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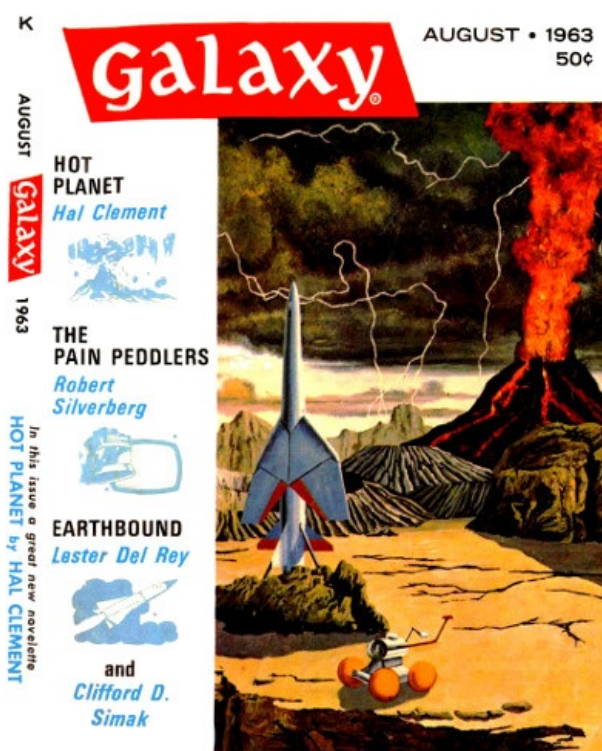
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*** START OF THE PROJECT GUTENBERG EBOOK HOT PLANET ***



HOT PLANET

By HAL CLEMENT

Illustrated by FINLAY

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Mercury had no atmosphere—everyone knew that. Why was it developing one now?

I

The wind which had nearly turned the *Albireo's* landing into a disaster instead of a mathematical exercise was still playing tunes about the fins and landing legs as Schlossberg made his way down to Deck Five.

The noise didn't bother him particularly, though the endless seismic tremors made him dislike the ladders. But just now he was able to ignore both. He was curious—though not hopeful.

"Is there anything at all obvious on the last sets of tapes, Joe?"

Mardikian, the geophysicist, shrugged. "Just what you'd expect ... on a planet which has at least one quake in each fifty-mile-square area every five minutes. You know yourself we had a nice seismic program set up, but when we touched down we found we couldn't carry it out. We've done our best with the natural tremors—incidentally stealing most of the record tapes the other projects would have used. We have a lot of nice information for the computers back home; but it will take all of them to make any sense out of it."

Schlossberg nodded; the words had not been necessary. His astronomical program had been one of those sabotaged by the transfer of tapes to the seismic survey.

"I just hoped," he said. "We each have an idea why Mercury developed an atmosphere during the last few decades, but I guess the high school kids on Earth will know whether it's right before we do. I'm resigned to living in a chess-type universe—few and simple rules, but infinite combinations of them. But it would be nice to know an answer sometime."

"So it would. As a matter of fact, I need to know a couple right now. From you. How close to finished are the other programs—or what's left of them?"

"I'm all set," replied Schlossberg. "I have a couple of instruments still monitoring the sun just in case, but everything in the revised program is on tape."

"Good. Tom, any use asking you?"

The biologist grimaced. "I've been shown two hundred and sixteen different samples of rock and dust. I have examined in detail twelve crystal growths which looked vaguely like vegetation. Nothing was alive or contained living things by any standards I could conscientiously set."

Mardikian's gesture might have meant sympathy.

"Camille?"

"I may as well stop now as any time. I'll never be through. Tape didn't make much difference to me, but I wish I knew what weight of specimens I could take home."

"Eileen?" Mardikian's glance at the stratigrapher took the place of the actual question.

"Cam speaks for me, except that I could have used any more tape you could have spared. What I have is gone."

"All right, that leaves me, the tape-thief. The last spools are in the seismographs now, and will start running out in seventeen hours. The tractors will start out on their last rounds in sixteen, and should be back in roughly a week. Will, does that give you enough to figure the weights we rockhounds can have on the return trip?"

The *Albireo's* captain nodded. "Close enough. There really hasn't been much question since it became evident we'd find nothing for the mass tanks here. I'll have a really precise check in an hour, but I can tell right now that you have about one and a half metric tons to split up among the three of you.

"Ideal departure time is three hundred ten hours away, as you all know. We can stay here until then, or go into a parking-and-survey orbit at almost any time before then. You have all the survey you need, I should think, from the other time. But suit yourselves."

"I'd just as soon be space-sick as seasick," remarked Camille Burkett. "I still hate to think that the entire planet is as shivery as the spot we picked."

Willard Rowson smiled. "You researchers told me where to land after ten days in orbit mapping this rockball. I set you just where you asked. If you'd found even five tons of juice we could use in the reaction tanks I could still take you to another one—if you could agree which one. I hate to say 'Don't blame me,' but I can't think of anything else that fits."

"So we sit until the last of the tractors is back with the precious seismo tapes, playing battleship while our back teeth are being shaken out by earthquakes—excuse the word. What a thrill!"

Glorious adventure!" Zaino, the communications specialist who had been out of a job almost constantly since the landing, spoke sourly. The captain was the only one who saw fit to answer.

