

SUN UP

by A.A. Jackson IV and Howard Waldrop

The robot exploration ship Saenger parked off the huge red sun.

It was now a tiny dot of stellar debris, bathed in light, five million nine hundred ninety-four thousand myriameters from the star. Its fusion ram had been silent for some time. It had coasted in on its reaction motors like a squirrel climbing down a curved treetrunk.

The ship Saenger was partly a prepackaged scientific laboratory, partly a deep space probe, with sections devoted to smaller launching platforms, inflatable observatories, assembly shops. The ship Saenger had a present crew of eighteen working robots. It was an advance research station, sent unmanned to study this late-phase star. When it reached parking orbit, it sent messages back to its home world. In a year and a half, the first shipful of scientists and workers would come, finding the station set up and work underway.

The ship was mainly Saenger, a solid-state intelligence budded off the giant SSI on the Moon.

Several hours after it docked off the sun, Saenger knew it was going to die.

There was a neutron star some 34 light-years away from Saenger, and 53 light-years away from the earth. To look at it, you wouldn't think it was any more than a galactic garbage dump. All you could tell by listening to it was that it was noisy, full of X-rays, that it rotated, and that it interfered with everything up and down the wavelengths.

Everything except Snapshot.

Close in to the tiny roaring star, closer than a man could go, were a series of big chunks of metal that looked like solid debris.

They were arrays of titanium and crystal, vats of liquid nitrogen, shielding; deep inside were the real workings of Snapshot.

Snapshot was in the business of finding Ken wormholes in the froth of garbage given off by the star. Down at the Planck length, 10-35 cm, the things appeared, formed, reappeared, twisted, broke off like steam on hot rocks. At one end of the wormholes was Snapshot, and at the other was the Universe.

It sent messages from one end, its scanners punching through the bubbling mass of waves, and it kept track of what went where and who was talking to whom.

Snapshot's job was like that of a man trying to shoot into the hole of an invisible Swiss cheese that was turning on three axes at 3300 rpm. And it had to remember which holes it hit. And do it often.

There were a couple of Snapshots scattered within close range of Earth, and some further away. All these systems coordinated messages, allowed instantaneous communication across light-years.

All these communications devices made up Snapshot. Snapshot was one ten-millionth the function of Plato.

Plato was a solid crystal intelligence grown on the Moon, deep under the surface. The people who worked with Plato weren't exactly sure how he did things, but they were finding out every day. Plato came up with the right answers; he had devised Snapshot, he was giving man the stars a step or two at a time. He wasn't human, but he had been planned by humans so they could work with him.

"Plato, this is Saenger."

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"That's being sent. I have an emergency here that will cancel the project. Please notify the responsible parties."

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"I don't think so. I'll tell them myself."

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"I'll get back to you on that."

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"Holding."

XXXXXX PLATO TRANSFER SNAPSHOT re Saenger RUNNING

Doctor Maxell leaned back in her chair. The Snapshot printout was running and the visuals awaited her attention.

"Uchi," she said, "they'll have to scrub Saenger."

"I heard the bleep," said the slight man. He pulled off his glasses and rubbed his eyes. "Is Plato ready yet?"

"Let's see it together," she said. "It'll save time when we have to rerun it for the Committee."

They watched the figures, the graphics, the words. The printout ran into storage.

"Supernova," said Dr. Maxell.

"Well... first opportunity to see one close up."

"But there goes the manned part of the project. There goes Saenger."

"The Committee will have to decide what comes next."

"You want to tell them or should I?"

"Saenger, this is Dr. Maxell."

"Speaking."

No matter how many times she did it, Sondra never got used to speaking across light-years with no more delay than through an interoffice system.

"Saenger, the Committee has seen your reports and is scrubbing the remainder of your mission. The rest of your program will be modified. You're to record events in and around the star until such time as--your functions cease."

There was a slight pause.

"Would it be possible to send auxiliary equipment to allow me to leave this system before the star erupts?"

"I'm afraid not, Saenger. If the forces hold to your maximum predicated time, there's still no chance of getting a booster to you."

Saenger, like the other robot research stations, was a fusion ram. They used gigantic boosters to push them to ramming speed. The boosters, like shuttlecraft, were reusable and were piloted back to launching orbits. Saenger used its ram to move across vast distances and to slow down. Its ion motors were useful only for maneuvering and course corrections.

The reaction motors could not bring it to ramming speed.

The booster for its return journey was to be brought out on the first manned ship which would have come to Saenger.

The manned ship was not coming.

All this was implied in Doctor Maxell's words.

"Would I be of more use if I were to remain functioning throughout the event?"

