

# THE IRON STAR

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THE ALIEN SHIP came drifting up from behind the far side of the neutron star just as I was going on watch. It looked a little like a miniature neutron star itself: a perfect sphere, metallic, dark. But neutron stars don't have six perky little out-thrust legs and the alien craft did.

While I paused in front of the screen the alien floated diagonally upward, cutting a swathe of darkness across the brilliantly starry sky like a fast-moving black hole. It even occulted the real black hole that lay thirty light-minutes away.

I stared at the strange vessel, fascinated and annoyed, wishing I had never seen it, wishing it would softly and suddenly vanish away. This mission was sufficiently complicated already. We hadn't needed an alien ship to appear on the scene. For five days now we had circled the neutron star in seesaw orbit with the aliens, a hundred eighty degrees apart. They hadn't said anything to us and we didn't know how to say anything to them. I didn't feel good about that. I like things direct, succinct, known.

Lina Sorabji, busy enhancing sonar transparencies over at our improvised archaeology station, looked up from her work and caught me scowling. Lina is a slender, dark woman from Madras whose ancestors were priests and scholars when mine were hunting bison on the Great Plains. She said, "You shouldn't let it get to you like that, Tom."

“You know what it feels like, every time I see it cross the screen? It’s like having a little speck wandering around on the visual field of your eye. Irritating, frustrating, maddening—and absolutely impossible to get rid of.”

“You want to get rid of it?”

I shrugged. “Isn’t this job tough enough? Attempting to scoop a sample from the core of a neutron star? Do we really have to have an alien spaceship looking over our shoulders while we work?”

“Maybe it’s not a spaceship at all,” Lina said cheerily. “Maybe it’s just some kind of giant spacebug.”

I suppose she was trying to amuse me. I wasn’t amused. This was going to win me a place in the history of space exploration, sure: Chief Executive Officer of the first expedition from Earth ever to encounter intelligent extraterrestrial life. Terrific. But that wasn’t what IBM/Toshiba had hired me to do. And I’m more interested in completing assignments than in making history. You don’t get paid for making history.

Basically the aliens were a distraction from our real work, just as last month’s discovery of a dead civilization on a nearby solar system had been, the one whose photographs Lina Sorabji now was studying. This was supposed to be a business venture involving the experimental use of new technology, not an archaeological mission or an exercise in interspecies diplomacy. And I knew that there was a ship from the Exxon/Hyundai combine loose somewhere in hyperspace right now working on the same task we’d been sent out to handle. If they brought it off first, IBM/Toshiba would suffer a very severe loss of face, which is considered very bad on the corporate level. What’s bad for IBM/Toshiba would be exceedingly bad for me. For all of us.

I glowered at the screen. Then the orbit of the Ben-wah Maru carried us down and away and the alien disappeared from my line of sight. But not for long, I knew.

As I keyed up the log reports from my sleep period I said to Lina, “You have anything new today?” She had spent the past three weeks analyzing the dead-world data. You never know what the parent companies will see as potentially profitable.

"I'm down to hundred-meter penetration now. There's a system of broad tunnels wormholing the entire planet. Some kind of pneumatic transportation network, is my guess. Here, have a look."

A holoprint sprang into vivid life in the air between us. It was a sonar scan that we had taken from ten thousand kilometers out, reaching a short distance below the surface of the dead world. I saw odd-angled tunnels lined with gleaming luminescent tiles that still pulsed with dazzling colors, centuries after the cataclysm that had destroyed all life there. Amazing decorative patterns of bright lines were plainly visible along the tunnel walls, lines that swirled and overlapped and entwined and beckoned my eye into some adjoining dimension.

Trains of sleek snub-nosed vehicles were scattered like caterpillars everywhere in the tunnels. In them and around them lay skeletons, thousands of them, millions, a whole continent full of commuters slaughtered as they waited at the station for the morning express. Lina touched the fine scan and gave me a close look: biped creatures, broad skulls tapering sharply at the sides, long apelike arms, seven-fingered hands with what seemed like an opposable thumb at each end, pelvises enlarged into peculiar bony crests jutting far out from their hips. It wasn't the first time a hyperspace exploring vessel had come across relics of extinct extraterrestrial races, even a fossil or two. But these weren't fossils. These beings had died only a few hundred years ago. And they had all died at the same time.