"If you want adventure, you made a mistake exploring space. The only space adventures I've heard of are second-hand stories built on guesswork; the people who really had them weren't around to tell about it. Unless Dr. Marini discovers a set of Mercurian monsters at the last minute and they invade the ship or cut off one of the tractors, I'm afraid you'll have to do without adventures." Zaino grimaced.

"That sounds funny coming from a spaceman, Captain. I didn't really mean adventure, though; all I want is something to do besides betting whether the next quake will come in one minute or five. I haven't even had to fix a suit-radio since we touched down. How about my going out with one of the tractors on this last trip, at least?"

"It's all right with me," replied Rowson, "but Dr. Mardikian runs the professional part of this operation. I require that Spurr, Trackman, Hargedon and Aiello go as drivers, since without them even a minor mechanical problem would be more than an adventure. As I recall it, Dr. Harmon, Dr. Schlossberg, Dr. Marini and Dr. Mardikian are scheduled to go; but if any one of them is willing to let you take his or her place, I certainly don't mind."

The radioman looked around hopefully. The geologists and the biologist shook their heads negatively, firmly and unanimously; but the astronomer pondered for a moment. Zaino watched tensely.

"It may be all right," Schlossberg said at last. "What I want to get is a set of wind, gas pressure, gas temperature and gas composition measures around the route. I didn't expect to be more meteorologist than astronomer when we left Earth, and didn't have exactly the right equipment. Hargedon and Aiello helped me improvise some, and this is the first chance to use it on Darkside. If you can learn what has to be done with it before starting time, though, you are welcome to my place."

The communicator got to his feet fast enough to leave the deck in Mercury's feeble gravity.

"Lead me to it, Doc. I guess I can learn to read a home-made weathervane!"

"Is that merely bragging, or a challenge?" drawled a voice which had not previously joined the discussion. Zaino flushed a bit.

"Sorry, Luigi," he said hastily. "I didn't mean it just that way. But I still think I can run the stuff."

"Likely enough," Aiello replied. "Remember though, it wasn't made just for talking into." Schlossberg, now on his feet, cut in quickly.

"Come on, Arnie. We'll have to suit up to see the equipment; it's outside."

He shepherded the radioman to the hatch at one side of the deck and shooed him down toward the engine and air lock levels. Both were silent for some moments; but safely out of earshot of Deck Five the younger man looked up and spoke.

"You needn't push, Doc. I wasn't going to make anything of it. Luigi was right, and I asked for it." The astronomer slowed a bit in his descent.

"I wasn't really worried," he replied, "but we have several months yet before we can get away from each other, and I don't like talk that could set up grudges. Matter of fact, I'm even a little uneasy about having the girls along, though I'm no misogynist."

"Girls? They're not—"

"There goes your foot again. Even Harmon is about ten years older than you, I suppose. But they're girls to me. What's more important, they no doubt think of themselves as girls."

"Even Dr. Burkett? That is—I mean—"

"Even Dr. Burkett. Here, get into your suit. And maybe you'd better take out the mike. It'll be enough if you can listen for the next hour or two." Zaino made no answer, suspecting with some justice that anything he said would be wrong.

Each made final checks on the other's suit; then they descended one more level to the airlock. This occupied part of the same deck as the fusion plants, below the wings and reaction mass tanks but above the main engine. Its outer door was just barely big enough to admit a spacesuited person. Even with the low air pressure carried by spaceships, a large door area meant large total force on jamb, hinges and locks. It opened onto a small balcony from which a ladder led to the ground. The two men paused on the balcony to look over the landscape.

This hadn't changed noticeably since the last time either had been out, though there might have been some small difference in the volcanic cones a couple of miles away to the northeast. The furrows down the sides of these, which looked as though they had been cut by water but were actually bone-dry ash slides, were always undergoing alteration as gas from below kept blowing fresh scoria fragments out of the craters.

The spines—steep, jagged fragments of rock which thrust upward from the plain beyond and to both sides of the cones—seemed dead as ever.

The level surface between the *Albireo* and the cones was more interesting. Mardikian and Schlossberg believed it to be a lava sheet dating from early in Mercury's history, when more volatile substances still existed in the surface rocks to cut down their viscosity when molten. They supposed that much—perhaps most—of the surface around the "twilight" belt had been flooded by this very liquid lava, which had cooled to a smoother surface than most Earthly lava flows.

How long it had stayed cool they didn't guess. But both men felt sure that Mercury must have periodic upheavals as heat accumulated inside it—heat coming not from radioactivity but from tidal energy. Mercury's orbit is highly eccentric. At perihelion, tidal force tries to pull it apart along the planet-to-sun line, while at aphelion the tidal force is less and the little world's own gravity tries to bring it back to a spherical shape. The real change in form is not great, but a large force working through even a small amount of distance can mean a good deal of energy.

If the energy can't leak out—and Mercury's rocks conduct heat no better than those of Earth—the temperature must rise.

Sooner or later, the men argued, deeply buried rock must fuse to magma. Its liquefaction would let the bulk of the planet give farther under tidal stress, so heat would be generated even faster. Eventually a girdle of magma would have to form far below the crust all around the twilight strip, where the tidal strain would be greatest. Sooner or later this would melt its way to the surface, giving the zone a period of intense volcanic activity and, incidentally, giving the planet a temporary atmosphere.

The idea was reasonable. It had, the astronomer admitted, been suggested long before to account for supposed vulcanism on the moon. It justified the careful examination that Schlossberg and Zaino gave the plain before they descended the ladder; for it made reasonable the occasional changes which were observed to occur in the pattern of cracks weaving over its surface.

