Celestial Debris

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Ron checked the safety line again as he drifted smoothly along, a few centimeters from the black metal surface. Stars hung almost motionless on all sides while the metal slid swiftly beneath him.

“I wish you would use your magnetic boots,” a little voice whispered in his head—the voice of the artificial intelligence he called Joey, the computer that was his constant companion, and sometimes his guardian.

“Aw, Joey, they’re so slow!” Ron muttered. He resented Joey’s intrusion; gliding was fun, and it didn’t hurt anyone. It wasn’t as if he were playing one of his practical jokes or anything.

“But walking is much safer, and it’s good exercise,” Joey insisted.

“Gliding out is perfectly safe,” Ron replied. “I’ve checked the line a million times.”

“You’ve checked your end.”

Ron started to reply to that, then stopped, his attention focused on a structure ahead, a large framework of piping bolted to the black metal. He was approaching the framework rapidly. He grinned. “All right, Joey,” he said, “I’ve checked my end. Maybe I’ll walk next time. Right now, though, it’s too late; I’m here.”

He straightened his legs, and simultaneously reached out for the framework. His gauntleted hand closed on a pipe, bringing his glide to an abrupt halt; he swung himself around, and the magnetized soles of his heavy boots clapped onto the metal of the colony’s exterior, eerily silent in the vacuum of space. He straightened up, perpendicular to the surface, as if he were standing on it, braced by the hand on the framework.

It did not feel as if he were standing. The colony’s spin at this point on its surface was equivalent to about a quarter of a G in the direction he had been gliding, and that meant he was hanging horizontally, face down, supported by his boots and one hand. He wasn’t standing upright, no matter how it might have appeared. He was looking down through one corner of the framework into the infinite depths of empty space, with nothing below him but stars.

He was on the dark side of the colony’s primary mirror, at the outer end of the great cylinder; the mirror shielded him from the glare and radiation that the sun poured out, but he could see a narrow black sliver of Earth sliding along the rim as the colony rotated, the cities on Earth’s night side a sprinkling of golden sparks.

He watched for a moment, enjoying the view. Joey reminded him, “You have only forty minutes of oxygen left.”

“Oh, yeah.” Joey was useful for such reminders, Ron thought. He didn’t even really mind when Joey ruined some gag or other; that had probably kept him out of a lot of trouble. The constant nagging about all the little stuff was tiresome, though, and when he turned sixteen one of the first things Ron intended to do was have Joey reprogrammed to eliminate all the unnecessary fussbudgeting.

But for now, for the next three months, he had to put up with it. Having a computer hook-up inside his skull was great; having to get his parents’ approval for all its programming was a pain.

He pulled his boots free and swung “down “ alongside the framework of his science fair project.

This tangle of old pipes that he had dragged out here, assembled, and mounted to the back of the mirror held the components of the project he was sure would win him the Heinlein Medal at this year’s fair. He looked them over carefully.

The sensor band was still there, looped around one entire side of the structure, and the little read-out at the near corner showed green. Joey agreed, “Everything is working.”

The recorder also showed green, and Joey told him, “You have forty-eight hours, sixteen minutes, and thirty-five seconds of uninterrupted data flow on record, no downtime reported.”

A glance at the clock read-out on the upper corner of his faceplate told him that was exactly right. He nodded to himself.

The third, and most essential component was also there: the huge, tapering sack that was supposed to catch anything that came through the sensor ring, but it did not look right. It bulged oddly at the narrow end.

Ron frowned.

His experiment was designed to collect celestial debris from the space around the colony—space garbage, cosmic junk. Space was full of dust, micrometeorites, and stray bits of this and that; he had set up his frame and giant trashbag to take advantage of the colony’s spin in gathering samples of the sort of junk that constantly bombarded anything in Earth’s orbit. Once he had his sample, and the data from the sensors on how fast the largest pieces came in, and at what angle, he had intended to analyze it all and determine how much fell into each of various categories.