I shook my head somberly. "Those are some tunnels. They might have been able to convert them into pretty fair radiation shelters, is my guess. If only they'd had a little warning of what was coming."

"They never knew what hit them."

"No," I said. "They never knew a thing. A supernova brewing right next door and they must not have been able to tell what was getting ready to happen."

Lina called up another print, and another, then another. During our brief fly-by last month our sensors had captured an amazing panoramic view of this magnificent lost civilization: wide streets, spacious parks, splendid public buildings, imposing private houses, the works. Bizarre architecture, all unlikely angles and jutting crests like its creators, but unquestionably grand, noble, impressive. There

had been keen intelligence at work here, and high artistry. Everything was intact and in a remarkable state of preservation, if you make allowances for the natural inroads that time and weather and I suppose the occasional earthquake will bring over three or four hundred years. Obviously this had been a wealthy, powerful society, stable and confident.

And between one instant and the next it had all been stopped dead in its tracks, wiped out, extinguished, annihilated. Perhaps they had had a fraction of a second to realize that the end of the world had come, but no more than that. I saw what surely were family groups huddling together, skeletons clumped in threes or fours or fives. I saw what I took to be couples with their seven-fingered hands still clasped in a final exchange of love. I saw some kneeling in a weird elbows-down position that might have been one of—who can say? Prayer? Despair? Acceptance?

A sun had exploded and this great world had died. I shuddered, not for the first time, thinking of it.

It hadn't even been their own sun. What had blown up was this one, forty light-years away from them, the one that was now the neutron star about which we orbited and which once had been a main-sequence sun maybe three or four times as big as Earth's. Or else it had been the other one in this binary system, thirty light-minutes from the first, the blazing young giant companion star of which nothing remained except the black hole nearby. At the moment we had no way of knowing which of these two stars had gone supernova first. Whichever one it was, though, had sent a furious burst of radiation heading outward, a lethal flux of cosmic rays capable of destroying most or perhaps all life-forms within a sphere a hundred light-years in diameter.

The planet of the underground tunnels and the noble temples had simply been in the way. One of these two suns had come to the moment when all the fuel in its core had been consumed: hydrogen had been fused into helium, helium into carbon, carbon into neon, oxygen, sulphur, silicon, until at last a core of pure iron lay at its heart. There is no atomic nucleus more strongly bound than iron. The star had reached the point where its release of energy through fusion had to cease; and with the end of energy production the star no longer

could withstand the gravitational pressure of its own vast mass. In a moment, in the twinkling of an eye, the core underwent a catastrophic collapse. Its matter was compressed—beyond the point of equilibrium. And rebounded. And sent forth an intense shock wave that went rushing through the star's outer layers at a speed of 15,000 kilometers a second.

Which ripped the fabric of the star apart, generating an explosion releasing more energy than a billion suns.

The shock wave would have continued outward and outward across space, carrying debris from the exploded star with it, and interstellar gas that the debris had swept up. A fierce sleet of radiation would have been riding on that wave, too: cosmic rays, X-rays, radio waves, gamma rays, everything, all up and down the spectrum. If the sun that had gone supernova had had planets close by, they would have been vaporized immediately. Outlying worlds of that system might merely have been fried.

The people of the world of the tunnels, forty light-years distant, must have known nothing of the great explosion for a full generation after it had happened. But, all that while, the light of that shattered star was traveling towards them at a speed of 300,000 kilometers per second, and one night its frightful baleful unexpected glare must have burst suddenly into their sky in the most terrifying way. And almost in that same moment—for the deadly cosmic rays thrown off by the explosion move nearly at the speed of light—the killing blast of hard radiation would have arrived. And so these people and all else that lived on their world perished in terror and light.

All this took place a thousand light-years from Earth: that surging burst of radiation will need another six centuries to complete its journey towards our home world. At that distance, the cosmic rays will do us little or no harm. But for a time that long-dead star will shine in our skies so brilliantly that it will be visible by day, and by night it will cast deep shadows, longer than those of the Moon.

That's still in Earth's future. Here the fatal supernova, and the second one that must have happened not long afterwards, were some four hundred years in the past. What we had here now was a neutron star left over from one cataclysm and a black hole left over from the other. Plus the pathetic remains of a great civilization on a scorched

planet orbiting a neighboring star. And now a ship from some alien culture. A busy corner of the galaxy, this one. A busy time for the crew of the IBM/Toshiba hyperspace ship Ben-wah Maru.