No one was certain just how permanent the local surface was—though no one could really justify feeling safer on board the *Albireo* than outside on the lava. If anything really drastic happened, the ship would be no protection.

The sun, hanging just above the horizon slightly to the watcher's right, cast long shadows which made the cracks stand out clearly; as far as either man could see, nothing had changed recently. They descended the ladder carefully—even the best designed spacesuits are somewhat vulnerable—and made their way to the spot where the tractors were parked.

A sheet-metal fence a dozen feet high and four times as long provided shade, which was more than a luxury this close to the sun. The tractors were parked in this shadow, and beside and between them were piles of equipment and specimens. The apparatus Schlossberg had devised was beside the tractor at the north end of the line, just inside the shaded area.

It was still just inside the shade when they finished, four hours later. Hargedon had joined them during the final hour and helped pack the equipment in the tractor he was to drive. Zaino had had no trouble in learning to make the observations Schlossberg wanted, and the youngster was almost unbearably cocky. Schlossberg hoped, as they returned to the *Albireo*, that no one would murder the communications expert in the next twelve hours. There would be nothing to worry about after the trip started; Hargedon was quite able to keep anyone in his place without being nasty about it. If Zaino had been going with Aiello or Harmon—but he wasn't, and it was pointless to dream up trouble.

And no trouble developed all by itself.

II

Zaino was not only still alive but still reasonably popular when the first of the tractors set out, carrying Eileen Harmon and Eric Trackman, the *Albireo's* nuclear engineer.

It started more than an hour before the others, since the stratigrapher's drilling program, "done" or not, took extra time. The tractor hummed off to the south, since both Darkside routes required a long detour to pass the chasm to the west. Routes had been worked out from the stereo-photos taken during the orbital survey. Even Darkside had been covered fairly well with Uniquantum film under Venus light.

The Harmon-Trackman vehicle was well out of sight when Mardikian and Aiello started out on one of the Brightside routes, and a few minutes later Marini set out on the other with the spacesuit technician, Mary Spurr, driving.

Both vehicles disappeared quickly into a valley to the northeast, between the ash cones and a thousand-foot spine which rose just south of them. All the tractors were in good radio contact; Zaino made sure of that before he abandoned the radio watch to Rowson, suited up and joined Hargedon at the remaining one. They climbed in, and Hargedon set it in motion.

At about the same time, the first tractor came into view again, now traveling north on the farther side of the chasm. Hargedon took this as evidence that the route thus far was unchanged, and kicked in highest speed.

The cabin was pretty cramped, even though some of the equipment had been attached outside.

The men could not expect much comfort for the next week.

Hargedon was used to the trips, however. He disapproved on principle of people who complained about minor inconveniences such as having to sleep in spacesuits; fortunately, Zaino's interest and excitement overrode any thought he might have had about discomfort.

This lasted through the time they spent doubling the vast crack in Mercury's crust, driving on a little to the north of the ship on the other side and then turning west toward the dark hemisphere. The route was identical to that of Harmon's machine for some time, though no trace of its passage showed on the hard surface. Then Hargedon angled off toward the southwest. He had driven this run often enough to know it well even without the markers which had been set out with the seismographs. The photographic maps were also aboard. With them, even Zaino had no trouble keeping track of their progress while they remained in sunlight.

However, the sun sank as they traveled west. In two hours its lower rim would have been on the horizon, had they been able to see the horizon; as it was, more of the "sea level" lava plain was in shadow than not even near the ship, and their route now lay in semi-darkness.

The light came from peaks projecting into the sunlight, from scattered sky-light which was growing rapidly fainter and from the brighter celestial objects such as Earth. Even with the tractor's lights it was getting harder to spot crevasses and seismometer markers. Zaino quickly found the fun wearing off ... though his pride made him cover this fact as best he could.

If Hargedon saw this, he said nothing. He set Zaino to picking up every other instrument, as any partner would have, making no allowance for the work the youngster was doing for Schlossberg. This might, of course, have had the purpose of keeping the radioman too busy to think about discomfort. Or it might merely have been Hargedon's idea of normal procedure.

Whatever the cause, Zaino got little chance to use the radio once they had driven into the darkness. He managed only one or two brief talks with those left at the ship.

The talks might have helped his morale, since they certainly must have given the impression that nothing was going on in the ship while at least he had something to do in the tractor. However, this state of affairs did not last. Before the vehicle was four hours out of sight of the *Albireo*, a broadcast by Camille Burkett reached them.

The mineralogist's voice contained at least as much professional enthusiasm as alarm, but everyone listening must have thought promptly of the dubious stability of Mercury's crust. The call was intended for her fellow geologists Mardikian and Harmon. But it interested Zaino at least as much.

"Joe! Eileen! There's a column of what looks like black smoke rising over Northeast Spur. It can't be a real fire, of course; I can't see its point of origin, but if it's the convection current it seems to be the source must be pretty hot. It's the closest thing to a genuine volcano I've seen since we arrived; it's certainly not another of those ash mounds. I should think you'd still be close enough to make it out, Joe. Can you see anything?"



The reply from Mardikian's tractor was inaudible to Zaino and Hargedon, but Burkett's answer made its general tenor plain.