In theory, he should have a few particles from the Moon, considerably more from Earth, several from elsewhere in the solar system, and some even from outside the system entirely. He could determine how much was put there by people, and how much by the rest of nature, and see how much truth there was to the accusations that humanity was cluttering up Earth’s neighborhood with garbage. He could extrapolate just how much of what was really out there, what the chances were of eventual damage to the colony from celestial debris—oh, it would be a great entry! The judges should be very impressed.

Except that now he suspected something had gone wrong. The bulge in the collecting bag was much bigger than it should have been; forty-eight hours of normal dust accumulation shouldn’t amount to more than the mass of his little finger, according to his estimates.

He must have caught something considerably larger than a micrometeorite. That was a million-to-one chance—maybe a billion to one—but it looked as if it had happened.

Moving carefully, he unhooked the bag from the framework and closed it up. If he tried to look in it out here, he knew that he would probably lose half his samples, send them spinning back off into space; even if the experiment had been ruined, he did not want to do that, not after all the work he had put into collecting them.

When he had the bag closed, he unclipped the data recorder and stuck its velcro backing to one of the strips on his pressure suit. Then he turned and kicked off from the nearest pipe, launching himself back toward the entryport before Joey could protest, with the collecting bag trailing along for several meters behind him.

“I really do wish you would walk,” the internal computer link said.

He ignored it this time; he was too busy trying to imagine what could have happened to make that bulge in the sack.

Once he was in the airlock, instead of cycling the pumps, he fastened the mouth of the bag to the mouth of an airtight storage jar he had prepared, and then carefully poured the bag’s contents into the jar.

Through the clear glass of the jar he saw a sprinkle of powder trickle in, and then a misshapen pale mass, perhaps twenty centimeters long. That was obviously what had caused the bulge.

He finished emptying the bag, closed the jar, and then lifted it up to look at the object.

It was only then that he recognized it.

It was a human hand.

He almost shrieked, but stopped himself in time, and stared in horrified astonishment.

“Joey,” he said, “look at that!”

“I see it, Ron,” Joey replied.

He wasn’t hallucinating, then, if Joey saw it, too.

It was a man’s hand, frozen solid, bloodlessly pale. The stump end was not cut or chewed, but had broken off jaggedly, like a chunk of glass.

Ron knew what that meant. Someone had exposed his hand to the hard vacuum of space, and it had frozen, frozen so hard that when the man bumped it against something it had snapped right off.

And then it had gone drifting through space until his collection bag had caught it.

“Oh, weird! It could have been out there for years!” he said.

“That’s true,” Joey said, “but I don’t have any record of anyone having lost a hand in space that way, in all of recorded history, right back to the first Soviet and American flights.”

“So maybe it just happened.”

“I think this should be reported to the authorities immediately.”

“Yeah,” Ron agreed, staring at the jar.

“You have only ten minutes of oxygen left,” Joey reminded him.

“Oh,” Ron said. He reached for the panel and started the airlock pumps.

A few minutes later, still wearing his pressure suit but with the helmet tucked under one arm and his sample jar tucked under the other, Ron ducked into the first public vid booth he saw, just off the main corridor outside the airlock.

His science project would have to wait; this catch was more important.

He knew who to call; his father was on the docking port staff. He would know what to do. Ron punched in his father’s code.

Instantly, the screen lit and displayed the message, “Call Rejected.”

Startled, Ron stared at that for a moment, then typed the 999 code for an emergency override and hit the “Redial” button.

His father’s face appeared on the screen, frowning mightily.

“Ron,” he said, “I don’t have any time to spare right now; we’ve got a man missing. This had better be serious—and unless it’s damned serious, you had better sign off right now.”

“It is serious, Dad!” Ron said, holding up his specimen jar. “Look what I caught.”

His father blinked, and then the frown grew even more ferocious.

“It’s a little early for Hallowe’en,” he said angrily.

Then he cut the connection.

