a mission got unexpectedly long or difficult and the operator could not stop to rest. "In a hurry, you said? Do you mean there is something we can do at once?"

Christian nodded. "We'd bloody well better." He climbed to his feet. The medication began to tranquilize and stimulate. His trembling died away, his voice gained force. "Whew! Hope I can snatch a shower during preparations. I smell six weeks dead, don't I?" Sweat sheened on his skin and darkened his shirt.

Willem regarded him narrowly. "My monitors say the machine is a ruin. The transceiver's badly damaged. It can carry some information, erratically, but the power unit's out of commission. Anything that could perhaps function, like an arm, can't anymore. And the energy reserve is dwindling fast."

"Gimmick's intact."

Willem sighed. "Yes, evidently. That hurts, doesn't it?" He had often heard such highly developed computers and neural nets, with their programs and databases, called "brains." People who worked with one, like Christian—although seldom as intimately as he did—were apt to give it a name and speak of its personal quirks, as other people might speak of a ship or a tool that had served them a long time. "I imagine you'd prefer the wreck to have been quick and total. Merciful, so to speak. That would have been a shock to you, however, worse than you got."

"I know. Like suddenly dying myself. I'd have recovered. But this way—My God, man, Gimmick's out there, not a heap of smashed parts but Gimmick! And sunrise is coming."

Willem sighed. “Exactly. Have you any idea what happened?”

The question, its style carefully parched, demanded an answer in kind. Christian’s fists unclenched. “We were examining an unusual sort of crag. All at once it broke into huge chunks. It buried Gimmick.” His tone sharpened. “The body Gimmick was using.” Again impersonal: “The top of the transceiver mast, with the dish, is sticking out, and what came to me shows that the interior armor protected the brain.”

“Are you sure? It could be in poor shape too.”

Christian shook his head. “No. Do you believe I wouldn’t know that, feel it, same as I would if my own brain took a concussion?”

“All right. But the accident—how could a collapse happen? An earthquake?”

“No.” Christian spoke with certainty. He had, in a way, been there. “Nor a meteorite strike. Somehow our seismic probe must have touched things off. I don’t see how. You know it didn’t have any great force. And Mercury’s geologically used up. That jut of rock stood unchanged for—what?—three billion years?”

“A freak occurrence, then.”

“Maybe. Or maybe such formations and weaknesses are common. How much do we know? Why the devil are we on Mercury, except to get the lay of the land? Before something like this happens elsewhere—”

Christian drew breath and forced coolness upon himself. “I was only in linkage with Gimmick. The full information isn’t in me, it’s in his database. If we don’t retrieve him before sunrise, everything will be baked and blasted to nothing.”

“I suppose so. Thermostatic system destroyed and the rocks probably not a good replacement for smashed radiation shielding.” Willem laid a hand on his friend’s shoulder. “I’m sorry. Dreadful luck. Worse for you than the expedition, perhaps. This association you’ve grown used to, this particular rapport you’ve developed, gone. You’ll have to start all over, won’t you?” He regarded the creases in the face, the fallowness in the blond hair. “Unless you choose to make a career change, or just retire. I’m sorry, Christian.”

The response lashed at him: “No! There’s time to go dig, detach Gimmick from the wreckage, get back here. But we’ve got to move, I tell you!”

“I... am afraid not. Let me check and make sure.” Willem turned to his keyboards and readouts. Christian stood where he was. His fists doubled again.

After a while the cyberneticist looked at him and said slowly: “No. I’ve gathered the present whereabouts of everything we have with proper capability,” self-programming robots surveying and studying the planet in advance of the grand enterprise. Christian’s had been the only direct human-machine alliance, expensive in terms of life support and equipment, rewarding in terms of special situations calling for an organic mind on the scene. “They’re scattered across the globe, remember. Even the nearest has rough terrain to cross. None can get there soon enough.”

Christian had become quite composed. “I guessed so. Well, it isn’t too far from

here. I'll go myself."

3

Everyone else at Clement called the idea insane. The central artificial intelligence made a lightning-quick calculation and agreed. No possible gain was worth the risk of losing the outfit necessary, let alone a human life. Commander Gupta forbade it.

Christian Brannock stood his ground. He and Gimmick had been doing work impossible for any single man or machine. The delay while a replacement was found and brought to the planet, then the time spent regaining the lost information, could possibly cripple the whole undertaking, if only by the added cost. More to the point, as an independent contractor he had broad discretion. Within limits that he insisted he was not exceeding, he could commandeer whatever he needed to cope with an emergency.

His haste and resolution overbore them. Two hours later he was on his way.

After that, he waited. The rover that carried him operated itself. Its program included a topographic map, and survey satellites provided exact detail. Following its progress through communication relays, from time to time the intelligence at base ordered a change of course that would make for better speed. None of this impinged directly on Christian. Nor could he talk with the robot that accompanied him. It was built for power and dexterity, not thought. When they reached the site, the intelligence would direct its operations. Meanwhile its bulk crowded a cabin intended for, at most, three men.