"I hadn't thought of that. Yes, I'd say it was pretty close to the Brightside route. It wouldn't be practical for you to stop your run now to come back to see. You couldn't do much about it anyway. I could go out to have a look and then report to you. If the way back is blocked there'll be plenty of time to work out another." Hargedon and Zaino passed questioning glances at each

other during the shorter pause that followed.

"I know there aren't," the voice then went on, responding to the words they could not hear, "but it's only two or three miles, I'd say. Two to the spur and not much farther to where I could see the other side. Enough of the way is in shade so I could make it in a suit easily enough. I can't see calling back either of the dark-side tractors. Their work is just as important as the rest—anyway, Eileen is probably out of range. She hasn't answered yet."

Another pause.

"That's true. Still, it would mean sacrificing that set of seismic records—no, wait. We could go out later for those. And Mel could take his own weather measures on the later trip. There's plenty of time!"

Pause, longer this time.

"You're right, of course. I just wanted to get an early look at this volcano, if it is one. We'll let the others finish their runs, and when you get back you can check the thing from the other side yourself. If it is blocking your way there's time to find an alternate route. We could be doing that from the maps in the meantime, just in case."

Zaino looked again at his companion.

"Isn't that just my luck!" he exclaimed. "I jump at the first chance to get away from being bored to death. The minute I'm safely away, the only interesting thing of the whole operation happens—back at the ship!"

"Who asked to come on this trip?"

"Oh, I'm not blaming anyone but myself. If I'd stayed back there the volcano would have popped out here somewhere, or else waited until we were gone."

"If it is a volcano. Dr. Burkett didn't seem quite sure."

"No, and I'll bet a nickel she's suiting up right now to go out and see. I hope she comes back with something while we're still near enough to hear about it."

Hargedon shrugged. "I suppose it was also just your luck that sent you on a Darkside trip? You know the radio stuff. You knew we couldn't reach as far this way with the radios. Didn't you think of that in advance?"

"I didn't think of it, any more than you would have. It was bad luck, but I'm not grouching about it. Let's get on with this job." Hargedon nodded with approval, and possibly with some surprise, and the tractor hummed on its way.

The darkness deepened around the patches of lava shown by the driving lights; the sky darkened toward a midnight hue, with stars showing ever brighter through it; and radio reception from the *Albireo* began to get spotty. Gas density at the ion layer was high enough so that recombination of molecules with their radiation-freed electrons was rapid. Only occasional streamers of ionized gas reached far over Darkside. As these thinned out, so did radio reception. Camille Burkett's next broadcast came through very poorly.

There was enough in it, however, to seize the attention of the two men in the tractor.

She was saying: "—real all right, and dangerous. It's the ... thing I ever saw ... kinds of lava from what looks like ... same vent. There's high viscosity stuff building a spatter cone to end all spatter cones, and some very thin fluid from somewhere at the bottom. The flow has already blocked the valley used by the Brightside routes and is coming along it. A new return route will have to be found for the tractors that ... was spreading fast when I saw it. I can't tell how much will come. But unless it stops there's nothing at all to keep the flow away from the ship. It isn't coming fast, but it's coming. I'd advise all tractors to turn back. Captain Rowson reminds me that only one takeoff is possible. If we leave this site, we're committed to leaving Mercury. Arnie and Ren, do you hear me?"

Zaino responded at once. "We got most of it, Doctor. Do you really think the ship is in danger?"

"I don't know. I can only say that *if* this flow continues the ship will have to leave, because this area will sooner or later be covered. I can't guess how likely ... check further to get some sort of estimate. It's different from any Earthly lava source—maybe you heard—should try to get Eileen and Eric back, too. I can't raise them. I suppose they're well out from under the ion layer by now. Maybe you're close enough to them to catch them with diffracted waves. Try, anyway. Whether you can raise them or not you'd better start back yourself."

Hargedon cut in at this point. "What does Dr. Mardikian say about that? We still have most of the seismometers on this route to visit."

"I think Captain Rowson has the deciding word here, but if it helps your decision Dr. Mardikian has already started back. He hasn't finished his route, either. So hop back here, Ren. And Arnie, put that technical skill you haven't had to use yet to work raising Eileen and Eric."

"What I can do, I will," replied Zaino, "but you'd better tape a recall message and keep it going out on. Let's see—band F."

"All right. I'll be ready to check the volcano as soon as you get back. How long?"

"Seven hours—maybe six and a half," replied Hargedon. "We have to be careful."

"Very well. Stay outside when you arrive; I'll want to go right out in the tractor to get a closer look." She cut off.

"And *that* came through clearly enough!" remarked Hargedon as he swung the tractor around. "I've been awake for fourteen hours, driving off and on for ten of them; I'm about to drive for another six; and then I'm to stand by for more."

"Would you like me to do some of the driving?" asked Zaino.

"I guess you'll have to, whether I like it or not," was the rather lukewarm reply. "I'll keep on for awhile, though—until we're back in better light. You get at your radio job."

III

Zaino tried. Hour after hour he juggled from one band to another. Once he had Hargedon stop while he went out to attach a makeshift antenna which, he hoped, would change his output from broadcast to some sort of beam; after this he kept probing the sky with the "beam," first listening to the *Albireo's* broadcast in an effort to find projecting wisps of ionosphere and then, whenever he thought he had one, switching on his transmitter and driving his own message at it.

Not once did he complain about lack of equipment or remark how much better he could do once he was back at the ship.