I was still going over the reports that had piled up at my station during my sleep period—mass-and-output readings on the neutron star, progress bulletins on the setup procedures for the neutronium scoop, and other routine stuff of that nature—when the communicator cone in front of me started to glow. I flipped it on. Cal Bjornsen, our communications guru, was calling from Brain Central downstairs.

Bjornsen is mostly black African with some Viking genes salted in. The whole left side of his face is cyborg, the result of some extreme bit of teenage carelessness. The story is that he was gravity-vaulting and lost polarity at sixty meters. The mix of ebony skin, blue eyes, blond hair, and sculpted titanium is an odd one, but I've seen a lot of faces less friendly than Cal's. He's a good man with anything electronic.

He said, "I think they're finally trying to send us messages, Tom."

I sat up fast. "What's that?"

"We've been pulling in signals of some sort for the past ninety minutes that didn't look random, but we weren't sure about it. A dozen or so different frequencies all up and down the line, mostly in the radio band, but we're also getting what seem to be infrared pulses, and something flashing in the ultraviolet range. A kind of scattershot noise effect, only it isn't noise."

"Are you sure of that?"

"The computer's still chewing on it," Bjornsen said. The fingers of his right hand glided nervously up and down his smooth metal cheek. "But we can see already that there are clumps of repetitive patterns."

"Coming from them? How do you know?"

"We didn't, at first. But the transmissions conked out when we lost line-of-sight with them, and started up again when they came back into view."

"I'll be right down," I said.

Bjornsen is normally a calm man, but he was running in frantic circles when I reached Brain Central three or four minutes later. There was stuff dancing on all the walls: sine waves, mainly, but plenty

of other patterns jumping around on the monitors. He had already pulled in specialists from practically every department—the whole astronomy staff, two of the math guys, a couple from the external maintenance team, and somebody from engines. I felt preempted. Who was CEO on this ship, anyway? They were all babbling at once. “Fourier series,” someone said, and someone yelled back, “Dirichlet factor,” and someone else said, “Gibbs phenomenon!” I heard Angie Seraphin insisting vehemently, “—continuous except possibly for a finite number of finite discontinuities in the interval— $\pi$  to  $\pi$ —”

“Hold it,” I said, “What’s going on?”

More babble, more gibberish. I got them quiet again and repeated my question, aiming it this time at Bjornsen.

“We have the analysis now,” he said.

“So?”

“You understand that it’s only guesswork, but Brain Central gives good guess. The way it looks, they seem to want us to broadcast a carrier wave they can tune in on, and just talk to them while they lock in with some sort of word-to-word translating device of theirs.”

“That’s what Brain Central thinks they’re saying?”

“It’s the most plausible semantic content of the patterns they’re transmitting,” Bjornsen answered.

I felt a chill. The aliens had word-to-word translating devices? That was a lot more than we could claim. Brain Central is one very smart computer, and if it thought that it had correctly deciphered the message coming in, then in all likelihood it had. An astonishing accomplishment, taking a bunch of ones and zeros put together by an alien mind and culling some sense out of them.

But even Brain Central wasn’t capable of word-to-word translation out of some unknown language. Nothing in our technology is. The alien message had been designed to be easy: put together, most likely, in a careful high-redundancy manner, the computer equivalent of picture-writing. Any race able to undertake interstellar travel ought to have a computer powerful enough to sweat the essential meaning out of a message like that, and we did. We couldn’t go farther than that though. Let the entropy of that message—that is, the unexpectedness of it, the unpredictability of its semantic content—rise just a little beyond the picture-writing level,

and Brain Central would be lost. A computer that knows French should be able to puzzle out Spanish, and maybe even Greek. But Chinese? A tough proposition. And an alien language? Languages may start out logical, but they don't stay that way. And when its underlying grammatical assumptions were put together in the first place by beings with nervous systems that were wired up in ways entirely different from our own, well, the notion of instantaneous decoding becomes hopeless.

Yet our computer said that their computer could do word-to-word. That was scary.

