



Illustrated by Eldar Zakirov

Shepherd Moons

Jerry Oltion

The mood in the control room was tense. When everything depends on the next hour or so, people grow quiet and focused. In a little less than an hour, the DART spacecraft would arrive at the asteroid Didymos, and all their effort would go out in a final blaze of glory.

Priya Joshi and her partner in crime—and in practically everything else—Mark Anderson, shared a monitor at the end of the back row. They weren't directly part of the mission, but as astronauts with extensive EVA training and experience navigating spacecraft, they were there to observe and learn and help if they could. Plus Priya was on NASA's asteroid exploration team, an as-yet theoretical sub-group of astronauts who might someday actually venture out to one of the Solar System's flying rocks, and this was her chance to see one up close. Really close.

It wasn't every day that NASA whacked an asteroid with a half-ton space probe. DART was

designed to test how much influence an impact would have on the asteroid's orbit, but it was also proof of concept for much more ambitious missions to follow, some of which might be crewed depending upon what they discovered tonight. Didymos was an Earth-crossing asteroid with a two-year period, relatively easy to reach and relatively easy to return from after an extended stay. If NASA ever sent a mission out there, Priya planned to be on board.

The mission clock ticked over to 6:30. Forty-four minutes to impact. Didymos was a bright speck in the center of the field, still too small to show a disk. But the probe was approaching at over four miles per second, and as they watched, a dimmer speck separated from the bright one. Dimorphos, Didymos's tiny moon. That was the actual target. DART would strike it head-on as it swung around in its orbit, slowing it down by a smidgen, enough for telescopes on Earth to detect the difference in its period after a few more orbits. And that sudden slowdown would change the orbit of the larger companion by an even smaller smidgen. Not enough to matter, but it was a proof-of-concept mission, a demonstration that we could alter the orbit of an asteroid if we needed to.

A cheer filled the room as the two bright dots separated. "Right on schedule," Mark said. So far the mission was going nominally. It was entirely automated at this point, with the probe thirty-six light-seconds away, so if anything went wrong, there would be little the controllers could do to correct it.

"It'll be switching guidance from Didymos to Dimorphos," Priya said. And as she spoke, the view gave a little jerk. "That was the thruster."

The mission communicator a few stations down the row said, "The probe has achieved a navigation lock on Dimorphos. All systems are 'go.' Forty-one minutes to impact."

Priya said, "That means the probe is . . . almost exactly ten thousand miles out."

Mark laughed. "Stop showing off!"

Priya felt herself blush. "The numbers are easy. Four miles per second, sixty seconds in a minute, forty-one minutes."

Mark said, "Four miles per second sounds fast, but it's less than orbital speed. The ISS is going faster."

"But the ISS isn't going to smack into an asteroid."

"I hope not," Mark said. "I'm going up next year."

She fist-bumped him. "To a great mission." She'd been up once, three years ago, but wasn't even on the schedule again.

"You'll get another shot at it," he said.

Priya just shrugged. To be honest, another tour on the ISS wasn't high on her list of priorities. She wanted the Moon, or an asteroid like Didymos, or even Mars. To actually go somewhere, see something new, accomplish something nobody had done before.

The two specks drew apart on the monitor as the probe closed in. Mark said, "I read somewhere that the number of Earth-grazing asteroids that are binary is way higher than the number of binaries out in the main asteroid belt. Weird statistic."

Priya said, "It's the YORP effect. Sunlight on a rotating body makes it spin faster, and it eventually breaks apart. Sunlight is stronger on near-Earth asteroids than on main belt asteroids."

Mark laughed. "I was just going to guess that."

"Sure you were."

Priya took a sip of coffee and kept the mug in her hand for warmth. She had become shivering cold in the last few minutes.

They watched the asteroids draw apart, Didymos finally becoming a disk rather than just a point of light. It was roughly spherical, with boulders and depressions more or less at random. Dimorphos was much smaller, only five hundred feet, a fifth the size of Didymos, so they didn't see detail until just a couple minutes before impact. When they did, all that stood out was just a bright spot on a surprisingly smooth, round surface.

"That's weird," Priya said. "It's more spherical than Didymos. You'd expect the smaller one to be more ragged. Less gravity to pull things together."

It was growing fast now. Didymos slid off to the side of the screen, leaving Dimorphos dead

center. The bright spot began to take on shape, but that shape was perfectly round. Round with a blister dead center. Sunlight angling in from the side made it obvious that they were looking at a dome. A dome with round ports, dish antennae, and angled black solar panels.