Hargedon's silence began to carry an undercurrent of approval not usual in people who spent much time with Zaino. The technician made no further reference to the suggestion of switching drivers. They came in sight of the *Albireo* and doubled the chasm with Hargedon still at the wheel, Zaino still at his radio and both of them still uncertain whether any of the calls had gotten through.

Both had to admit, even before they could see the ship, that Burkett had had a right to be impressed.

The smoke column showed starkly against the sky, blowing back over the tractor and blocking the sunlight which would otherwise have glared into the driver's eyes. Fine particles fell from it in a steady shower; looking back, the men could see tracks left by their vehicle in the deposit which had already fallen.

As they approached the ship the dark pillar grew denser and narrower, while the particles raining from it became coarser. In some places the ash was drifting into fairly deep piles, giving Hargedon some anxiety about possible concealed cracks. The last part of the trip, along the edge of the great chasm and around its end, was really dangerous; cracks running from its sides were definitely spreading. The two men reached the *Albireo* later than Hargedon had promised, and found Burkett waiting impatiently with a pile of apparatus beside her.

She didn't wait for them to get out before starting to organize.

"There isn't much here. We'll take off just enough of what you're carrying to make room for this. No—wait. I'll have to check some of your equipment; I'm going to need one of Milt Schlossberg's gadget's, I think, so leave that on. We'll take—"

"Excuse me, Doctor," cut in Hargedon. "Our suits need servicing, or at least mine will if you want me to drive you. Perhaps Arnie can help you load for a while, if you don't think it's too important for him to get at the radio—"

"Of course. Excuse me. I should have had someone out here to help me with this. You two go on in. Ren, please get back as soon as you can. I can do the work here; none of this stuff is very heavy."

Zaino hesitated as he swung out of the cab. True, there wasn't too much to be moved, and it wasn't very heavy in Mercury's gravity, and he really should be at the radio; but the thirty-nine-year-old mineralogist was a middle-aged lady by his standards, and shouldn't be allowed to carry heavy packages....

"Get along, Arnie!" the middle-aged lady interrupted this train of thought. "Eric and Eileen are getting farther away and harder to reach every second you dawdle!"

He got, though he couldn't help looking northeast as he went rather than where he was going.

The towering menace in that direction would have claimed anyone's attention. The pillar of sable ash was rising straighter, as though the wind were having less effect on it. An equally black cone had risen into sight beyond Northeast Spur—a cone that must have grown to some two thousand feet in roughly ten hours. It had far steeper sides than the cinder mounds near it; it couldn't be made of the same loose ash. Perhaps it consisted of half-melted particles which were fusing together as they fell—that might be what Burkett had meant by "spatter-cone." Still, if that were the case, the material fountaining from the cone's top should be lighting the plain with its incandescence rather than casting an inky shadow for its entire height.

Well, that was a problem for the geologists; Zaino climbed aboard and settled to his task.

The trouble was that he could do very little more here than he could in the tractor. He could have improvised longer-wave transmitting coils whose radiations would have diffracted a little more effectively beyond the horizon, but the receiver on the missing vehicle would not have detected them. He had more power at his disposal, but could only beam it into empty space with his better antennae. He had better equipment for locating any projecting wisps of charged gas which might reflect his waves, but he was already located under a solid roof of the stuff—the *Albireo* was technically on Brightside. Bouncing his beam from this layer still didn't give him the range he needed, as he had found both by calculation and trial.

What he really needed was a relay satellite. The target was simply too far around Mercury's sharp curve by now for anything less.

Zaino's final gesture was to set his transmission beam on the lowest frequency the tractor would pick up, aim it as close to the vehicle's direction as he could calculate from map and itinerary and set the recorded return message going. He told Rowson as much.

"Can't think of anything else?" the captain asked. "Well, neither can I, but of course it's not my field. I'd give a year's pay if I could. How long before they should be back in range?"

"About four days. A hundred hours, give or take a few. They'll be heading back anyway by that time."

"Of course. Well, keep trying."

"I am—or rather, the equipment is. I don't see what else I can do unless a really bright idea should suddenly sprout. Is there anywhere else I could be useful? I'm as likely to have ideas working as just sitting."

"We can keep you busy, all right. But how about taking a transmitter up one of those mountains? That would get your wave farther."

"Not as far as it's going already. I'm bouncing it off the ion layer, which is higher than any mountain we've seen on Mercury even if it's nowhere near as high as Earth's."

"Hmph. All right."

"I could help Ren and Dr. Burkett. I could hang on outside the tractor—"

"They've already gone. You'd better call them, though, and keep a log of what they do."

"All right." Zaino turned back to his board and with no trouble raised the tractor carrying Hargedon and the mineralogist. The latter had been trying to call the *Albireo* and had some acid comments about radio operators who slept on the job.

"There's only one of me, and I've been trying to get the Darkside team," he pointed out. "Have you found anything new about this lava flood?"

"Flow, not flood," corrected the professional automatically. "We're not in sight of it yet. We've just rounded the corner that takes us out of your sight. It's over a mile yet, and a couple of more corners, before we get to the spot where I left it. Of course, it will be closer than that by now. It was spreading at perhaps a hundred yards an hour then. That's one figure we must refine.... Of course, I'll try to get samples, too. I wish there were some way to get samples of the central cone. The whole thing is the queerest volcano I've ever heard of. Have you gotten Eileen started back?"