"Certainly," she said. "But that's not possible. Check with Plato on the figures for the shock wave and your stress capabilities."

Slight pause.

"I see. But, it would be even better for scientific research if I survived the explosion of the star?"

"Of course. But there is nothing you can do. Please stand by for new programming."

There was another short silence, then:

"You will be checking on my progress, won't you?"

"Yes Saenger, we will."

"Then I shall do the best possible job of information-gathering for which I am equipped."

"You do that, Saenger. Please do that for us."

In Saenger's first messages, it told them what it saw. The spectroscopy, X-ray scans, ir, uv and neutrino grids told the same thing: the star was going

to explode.

Saenger reached an optimum figure of one year, two months and some days. The research ship checked with Plato. The crystal intelligence on the Moon told him to knock a few months off that.

Plato printed a scenario of the last stages of the 18-solar-mass star. He sent it to Doctor Maxell. It looked like this:

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START--016 CORE IGNITION HELIUM FLARE
OPT. TIME 12 DAYS
STAGE: 160 SHELL IGNITION
DURATION 2.37 DAYS,
CORE COOLING 160 BURNOFF
STAGE: SILICONE CORE IGNITION
DUR. 20 HOURS
STAGE: SILICONE CORE BURNING
DUR. 2.56 DAYS
STAGE: SILICONE SHELL IGNITION
DUR. 8 HOURS
STAGE: CORE CONTRACTION
DUR. 15 HOURS
STAGE: IRON CORE PHOTODISINTEGRATED
--CORE COLLAPSE DUR. 5 h 24 min 18 sec
SUPERNOVA no durational msmnt possible
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The same information was sent to Saenger. With the message from Plato that the first step of the scenario was less than eleven months away.

Saenger prepared himself for the coming explosion. It sent out small automatic probes to ring the star at various distances. One of them it sent on an outward orbit. It was to witness the destruction of Saenger before it, too, was vaporized by the unloosed energies of the star.

One of the problems they had working with Plato was that he was not human. So, then, neither were any of the other SSIs budded off Plato. Of which Saenger was one. Humans had made Plato, had guided it while it evolved its own brand of sentience.

They had done all they could to guide it along human thought patterns. But if it went off on some detour which brought results, no matter how alien the process, they left it to its own means.

It had once asked for some laboratory animals to test to destruction, and they had said no. Otherwise, they let Plato do as it pleased.

They gave a little, they took a little while the intelligence grew within its deep tunnels in the Moon. What they eventually got was the best mind man could ever hope to use, to harness for his own means.

And as Plato had been budded off the earlier, smaller Socrates, they were preparing a section of Plato for excision. It would be used for even grander schemes, larger things. Aristotle's pit was being excavated near Tycho.

That part of Plato concerned with such things was quizzical. It already knew it was developing larger capacities, and could tackle a few of the problems for which they would groom Aristotle. In a few years, it knew it might answer them all, long before the new mass had gained its full capacity.

But nobody asked it, so it didn't mention it.

Not maliciously, though. It had been raised that way.

Thousands of small buds had already been taken off Plato, put in stations throughout the solar system, used in colonization, formed into the Snapshot system, used for the brains of exploratory ships.

Saenger was one of those.

"Plato."

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"I have a problem."
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"What can I do? Besides that?"
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"Then what?"
- - - - - D = RT . x, x, <= - 1
"Do go on."
- - - - - C2; C2 -1/10 r SQR(t)

"Saenger is talking to Plato a lot, Sondra."
"A lot? How much is a lot?"

"I saw some discards yesterday, had Saenger's code on it. Thought they were from the regular run. But I came across the same thing this morning, before the Snapshot encoding. So it couldn't have been on regular transmission."

"And...?" asked Sondra.

"And I ran a capacity trace on it. Saenger used four ten-billionths of Plato's time this morning. And yesterday, a little less."

She drummed her fingers on the desk. "That's more than ten probes should have used, even on maintenance schedules. Maybe Plato is as interested as we are in supernovae?"

"What Saenger gave us was pretty complete. There's not much he could tell Plato he didn't tell us."

"Want to run it on playback?" asked Sondra.

"I'd rather you asked Saenger yourself," said the man. "Maybe they just exchanged information and went over capacity."

Sondra Maxell took off her earphones. "Uchi, do you think Saenger knows it's going to die?"

"Well, it knows what 'ceasing to function' is. Or has a general idea, anyway. I don't think it has the capacity to understand death. It has nothing to go by."

"But it's a reasoning being, like Plato. I..." She thought a moment.

"How many of Plato's buds have ceased to function?"

"Just the one, on the Centauri rig."

"And that was quick, sudden, totally unexpected?"

"The crew and the ship wiped out in a couple of nanoseconds. What...?"