On the other hand, if we couldn't talk to them, we wouldn't begin to find out what they were doing here and what threat, if any, they might pose to us. By revealing our language to them we might be handing them some sort of advantage, but I couldn't be sure of that, and it seemed to me we had to take the risk.

It struck me as a good idea to get some backing for that decision, though. After a dozen years as CEO aboard various corporate ships I knew the protocols. You did what you thought was right, but you didn't go all the way out on the limb by yourself if you could help it.

"Request a call for a meeting of the corporate staff," I told Bjornsen.

It wasn't so much a scientific matter now as a political one. The scientists would probably be gung-ho to go blasting straight ahead with making contact. But I wanted to hear what the Toshiba people would say, and the IBM people, and the military people. So we got everyone together and I laid the situation out and asked for a Consensus Process. And let them go at it, hammer and tongs.

Instant polarization. The Toshiba people were scared silly of the aliens. We must be cautious, Nakamura said. Caution, yes, said her cohort Nagy-Szabo. There may be danger to Earth. We have no knowledge of the aims and motivations of these beings. Avoid all contact with them, Nagy-Szabo said. Nakamura went even further. We should withdraw from the area immediately, she said, and return to Earth for additional instructions. That drew hot opposition from Jorgensen and Kalliotis, the IBM people. We had work to do here, they said. We should do it. They grudgingly conceded the need to be wary, but strongly urged continuation of the mission and advocated a circumspect opening of contact with the other ship. I think they were

already starting to think about alien marketing demographics. Maybe I do them an injustice. Maybe.

The military people were about evenly divided between the two factions. A couple of them, the hair-splitting career-minded ones, wanted to play it absolutely safe and clear out of here fast, and the others, the up-and-away hero types, spoke out in favor of forging ahead with contact and to hell with the risks.

I could see there wasn't going to be any consensus. It was going to come down to me to decide.

By nature I am cautious. I might have voted with Nakamura in favor of immediate withdrawal; however that would have made my ancient cold-eyed Sioux forebears howl. Yet in the end what swayed me was an argument that came from Bryce-Williamson, one of the fiercest of the military sorts. He said that we didn't dare turn tail and run for home without making contact, because the aliens would take that either as a hostile act or a stupid one, and either way they might just slap some kind of tracer on us that ultimately would enable them to discover the location of our home world. True caution, he said, required us to try to find out what these people were all about before we made any move to leave the scene. We couldn't just run and we couldn't simply ignore them.

I sat quietly for a long time, weighing everything.

"Well?" Bjornsen asked. "What do you want to do, Tom?"

"Send them a broadcast," I said. "Give them greetings in the name of Earth and all its peoples. Extend to them the benevolent warm wishes of the board of directors of IBM/Toshiba. And then we'll wait and see."

We waited. But for a long while we didn't see.

Two days, and then some. We went round and round the neutron star, and they went round and round the neutron star, and no further communication came from them. We beamed them all sorts of messages at all sorts of frequencies along the spectrum, both in the radio band and via infrared and ultraviolet as well, so that they'd have plenty of material to work with. Perhaps their translator gadget wasn't all that good, I told myself hopefully. Perhaps it was stripping

its gears trying to fathom the pleasant little packets of semantic data that we had sent them.

On the third day of silence I began feeling restless. There was no way we could begin the work we had been sent here to do, not with aliens watching. The Toshiba people—the Ultra Cautious faction—got more and more nervous. Even the IBM representatives began to act a little twitchy. I started to question the wisdom of having overruled the advocates of a no-contact policy. Although the parent companies hadn't seriously expected us to run into aliens, they had covered that eventuality in our instructions, and we were under orders to do minimum tipping of our hands if we found ourselves observed by strangers. But it was too late to call back our messages and I was still eager to find out what would happen next. So we watched and waited, and then we waited and watched. Round and round the neutron star.

We had been parked in orbit for ten days now around the neutron star, an orbit calculated to bring us no closer to its surface than 9000 kilometers at the closest skim. That was close enough for us to carry out our work, but not so close that we would be subjected to troublesome and dangerous tidal effects.

The neutron star had been formed in the supernova explosion that had destroyed the smaller of the two suns in what had once been a binary star system here. At the moment of the cataclysmic collapse of the stellar sphere, all its matter had come rushing inward with such force that electrons and protons were driven into each other to become a soup of pure neutrons. Which then were squeezed so tightly that they were forced virtually into contact with one another, creating a smooth globe of the strange stuff that we call neutronium, a billion billion times denser than steel and a hundred billion billion times more incompressible.