Voices raised all around the control room. “What the hell! That’s artificial! Who put that there?”

Priya said, “Abort! Abort! Oh, shit.” She set her coffee mug down hard on the desk, sloshing it, but didn’t look down. She couldn’t tear her eyes away. The probe sailed straight onward, the abort signal crawling along after it at the speed of light, if one had been sent at all. Nor could the thrusters move the probe far enough in the few seconds left even if the signal had been instantaneous.

The guidance system did an impeccable job: The probe struck dead square in the center of the dish antenna mounted atop the domed outpost.

The video winked out upon impact, but DART had deployed a cubesat ten days earlier that had drifted behind to watch the results. LICIA got clear video of the expanding debris cloud. Shrapnel erupted outward from the surface, blasting into space in a tight cone—aimed directly at LICIA. There was just time to make out some of the tumbling girders and twisted metal panels before LICIA ran into the debris cloud and the signal stopped.

The control room erupted in pandemonium. Among the dozen other voices, Priya said to Mark, “The facility must have been dug into the asteroid a ways. If it was completely on the surface, the explosion would have blown everything out sideways. But the ejecta mostly came straight back along the incoming path, which means it was directed like rocket exhaust. My guess is that there were at least a dozen basement levels.”

Greg, the tech at the station next to her nodded. “It reminds me of the 9/11 attacks on the World Trade Center. The planes just disappeared into the buildings for a second or two before the explosions. The force was all outward, and it came from deep inside.”

Priya had been in grade school when that happened, but she remembered the video as if it had been yesterday. “Yeah,” she said, “The structure was mostly empty space. And that’s what it looks like we have here. The explosion didn’t really take off until DART hit bottom.”

Mark said, “That implies habitation. If it was a robotic installation, there wouldn’t be any need for empty space.”

“I didn’t see any bodies in the debris,” Greg said.

“It’s hard to tell,” Mark said, “but it doesn’t look like there was atmosphere in there. The debris was all solid stuff. Hardware.”

“And rock, there at the end,” said Priya. She tapped the video slider on her monitor and dragged it back a quarter inch, replaying the impact and its aftermath. Amid the metal debris, several obvious chunks of ragged asteroid material also flew out. Priya said, “That’s from the ground floor.”

It’s amazing what you can learn by watching something be destroyed, she thought. They were like physicists examining particle tracks in an atom smasher, deducing what had to have created the patterns they saw.

“Who the hell could have put that there?” someone down the row asked. “And why?”

“Elon?” Mark said.

Greg said, “Not likely. Something like this would have taken a major launch effort. He’d never have been able to keep it secret.”

“China, then?” Priya said.

“North Korea,” someone else said, and everyone laughed. But it was a hollow laugh. Someone had obviously put an outpost on Dimorphos, and the only good reason for doing that was the same reason for the DART mission: to nudge the binary pair into a different orbit. But if they were doing it in secret, then presumably they intended to shift it onto a course that would impact Earth.

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Priya was in the Astronaut Office first thing in the morning. “I volunteer for the mission,” she said.

To his credit, the director didn't ask "What mission?" He just said, "We're not even close to assigning a crew yet."

"I know that. But when you do, I'm your best candidate. It's a two-year trip out and back, so supplies are going to be our biggest concern. I weigh a hundred and ten pounds and can thrive on a twelve hundred calorie diet. Probably less in freefall. And I'm already in the asteroid rendezvous group. And my Ph.D. thesis was on the search for extraterrestrial intelligence."

He raised his eyebrows. "You think that was an ET outpost?"

"When you've eliminated the impossible, whatever's left . . ."

"Yeah, right. I think we're far from proving that someone from Earth couldn't have set that up. But yes, you're on the short list. Because we're probably going out there no matter who turns out to be the culprit."

Priya thanked him and let herself out, nearly bumping into Mark in the hallway. "Beat you to it," she said.

Mark laughed. "We'll see how much that matters when the time comes. I get the feeling there's going to be a lot of money thrown at this one."

"Yeah, maybe so. Good luck to both of us, then." Priya gave him a quick hug. But she knew it was a one-person mission, and she knew who was going.