Otherwise he was fairly comfortable. Air blew recycled, always pure. (He remembered odors of blossoms, pines, a woman's sunlit hair.) Temperature varied subtly because that was best for health and alertness, without regard to the hundred-kelvin cold of midnight or the searing three hundred Celsius degrees of noonday. (He remembered a beach where surf burst and roared, a wind chill in his face and salt on his lips but warmth radiant from a leeward bluff.) The metal around him hummed and quivered, the deck underfoot pitched and swayed, as the vehicle drove full tilt across a rugged land. However, the seat in which he sat harnessed compensated for most, and what it could not entirely counteract didn't amount to much in Mercurian gravity. If anything, the motion soothed, almost cradlelike. (He remembered a boat heeled over, climbing the crests of waves and diving into their troughs, the tiller athrum beneath his hand, the mainsail a snowpeak against heaven.)

Exhaustion claimed him. He ate and drank something, reclined the seat, and slept. His dreams were uneasy. Once during them he asked Gimmick, "Do you ever dream? When we're not linked, I mean," and the robot replied, "You taught me how." Or was that a confused memory? They'd been together quite a few years, in quite a few strange places.

He woke refreshed, though, unharnessed, balanced himself against the lurching while he stretched his muscles and used the sanitor, ate more of the cold rations, and

settled back down. When he called for a revised estimate of arrival time, the vehicle said “About another three hours” in its flat voice.

He frowned. That wouldn't be long before sunrise. Well, he'd known when he started that this was the best he could hope for. And ... the swollen solar disc would take fifteen hours to clear the horizon.

He looked outward. Direct vision was impossible when he sat in the middle of thick armor, but the electronics that he activated gave him a simulacrum as good. Suddenly it was as if everything above the deck were gone and he directly beneath the sky, naked, alone, invulnerable. So might an angel have seen.

No, only a man. He did not now share the more than human senses of his partner. But for a while he lost himself in unaided vision.

A kind of dawn was breaking in the northeast, zodiacal light strengthened by the nearness of the sun. It lifted above rocks and craters like a huge wing, softly pearl-hued, a quarter of the way to the zenith before it faded among stars. The galactic belt outshone it, an ice-bright river from worldedge to worldedge. Everywhere else the stars themselves gleamed and glittered, their thousands overwhelming the crystalline blackness behind. Though Christian had beheld them oftener than he could recall, for a moment he felt his spirit fall free, upward and upward forever into the majesty of their silence.

A glimpse drew him back. Low over a northwesterly ridge stood a blue diamond. He could just espy a mote beside it, ashen-gold. Earth, he knew, and Earth's moon. Home.

Did that moon tonight throw a glint off a bit of Ellen's windborne dust?

Sometimes, without warning, the memory of her overtook him. He had long since healed himself of grief. There had been women before her, there had been women afterward. But she was the one for whom he left space and settled down to groundside engineering, because nothing was worth leaving her for months or years on end. When she died—robotic controls could not yet prevent every senseless accident—and he had scattered the contents of the urn across the countryside she loved, he returned to space. Their son was grown and didn't need him any longer. He took up the new technology of human-machine linkage, and seldom came back for a visit. But from time to time he remembered, and it hurt.

Maybe, selfishly speaking, he was otherwise better off. Of course, he'd been happy to pay the price. Nevertheless, on Earth he had always felt trapped. The stars—

Again he looked aloft. A deeper longing shook him. He had fared and wrought across the Solar System. Beyond waited a universe.

Half angrily, he dismissed the emotion. Self-pity. They were going to the stars, yes, but it wouldn't happen in his lifetime, and they wouldn't be flesh and blood, they would be machines. Oh, sentient, sensitive, bearing with them all the heritages of history, but not really human.

Her ghost lingered. It made the cabin too quiet.

He was not mawkish. In his job, he couldn't be and survive. Yet you couldn't survive either if you were a dullard. That meant you found ways to occupy long, empty stretches of time—not merely games and recorded shows, but anything from acquiring a language or mastering calligraphy to creating an artwork or maturing a philosophy. Christian Brannock was, among other things, a ballad singer who had composed several of his own.

He had taken his guitar along. The optics of total outervision obscured his immediate surroundings, but he knew where it was racked. He reached and pulled it free. Sound-board and strings glimmered into sight as he laid it over his lap. He struck a chord and began to sing

*“Once upon a hearth
We lit a little fire
To warm our winter hands
And kindle our desire,
Which never needed this;
But still, we found it good
To see the flames seduce
The dry and virgin wood. —”*

No. The music clanged to a halt. He had made the song in his Earthside youth, later Ellen enjoyed it, a while ago he revived it on Mars, where no true flame had ever danced. Doing it here felt somehow wrong.

Why was he so churned up inside? Because he was in danger of losing Gimmick? But Gimmick was only a machine, wasn't he—wasn't it? Well, maybe not “only.” . . .

Christian had work to make ready for. Defiantly, he launched into something older and bawdier.

*“Oh, a tinker came a-strolling,
A-strolling down the Strand —”*

4

Already the solar corona was well over a ridge in the northeast. Its opalescent glory drowned the zodiacal light and cast a wan, shadowful glow across pocks and scars beneath. A crimson tongue of prominence heralded the oncoming disc. Elsewhere the stars still ruled. Earth no longer beckoned. The scarp blocked sight of it.

That cliff sheered from horizon to horizon, filling nearly half the sky. Christian