“No, Dad, it’s...” Ron began. Then he saw the screen go blank.

“Real,” he finished weakly, his shoulders slumping.

He sat there for a moment, then hit “Redial “ again.

The call went through, but before Ron could say a word, his father growled, “I am tired of your jokes, Ron, and I am not going along with this one. You can show me your new toy later; maybe your friends will be impressed, but I’m not. I’ve seen fake hands before. I’m cutting off your override access for the rest of the day.”

The connection broke again.

Ron stared at the blank screen for a moment, then asked, “Now what?”

“I can’t answer that,” Joey replied.

Ron looked at the jar. “It is real, isn’t it?”

“I think so, but I’m not sure of it.”

“You won’t tell Dad it’s real? Couldn’t you make him listen?”

“As a companion computer, I’m not supposed to override personal communications unless there’s imminent injury to a human being.”

“But Dad’s not going to accept another call from me, is he?”

“It doesn’t seem likely,” Joey agreed. “At least, not for the duration of the emergency.”

“Then I have to report it to someone else! This hand must have come from that missing man—he’s still out there somewhere, and if he’s still alive he’s gotta be in bad shape. You tell someone, Joey—isn’t this a case of imminent injury?”

“I am afraid I can’t justify that,” Joey said. “It doesn’t seem likely that the person who lost this hand could still be alive, as the hand has obviously suffered the effects of exposure to vacuum. Human beings can’t survive more than about one minute in hard vacuum.”

“Yeah,” Ron said, “but if he sealed off his suit—I mean, suits always have seals, so you can shut off any part that gets punctured. Like a tourniquet. In case there’s an accident. He must have sealed off his hand, and that’s how it got frozen and broke off.”

“There is no evidence that the person who lost the hand you recovered was wearing a spacesuit.”

Ron blinked. “Oh, but he’d have to be. How else could it have happened? I mean, if he were... if a ship got wrecked, the hand wouldn’t have snapped off, would it? And there’d be other wreckage; it’d be easy to find. And Dad didn’t say he had a missing ship, he said he had a missing man.” He looked at the blank vidscreen, and asked, “Hey, Joey—can you tell me anything about this missing person?”

“I’ll contact the colony databanks,” Joey said.

Ron waited for perhaps two seconds before Joey continued, “The man who failed to report in on schedule is Engineer Third Class Yuri Korzhenevski. He was doing satellite repair work from a one-man scooter when communication was lost. His vehicle has been recovered; it was apparently damaged by a collision with a detached fragment of the satellite Korzhenevski was assigned to repair. Korzhenevski was not aboard the scooter.”

“Well, then of course he was in a suit!” Ron pointed out. “You can’t work from a scooter without one.”

The “scooters” the people of the space colonies used for short excursions were little more than platforms with attached reaction motors and communications equipment, and with assorted tie-downs for whatever equipment might be needed. They were not true ships at all, and had no life support systems; the pilots made do with spacesuits.

“Korzhenevski was wearing a spacesuit,” Joey agreed—but it stopped there.

Ron let out an exasperated sigh. Joey was refusing to admit that the hand had to have come from Korzhenevski—who else could it be from?

But what had happened, then?

Ron tried to puzzle it out.

The chunk of satellite must have knocked Korzhenevski off his scooter, and for some reason he hadn’t been properly tethered—otherwise he would have been able to just pull himself back.

So there he’d be, adrift in space, moving steadily away from his scooter—there wasn’t anything to slow him down out there, and he and his vehicle would continue to move away from each other with exactly the velocity they’d had at the moment he lost contact with the scooter.

But he’d be nice and secure in his suit, with hours of oxygen, and people would come looking for him as soon as he was late reporting in. The suit radio wasn’t powerful enough to reach more than a couple of kilometers, so he couldn’t call for help, but all he had to do was wait until he was missed.

So how could Korzhenevski have lost a hand?