"Not as far as I can tell. As with your cone samples, there are practical difficulties," replied Zaino. "I haven't quit yet, though."

"I should think not. If some of us were paid by the idea we'd be pretty poor, but the perspiration part of genius is open to all of us."

"You mean I should charge a bonus for getting this call through?" retorted the operator.

Whatever Burkett's reply to this might have been was never learned; her attention was diverted at that point.

"We've just come in sight of the flow. It's about five hundred yards ahead. We'll get as close as seems safe, and I'll try to make sure whether it's really lava or just mud."

"Mud? Is that possible? I thought there wasn't—couldn't be—any water on this planet!"

"It is, and there probably isn't. The liquid phase of mud doesn't have to be water, even though it usually is on Earth. Here, for example, it might conceivably be sulfur."

"But if it's just mud, it wouldn't hurt the ship, would it?"

"Probably not."

"Then why all this fuss about getting the tractors back in a hurry?"

The voice which answered reminded him of another lady in his past, who had kept him after school for drawing pictures in math class.

"Because in my judgment the flow is far more likely to be lava than mud, and if I must be wrong I'd rather my error were one that left us alive. I have no time at the moment to explain the basis of my judgment. I will be reporting our activities quite steadily from now on, and would prefer that you not interrupt unless a serious emergency demands it, or you get a call from Eileen.

"We are about three hundred yards away now. The front is moving about as fast as before, which suggests that the flow is coming only along this valley. It's only three or four feet high, so viscosity is very low or density very high. Probably the former, considering where we are. It's as black as the smoke column."

"Not glowing?" cut in Zaino thoughtlessly.

"*Black*, I said. Temperature will be easier to measure when we get closer. The front is nearly straight across the valley, with just a few lobes projecting ten or twelve yards and one notch where a small spine is being surrounded. By the way, I trust you're taping all this?" Again Zaino was reminded of the afternoon after school.

"Yes, Ma'am," he replied. "On my one and only monitor tape."

"Very well. We're stopping near the middle of the valley one hundred yards from the front. I am getting out, and will walk as close as I can with a sampler and a radiometer. I assume that the radio equipment will continue to relay my suit broadcast back to you." Zaino cringed a little, certain as he was that the tractor's electronic apparatus was in perfect order.

It struck him that Dr. Burkett was being more snappish than usual. It never crossed his mind that the woman might be afraid.

"Ren, don't get any closer with the tractor unless I call. I'll get a set of temperature readings as soon as I'm close enough. Then I'll try to get a sample. Then I'll come back with that to the tractor, leave it and the radiometer and get the markers to set out."

"Couldn't I be putting out the markers while you get the sample, Doctor?"

"You could, but I'd rather you stayed at the wheel." Hargedon made no answer, and Burkett resumed her description for the record.



"I'm walking toward the front, a good deal faster than it's flowing toward me. I am now about twenty yards away, and am going to take a set of radiation-temperature measures." A brief pause. "Readings coming. Nine sixty. Nine eighty. Nine ninety—that's from the bottom edge near the spine that's being surrounded. Nine eighty-five—" The voice droned on until about two dozen readings had been taped. Then, "I'm going closer now. The sampler is just a ladle on a twelve-foot handle we improvised, so I'll have to get that close. The stuff is moving slowly; there should be no trouble. I'm in reach now. The lava is very liquid; there's no trouble getting the sampler in—or out again—it's not very dense, either. I'm heading back toward the tractor now. No, Ren, don't come to meet me."

There was a minute of silence, while Zaino pictured the spacesuited figure with its awkwardly long burden, walking away from the creeping menace to the relative safety of the tractor. "It's frozen solid already; we needn't worry about spilling. The temperature is about—five eighty. Give me the markers, please."

Another pause, shorter this time. Zaino wondered how much of that could be laid to a faster walk without the ladle and how much to the lessening distance between flow and tractor. "I'm tossing the first marker close to the edge—it's landed less than a foot from the lava. They're all on a light cord at ten-foot intervals; I'm paying out the cord as I go back to the tractor. Now we'll stand by and time the arrival at each marker as well as we can."

"How close are you to the main cone?" asked Zaino.

"Not close enough to see its base, I'm afraid. Or to get a sample of it, which is worse. We—goodness, what was that?"

Zaino had just time to ask, "What was what?" when he found out.

IV

For a moment, he thought that the *Albireo* had been flung bodily into the air. Then he decided that the great metal pillar had merely fallen over. Finally he realized that the ship was still erect, but the ground under it had just tried to leave.

Everyone in the group had become so used to the almost perpetual ground tremors that they had ceased to notice them; but this one demanded attention. Rowson, using language which suggested that his career might not have been completely free of adventure after all, flashed through the communication level on his way down to the power section. Schlossberg and Babineau followed, the medic pausing to ask Zaino if he were all right. The radioman merely nodded affirmatively; his attention was already back at his job. Burkett was speaking a good deal faster than before.

"Never mind if the sample isn't lashed tight yet—if it falls off there'll be plenty more. There isn't time! Arnie, get in touch with Dr. Mardikian and Dr. Marini. Tell them that this volcano is explosive, that all estimates of what the flow may do are off until we can make more measures, and in any case the whole situation is unpredictable. Everyone should get back as soon as possible. Remember, we decided that those big craters Eileen checked were not meteor pits. I don't know whether this thing will let go in the next hour, the next year, or at all. Maybe what's happening now will act as a safety valve—but let's get out. Ren, that flow is speeding up and getting higher, and the ash rain is getting a lot worse. Can you see to drive?"