"I think, Uchi, that this is the first time one of Plato's children knows it's going to die. And so does Plato."

"You mean it might be giving Saenger special attention, because of that?"

"Or Saenger might be demanding it."

Uchi was silent.

"This is going to be something to see," he said, finally.

"Saenger, what have you been talking to Plato about?"

"The mechanics of the shock wave and the flux within the star's loosened envelope. If you would like, I could printout everything we've discussed."

"That would take months, Saenger."

"No matter then, Dr. Maxwell. I have a question."

"Yes?"

"Could I move further away from this star? The resolution of my instruments won't be affected up to point 10.7 AU. I could station a probe in this orbit. I thought you might get a better view and data if I were further out."

Sondra was quiet. "Saenger," she said, "you know you can't possibly get away from the shock, no matter how far you move on your ion engines?"

"Yes, Doctor."

"And that you can't get to ramming speed, either?"

"Yes," said Saenger.

"Then why are you trying to move further away?"

"To give you a better view," said the ship. "Plato and I figured the further away the more chance of getting valuable information I would have. I could telemeter much more coordinated data through Snapshot. The new programming is not specific about the distance of the ship, only of the probes."

Sondra looked at Uchi. "We'll ask the Committee. I don't think there'll be any real objections. We'll get back to you ASAP."

"Saenger out."

Off that star was black, and the light was so bright on the sunward side that all Saenger's screens had to be filtered down to No. 3.

The sun still appeared as a red giant in the optics, burning brighter than when Saenger docked around it. But Saenger had other eyes that saw in other waves. His neutrino grids saw the round ball of the star and its photosphere, but deep inside it detected a glowing cone, growing larger and more open each day, rooted down inside the atmosphere of the sun. The helium flash was not far away.

Already Plato had revised his figures again. He had little more than seven months before the star blew like a cosmic steam boiler, giving men the first close look at an event they had not seen before.

The star would cover the whole sunward sky, its shell would expand, covering everything for millions of myriameters with the screaming remnants of its atmosphere.

Saenger had no margin of safety.

He did not have time, or the proper materials, or anything.

He was monitoring himself and his worker robots as he moved outward on his reaction engines. He had swung out of the orbit as soon as the Committee had given permission.

His robots moved in and out through the airlocks and the open sides of the ship.

One of them, using a cutting laser, sawed through its leg and went whirling away on a puff of soundless force. These robot were never made to work outside the ship.

If Saenger could have, he would have said the word damn.

"Plato?"

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"There's not enough material in the ship unless I cannibalize my shielding."

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"But that would defeat the whole purpose."

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"How could I?"

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"Hey! Why didn't I think of that!"

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"But they'll know as soon as I do."

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"Well..."

"Now he's using his scoops," said Sondra as she monitored the Snapshot encoding for the day. "What in the hell is going on out there?"

"It's not interfering with the monitoring programs. He's sent out two more remote monitors. And the activity down there is picking up."

"He's backed off on his use of Plato. Way below normal, in fact. Do you think we ought to have him dump his grids now?" she asked;

"You're the boss," said Uchi. "I'd get as much information as we could first. He may find something in those last three minutes we don't know about."

"Has Plato contacted him?" asked Sondra. "Hmmm. Not lately."

"He's cut him loose," she said. "He's on his own."

Saenger was fighting now, with every passing moment. The ship was unrecognizable. The revamp Plato suggested changed the ship completely. Spidery arrays went out and out from the skeleton, and among them the robots worked.

Stars shone through frames which had once held thick shielding. Laboratories, quarters, all were emptied and dismantled. The frames themselves were being shaved away with improvised lasers until they were light and thin as bird's bones. The ship was little more than a shell around the solid-state intelligence and the fusion ram.

Saenger was using the magnetic scoops at the moment. He sucked in the loose hydrogen atmosphere which bathed the star system. The giant coils began to hum, and as they did Saenger lost some of his capacity, like a man too long under water. Part of his shielding was to protect him from the effects of the coils, and now that plating was gone. He was taking in hydrogen, compressing it, turning it to liquid hydrogen which would shield him from most of the harmful radiations.

Soon, though, he would remove the plates which shielded him from the growing bath of X-rays, photons and other stellar garbage. He was not sure, as he told Plato, that he could remain for long in that acid shower.

Saenger pulled a sufficient quantity of hydrogen in, turned off the coils. He let two robots carry off another layer of insulation.

Saenger was like a dazed man on a battlefield, too long without rest. And the real war had not even started.

Plato was more nearly right.

Three days before the predicted time, the star entered its supernova scenario.