He must have taken off his glove—but why? Even if it were torn, there’d be no reason to take it off. He could seal off the cuff without taking off the glove.

He must have been trying to do something, but Ron didn’t see what it could have been. Why would he not just drift and wait for rescue?

Maybe he didn’t dare wait for rescue. Maybe he couldn’t afford the time. If his suit had an air leak...

No, he’d hardly take off a glove if the problem was a shortage of air.

What else could have been so dangerous that Korzhenevski would have done something so desperate?

And how could he still be missing with everyone searching for him?

“Oh,” Ron said, realization dawning.

The suit would protect a man from everything out in space—that was what it was for.

Everything except falling out of space.

Korzhenevski must have fallen off the scooter straight toward Earth; nothing else made sense. That meant a short fall, and then burning up in the atmosphere.

That would make it very difficult to calmly wait for rescue. Korzhenevski had probably panicked, and started doing anything he could to slow or turn his fall.

And everyone who lived up here in orbit knew how to maneuver in space. Newton’s Laws: For every action, there is an equal and opposite reaction. If you want to go in one direction, you throw or spray something in exactly the opposite direction.

So Korzhenevski would have tried throwing things, either to slow his fall, or to turn himself aside in hopes of falling into an orbit where he might survive long enough to be rescued.

And when he ran out of other things, and got desperate enough, he must have thrown his glove.

And he must have been on Earth’s night side, for his hand to freeze like that. All the moisture would have boiled away into vacuum, carrying heat with it, but if he’d been in sunlight it wouldn’t have frozen so completely, would it?

Ron wasn’t sure, actually, but it sounded right.

He wondered what it would have felt like, and just what would have happened. It must have been really horrible.

But he didn’t know what it would be like, and that didn’t have anything to do with figuring out what had happened to the missing man. He tried to concentrate on that, instead.

Throwing things would have changed Korzhenevski’s trajectory—that might be why the authorities were having a hard time locating him.

He couldn’t have been doing much more throwing after losing his hand, though.

Ron realized he probably knew more than anyone else about what had happened to Korzhenevski, and it was urgent, even more urgent than Ron’s father thought—they didn’t just have to find him before he ran out of air, but before he fell into the atmosphere.

But who could Ron tell?

His father wouldn’t listen to him, and he didn’t know who else to call, but Joey might.

“Joey?” Ron asked.

“Yes?”

“I think I know what happened to Korzhenevski.” He quickly explained his theory.

When he had finished, Joey admitted, “This seems reasonable.”

“Could you tell someone, then? They won’t listen to me.”

“I can inform the colony’s central computer of your hypothesis,” Joey said.

“Do it, please.”

Joey did.

And then Ron didn’t know what to do next. He’d been planning to work on his science project, but somehow couldn’t bring himself to worry about that.

Besides, it was all messed up by Korzhenevski’s hand. That would throw off all the figures if he included it, and how could he ignore it? He couldn’t just take it out of the jar and pretend it had never been there; some of the particles would probably cling to it.

And besides, how could he concentrate on a science project when Korzhenevski was out there somewhere, maybe on his way to burning up?

He sat in the vidbooth for a moment, trying to think of something more he could do to help.

He was still sitting there when the screen lit up.

“Ron Kelly?” a woman’s voice asked. “We understand you may have information regarding a missing person.”

“Yes!” Ron said, eager to explain.

Five minutes later, following instructions, Ron handed his sample jar over to a technician in the colony’s analytical laboratory.

The technician forced a smile and thanked him, and Ron said, “You might want this, too.” He held out the data recorder.

“What is it?” she asked.

“It’s got the record of when the...when that hit the collector, and what direction it came from, and how fast it was traveling,” he explained.

“Oh,” she said. She accepted the recorder, handling it carefully, and looked at him with a little more respect. “Thank you,” she said. “That should help considerably.”

Then she went away. The adults had taken over, and there was nothing Ron could do but wait. He took off his pressure suit, put it away in its locker, and then puzzled over what to do next.