She fell silent. Zaino, in spite of her orders, left his set long enough to leap to the nearest port for a look at the volcano.

He never regretted it.

Across the riven plain, whose cracks were now nearly hidden under the new ash, the black cone towered above the nearer elevations. It was visibly taller than it had been only a few hours before. The fountain from its top was thicker, now jetting straight up as though wind no longer meant a thing to the fiercely driven column of gas and dust. The darkness was not so complete; patches of red and yellow incandescence showed briefly in the pillar, and glowing sparks rather than black cinders rained back on the steep slopes. Far above, a ring of smoke rolled and spread about the column, forming an ever-broadening blanket of opaque cloud above a landscape which had never before been shaded from the sun. Streamers of lightning leaped between cloud and pillar, pillar and mountain, even cloud and ground. Any thunder there might have been was drowned in the howl of the escaping gas, a roar which seemed to combine every possible note from the shrillest possible whistle to a bass felt by the chest rather than heard by the ears. Rowson's language had become inaudible almost before he had disappeared down the hatch.

For long moments the radioman watched the spreading cloud, and wondered whether the *Albireo* could escape being struck by the flickering, ceaseless lightning. Far above the widening ring of cloud the smoke fountain drove, spreading slowly in the thinning atmosphere and beyond it. Zaino had had enough space experience to tell at a glance whether a smoke or dust cloud was in air or not. This wasn't, at least at the upper extremity....

And then, quite calmly, he turned back to his desk, aimed the antenna straight up, and called Eileen Harmon. She answered promptly.

The stratigrapher listened without interruption to his report and the order to return. She conferred briefly with her companion, replied "We'll be back in twelve hours," and signed off. And that was that.

Zaino settled back with a sign, and wondered whether it would be tactful to remind Rowson of his offer of a year's pay.

All four vehicles were now homeward bound; all one had to worry about was whether any of them would make it. Hargedon and Burkett were fighting their way through an ever-increasing ash rain a scant two miles away—ash which not only cut visibility but threatened to block the way with drifts too deep to negotiate. The wind, now blowing fiercely toward the volcano, blasted the gritty stuff against their front window as though it would erode through; and the lava flow, moving far faster than the gentle ooze they had never quite measured, surged—and glowed—grimly behind.

A hundred miles or more to the east, the tractors containing Mardikian, Marini and their drivers headed southwest along the alternate route their maps had suggested; but Mardikian, some three hours in the lead, reported that he could see four other smoke columns in that general direction.

Mercury seemed to be entering a new phase. The maps might well be out of date.

Harmon and Trackman were having no trouble at the moment, but they would have to pass the great chasm. This had been shooting out daughter cracks when Zaino and Hargedon passed it hours before. No one could say what it might be like now, and no one was going out to make sure.

"We can see you!" Burkett's voice came through suddenly. "Half a mile to go, and we're way ahead of the flow."

"But it's coming?" Rowson asked tensely. He had returned from the power level at Zaino's phoned report of success.

"It's coming."

"How fast? When will it get here? Do you know whether the ship can stand contact with it?"

"I don't know the speed exactly. There may be two hours, maybe five or six. The ship can't take it. Even the temperature measures I got were above the softening point of the alloys, and it's hotter and much deeper now. Anyway, if the others aren't back before the flow reaches the ship they won't get through. The tractor wheels would char away, and I doubt that the bodies would float. You certainly can't wade through the stuff in a spacesuit, either."

"And you think there can't be more than five or six hours before the flow arrives?"

"I'd say that was a very optimistic guess. I'll stop and get a better speed estimate if you want, but won't swear to it."

Rowson thought for a moment.

"No," he said finally, "don't bother. Get back here as soon as you can. We need the tractor and human muscles more than we need even expert guesses." He turned to the operator.

"Zaino, tell all the tractors there'll be no answer from the ship for a while, because no one will be aboard. Then suit up and come outside." He was gone.

Ten minutes later, six human beings and a tractor were assembled in the flame-lit near-darkness outside the ship. The cloud had spread to the horizon, and the sun was gone. Burkett and Hargedon had arrived, but Rowson wasted no time on congratulations.

"We have work to do. It will be easy enough to keep the lava from the ship, since there seems to be a foot or more of ash on the ground and a touch of main drive would push it into a ringwall around us; but that's not the main problem. We have to keep it from reaching the chasm anywhere south of us, since that's the way the others will be coming. If they're cut off, they're dead. It will be brute work. We'll use the tractor any way we can think of. Unfortunately it has no plow attachment, and I can't think of anything aboard which could be turned into one. You have shovels, such as they are. The ash is light, especially here, but there's a mile and a half of dam to be built. I don't see how it can possibly be done ... but it's going to be."

"Come on, Arnie! You're young and strong," came the voice of the mineralogist. "You should be able to lift as much of this stuff as I can. I understand you were lucky enough to get hold of Eileen—have you asked for the bonus yet?—but your work isn't done."

"It wasn't luck," Zaino retorted. Burkett, in spite of her voice, seemed much less of a schoolmistress when encased in a spacesuit and carrying a shovel, so he was able to talk back to her. "I was simply alert enough to make use of existing conditions, which I had to observe for myself in spite of all the scientists around. I'm charging the achievement to my regular salary. I saw—"



He stopped suddenly, both with tongue and shovel. Then, "Captain!"