The Director was down in the Banks, with most of the Committee and other interested spectators. Uchi and Dr. Maxwell sat at their usual places before the Snapshot consoles.

"Really too bad," the Director was saying. "Research project like that scratched; about to lose one of our shipboard SSIs. But it'll give us a good look at what happens when a star dies."

They were scanning Snapshot for full visuals, X-ray, infrared, ultraviolet, radio. This would be the most closely watched star event ever, and they were running it all into Plato's permanent storage section where even he could not erase it.

If he had thought to try.

"How do you want to handle the monitors, Saenger?"

"I'll keep on the innermost probes until they are overtaken, then transfer to the outermost. Then back, and I'll hold as long as I can. Then you ought to have a few minutes on the farthest remote before it goes."

"Good enough. Please monitor readings until the shock wave hits. We'll listen in when we're not too busy."

"Certainly."

"Oops!" someone said. "There is goes."

It's hard to imagine a star shaking itself to pieces, but they saw it up close for the first time, then. One second the star seemed fine, if a little bright, then it darkened and the whole surface lifted like a trampoline top.

This from the closest of the probes, one million eight hundred thousand myriametets out. The limb of the star they were watching grew and grew and filled the screen and....

They were watching the sun expand from the second remote, two million two hundred sixty-eight thousand myriameters away, on the opposite side of the star. The sun filled that screen too, and the screen went blank before the shock front reached it and....

"Shockwave, pulling a little ahead of the gases," said a technician.

"Forty-seven point two seconds to the first. Seven-seven point seven to the second. About a tenth light-speed for the gases," said Uchi.

The information sped from Saenger through Snapshot to Plato. Records, stacks of tape, videoprints, all rolled into the permanent storage units on the Moon. They watched the star kill itself with its own light and heat.

The pickup switched to the furthest probe, orbiting almost two AU from the star. For the first time, they saw the whole sun, and it grew and grew even as they watched. It was immense, the lenses kept filtering down and down and still they could not keep the sensors from burning out. Lenses rotated in to replace others, and the thing covered fully a third of the heavens even this far away.

And it got bigger.

"He's supposed to switch back," said the Director. "Isn't he?"

"Do you think it already hit him?" asked one of the spectators.

"Couldn't," said Uchi. "We haven't gotten his information dump through Snapshot yet."

Then he looked at Sondra.

"He can't hold it on us, can he?"

"No," she said. "It's in the program."

But she bit her nails anyway.

Uchi timed the expansion. "It should have gotten him now! Why didn't he dump? Is he still on?"

Sondra feared to look but she did. Two inputs still through Snapshot. The outer probe and...

They looked at the screen. The supernova appeared as a rolling unfolding bunch of dirty sheets, and the center grew whiter with each ripple shaken loose.

It covered half the screen, then two-thirds, then three quarters.

"The shock must be almost to the probe," said the Director.

"What happened to Saenger?" asked Sondra of Uchi. "Where is he?"

"Look!"

They all did.

The whiteness of the star filled the screen and there was a marbled spot through which the glowing central core could be seen. The star must have lost a tenth its mass. The widening sphere of white-hot gases and debris whipped toward the probe.

And in front of it came something that looked like an old sink stopper.

Closer it came, and they saw it rode just before the shock wave, that the huge round thing caused swirls in the envelope of gases much like tension on a bubble of soap.

On it came, closer, and larger, the gases behind it moving perceptibly, quickly, toward the lens of the outermost probe.

"Saenger!" yelled Uchi, and Sondra joined him, and they all began to yea and cheer in the control room. "He built an ablation shield. He's riding that goddamn shock wave! Somehow, somewhere he got the stuff to make it! My God. What a ship, oh what a ship!"

And Saenger had the lens zoom in then, and they saw the skeletal framework, the spiderweb of metal and shielding and plastic and burnt pieces of rock, ore and robot parts which made it up.

Then the ship flashed by and the screen melted away as the gases hit the probe.

"Doctor Maxell..." came Saenger's voice. It was changed, and the phase kept slipping as he talked.

"Yes, Saenger? Yes?"

"Permission to abbbboort--tt--abort program and return to earth docking orbit. Almost at ram speed--zgichzzggzichh--at ram speed now."

"Yes, Saenger! Yes, Yes!"

"Ram functioning. Doctor Maxell?"

"What?"

"I want to come home now. I'm very tired."

"You will, you can," she said.

The screen changed to an aft view from Saenger. The white, growing

sphere of the burnt star was being left slowly behind. The slight wispy contrail from the ship's ram blurred part of the screen, the gas envelope the rest.

"I've lost some of myself," said Saenger.

"It doesn't matter, it doesn't matter."

She was crying.

"Everything will be all right," she said.