That tiny ball of neutronium glowing dimly in our screens was the neutron star. It was just eighteen kilometers in diameter but its mass was greater than that of Earth's sun. That gave it a gravitational field a quarter of a billion billion times as strong as that of the surface of Earth. If we could somehow set foot on it, we wouldn't just be squashed flat, we'd be instantly reduced to fine powder by the colossal tidal effects—the difference in gravitational pull between

the soles of our feet and the tops of our heads, stretching us towards and away from the neutron star's center with a kick of eighteen billion kilograms.

A ghostly halo of electromagnetic energy surrounded the neutron star: X-rays, radio waves, gammas, and an oily, crackling flicker of violet light. The neutron star was rotating on its axis some 550 times a second, and powerful jets of electrons were spouting from its magnetic poles at each sweep, sending forth a beacon-like pulsar broadcast of the familiar type that we have been able to detect since the middle of the twentieth century.

Behind that zone of fiercely outflung radiation lay the neutron star's atmosphere: an envelope of gaseous iron a few centimeters thick. Below that, our scan had told us, was a two-kilometers-thick crust of normal matter, heavy elements only, ranging from molybdenum on up to transuranics with atomic numbers as high as 140. And within that was the neutronium zone, the stripped nuclei of iron packed unimaginably close together, an ocean of strangeness nine kilometers deep. What lay at the heart of that, we could only guess.

We had come here to plunge a probe into the neutronium zone and carry off a spoonful of star-stuff that weighed 100 billion tons per cubic centimeter.

No sort of conventional landing on the neutron star was possible or even conceivable. Not only was the gravitational pull beyond our comprehension—anything that was capable of withstanding the tidal effects would still have to cope with an escape velocity requirement of 200,000 kilometers per second when it tried to take off, two thirds the speed of light—but the neutron star's surface temperature was something like 3.5 million degrees. The surface temperature of our own sun is six thousand degrees and we don't try to make landings there. Even at this distance, our heat and radiation shields were straining to the limits to keep us from being cooked. We didn't intend to go any closer.

What IBM/Toshiba wanted us to do was to put a miniature hyperspace ship into orbit around the neutron star: an astonishing little vessel no bigger than your clenched fist, powered by a fantastically scaled-down version of the drive that had carried us through the space-time manifold across a span of a thousand light-years in a

dozen weeks. The little ship was a slave-drone; we would operate it from the Ben-wah Maru. Or, rather, Brain Central would. In a maneuver that had taken fifty computer-years to program, we would send the miniature into hyperspace and bring it out again right inside the neutron star. And keep it there a billionth of a second, long enough for it to gulp the spoonful of neutronium we had been sent here to collect. Then we'd head for home, with the miniature ship following us along the same hyperpath.

We'd head for home, that is, unless the slave-drone's brief intrusion into the neutron star released disruptive forces that splattered us all over this end of the galaxy. IBM/Toshiba didn't really think that was going to happen. In theory a neutron star is one of the most stable things there is in the universe, and the math didn't indicate that taking a nip from its interior would cause real problems. This neighborhood had already had its full quota of giant explosions, anyway.

Still, the possibility existed. Especially since there was a black hole just thirty light-minutes away, a souvenir of the second and much larger supernova bang that had happened here in the recent past. Having a black hole nearby is a little like playing with an extra wild card whose existence isn't made known to the players until some randomly chosen moment midway through the game. If we destabilized the neutron star in some way not anticipated by the scientists back on Earth, we might just find ourselves going for a visit to the event horizon instead of getting to go home. Or we might not. There was only one way of finding out.

I didn't know, by the way, what use the parent companies planned to make of the neutronium we had been hired to bring them. I hoped it was a good one.

But obviously we weren't going to tackle any of this while there was an alien ship in the vicinity. So all we could do was wait. And see. Right now we were doing a lot of waiting, and no seeing at all.

Two days later Cal Bjornsen said, "We're getting a message back from them now. Audio only. In English."

We had wanted that, we had even hoped for that. And yet it shook me to learn that it was happening.

"Let's hear it," I said.