"What is it?"

"The only reason we're starting this wall here is to keep well ahead of the flow so we can work as long as possible, isn't it?"

"Yes, I suppose so. I never thought of trying anywhere else. The valley would mean a much shorter dam, but if the flow isn't through it by now it would be before we could get there—oh! Wait a minute!"

"Yes, sir. You can put the main switch anywhere in a D. C. circuit. Where are the seismology stores we never had to use?"

Four minutes later the tractor set out from the *Albireo*, carrying Rowson and Zaino. Six minutes after that it stopped at the base of the ash cone which formed the north side of the valley from which the lava was coming. They parked a quarter of the way around the cone's base from the emerging flood and started to climb on foot, both carrying burdens.

Forty-seven minutes later they returned empty-handed to the vehicle, to find that it had been engulfed by the spreading liquid.

With noticeable haste they floundered through the loose ash a few yards above the base until they had outdistanced the glowing menace, descended and started back across the plain to where they knew the ship to be, though she was invisible through the falling detritus. Once they had to detour around a crack. Once they encountered one which widened toward the chasm on their right, and they knew a detour would be impossible. Leaping it seemed impossible, too, but they did it. Thirty seconds after this, forty minutes after finding the tractor destroyed, the landscape was bathed in a magnesium-white glare as the two one-and-a-half kiloton charges planted just inside the crater rim let go.

"Should we go back and see if it worked?" asked Zaino.

"What's the use? The only other charges we had were in the tractor. Thank goodness they were nuclear instead of H. E. If it didn't work we'd have more trouble to get back than we're having now."

"If it didn't work, is there any point in going back?"

"Stop quibbling and keep walking. Dr. Burkett, are you listening?"

"Yes, Captain."

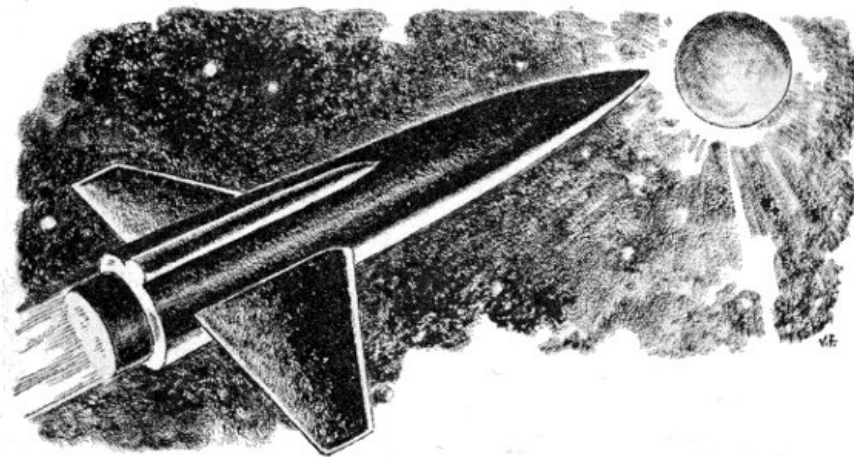
"We're fresh out of tractors, but if you want to try it on foot you might start a set of flow measures on the lava. Arnie wants to know whether our landslide slid properly."

However, the two were able to tell for themselves before getting back to the *Albireo*.

The flow didn't stop all at once, of course; but with the valley feeding it blocked off by a pile of volcanic ash four hundred feet high on one side, nearly fifty on the other and more than a quarter of a mile long, its enthusiasm quickly subsided. It was thin, fluid stuff, as Burkett had noted; but as it spread it cooled, and as it cooled it thickened.

Six hours after the blast it had stopped with its nearest lobe almost a mile from the ship, less than two feet thick at the edge.

When Mardikian's tractor arrived, Burkett was happily trying to analyze samples of the flow, and less happily speculating on how long it would be before the entire area would be blown off the planet. When Marini's and Harmon's vehicles arrived, almost together, the specimens had been loaded and everything stowed for acceleration. Sixty seconds after the last person was aboard, the *Albireo* left Mercury's surface at two gravities.



The haste, it turned out, wasn't really necessary. She had been in parking orbit nearly forty-five hours before the first of the giant volcanoes reached its climax, and the one beside their former site was not the first. It was the fourth.

"And that seems to be that," said Camille Burkett rather tritely as they drifted a hundred miles above the little world's surface. "Just a belt of white-hot calderas all around the planet. Pretty, if you like symmetry."

"I like being able to see it from this distance," replied Zaino, floating weightless beside her. "By the way, how much bonus should I ask for getting that idea of putting the seismic charges to use after all?"

"I wouldn't mention it. Any one of us might have thought of that. We all knew about them."

"Anyone *might* have. Let's speculate on how long it would have been before anyone *did*."

"It's still not like the other idea, which involved your own specialty. I still don't see what made you suppose that the gas pillar from the volcano would be heavily charged enough to reflect your radio beam. How did that idea strike you?"

Zaino thought back, and smiled a little as the picture of lightning blazing around pillar, cloud and mountain rose before his eyes.

"You're not quite right," he said. "I was worried about it for a while, but it didn't actually strike me."

It fell rather flat; Camille Burkett, Ph.D., had to have it explained to her.

*** END OF THE PROJECT GUTENBERG EBOOK HOT PLANET ***

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