He couldn’t work on his science project now even if he had wanted to—he’d just given away his sample jar and data record, and he couldn’t do anything on the project until he got them back.

And he’d have to find some way to compensate for that hand before he could do anything on the project, anyway.

He knew he should go home and find something else to do, but he couldn’t bring himself to leave; instead he settled into a waiting room near the dock.

It seemed like hours later that he felt the vibration that meant a shuttle was leaving the colony, but when he glanced at a clock read-out he saw that it was scarcely thirty minutes since he had first seen that frozen hand, there in the airlock. No shuttle was scheduled for departure then; he would never have ventured out on the mirror that close to a scheduled launch.

“What’s happening, Joey?” he asked.

“The genetic structure of the hand you found has been matched against the central files,” Joey told him. “It matches the records of Engineer Third Class Yuri Korzhenevski. The approach vector of the hand has been charted, and projected back to an approximate intersection with a possible vector for Korzhenevski after his separation from his scooter. A shuttle will now search the area of that intersection.”

“Do you think they’ll find him?” Ron asked.

“I don’t know,” Joey said.

The computer paused for a moment then suggested, “Perhaps you should go home now.”

Ron looked around at the empty waiting room, and at the closed and sealed doors of the docking and reception areas, and agreed. “Yeah,” he said. “You’re right.”

He was at home, lying in his own bed and doing homework over the terminal in his skull, when the first news came. Joey tagged it for him and played it back.

“In a dramatic deep-space rescue, a team from Alvarez Colony found and brought back Yuri Korzhenevski, an engineer whose scooter, fouled by celestial debris, had gone out of control,” an announcer said. “Korzhenevski’s location was determined with the aid of a young colony citizen, whose identity has not been revealed, whose science project intercepted a fragment lost by Korzhenevski during an attempt at orbital maneuvering. Korzhenevski’s condition is reported to be critical, and no estimates are being released of his chances for survival.”

“But he was alive?” Ron asked.

“Apparently,” Joey said.

Ron smiled at that, a big, broad smile. He might have saved a man’s life. Of course, he was way behind schedule on the science project now, but it was worth it to have helped with something like this.

At dinner that evening his parents congratulated him on his part in the rescue.

“I’m sorry I cut you off,” his father said.

“That’s okay,” Ron said. “You were busy and upset.”

His father cleared his throat and changed the subject. “It looks like Korzhenevski will live,” he said. “And they’ll grow him a new hand; the original was too badly damaged to reattach.”

Ron nodded; he was pleased to hear that.

And with Korzhenevski’s future out of the way, Ron considered his own.

“What did they do with my micrometeorites from the sample jar?” he asked. “Can I get them back?”

There was a moment of silence, and then his father said, “I don’t know, and that’s a good question. I’ll check. Excuse me.” He stood up and left the table.

Ron heard him punching keys, and then talking quietly to someone. A moment later he returned and said, “I’m sorry, Ron, but they didn’t know there was anything else in the jar; it was emptied, cleaned, and sterilized after they took the hand out.”

“Oh,” Ron said.

That was a blow. It was all very well to have saved a man’s life, and he wouldn’t have changed anything if he could have, but with those samples gone, so was his entire science fair project; there wasn’t time to do it over.

And he had been bragging to his friends about what a great project he had!

Well, maybe he could come up with another one, one he could do quickly...

An idea struck him—a wonderful, brilliant idea, a way to keep his original project from going completely to waste. It was something no one else had ever done, he was sure.

But it might not be an idea he could use.

“Say, Dad,” he said, “you said they’re growing Mr. Korzhenevski a new hand?”

“That’s right.”

“What are they going to do with the old one?”

His mother coughed, and said, “Ron! What kind of a question is that?” She looked shocked.

“Well,” he explained, “since my micrometeorite project is ruined, I was wondering about doing my science fair project on the effects of hard vacuum on soft tissue...”