* * *

In the following days, astronomers turned practically every telescope on Earth—and off it—on Didymos and its mysterious moon, but saw nothing remarkable. Radar picked up sparkles of reflection from the debris still moving away from the explosion, but no motion on the surface. Nobody radioed for rescue, and nobody on Earth claimed responsibility for the installation. Dimorphos's orbit had shortened by about a hundred and thirty seconds, nearly twice the predicted amount, presumably due to the focusing effect on the ejecta plume.

At least there wasn't an advancing fleet of vengeful aliens. But as the days drew on without answers, speculation ran rampant on the internet. It was the Russians. It was Martians. It was Satan. It was a leftover spacecraft from the fleet that had seeded the Earth with life billions of years ago. And of course it was responsible for COVID-19, global warming (which was nonetheless a myth), and inflation.

Then astronomers noticed that something had detached from another Earth-grazing asteroid about forty million miles away and was heading toward Didymos. Under power. There was no visible rocket exhaust, but the thing was accelerating continuously at 2.5 gees. In fourteen hours it had covered half the distance, then began decelerating at the same 2.5 gees.

If there had been fuel involved, the acceleration would have increased as the mass of the spacecraft decreased. Maybe the aliens—for nobody seriously doubted anyone else was behind it now—had an upper limit that they could withstand and had throttled down as their mass decreased. Or maybe they were using entirely different technology.

Maybe they were from Jupiter, which maybe not coincidentally had a surface gravity of 2.5 gees. Or maybe they just wanted to make us think they were from Jupiter.

Maybe, maybe, maybe. Nobody knew anything for sure.

Debate raged over whether to contact the aliens or not, but it was a moot point. Practically every nation made a clandestine attempt, but none were successful. Either the aliens weren't listening or weren't interested in responding.

There had already been a follow-up mission in the works. Called Hera, it was the second half of AIDA, the "Asteroid Impact and Deflection Assessment" program that Priya had been involved in for years. Hera was due to launch in 2024 and rendezvous with Didymos in late 2026 or early 2027.

The only way to speed up an interplanetary transfer is with sheer power. If you've got the thrust for it you can shoot straight for your target and get there in weeks rather than months, but it takes a phenomenal amount of fuel. Nobody on Earth had a space drive that could keep up 2.5 gees of thrust for over a day, but SpaceX had a rocket they once called the Big Falcon Rocket, later renamed "Starship" when people realized what BFR really stood for, and it had already made several successful flights. It was designed to carry people to the Moon and to Mars;

NASA suggested putting the Hera probe on a stripped-down Starship and sending it out to Didymos at top speed. It would still take several months, and the rendezvous would be at the far point in Didymos's orbit, and the probe couldn't go into orbit around the asteroid as originally planned, but it would get there years earlier and could at least send photos of what the aliens were up to.

And humanity collectively shivered in fear as they waited. There were over a dozen binary Earth-grazing asteroids, and it was a safe bet that every one of them had an alien outpost. None of them were on orbits that would bring them truly close to Earth within the next century or more, but with engines capable of keeping up 2.5 gees of thrust indefinitely, it wouldn't take long to alter one's orbit until it was on a collision course.

Priya lobbied for a crewed mission to follow, no matter what Hera discovered. Surprisingly, NASA agreed, perhaps worrying that SpaceX would do it on their own if they didn't. Or China. Or Russia. Or North Korea. It was imperative that the U.S. be first.

But of course that meant asking Congress for the money.

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The hearing was a joke. But after the midterm elections, Congress itself was a joke. The hearing started out simple enough, with questions like "Why can't we just aim the James Webb telescope at it?" (Followed by the inevitable grumble: "We spent enough on the damned thing, it ought to be useful for something.")

Priya, as the spearhead behind the mission—and because Congresspeople liked being photographed with astronauts—was NASA's representative. She answered with the truthful observation that at Dimorphos's distance, even the Webb couldn't see the level of detail they needed.

What could we possibly do with a manned mission that we couldn't do with robots? Adapt to what we find there.

What do you expect to find? We don't know. That's why we need to go look.

How do you propose to stop them once you get there?

And so on. It was clear from the start that the conservatives wanted someone to blame and someone to bomb, while the liberals wanted to convene a panel of experts who would study the situation for a decade and make a recommendation. And of course there were the grandstanders who asked brilliant questions like "Why didn't we know about this beforehand?"

To which Priya merely replied, "Congressional budget cuts," and let the silence linger.

Then the representative whom Priya had come to think of as the Honorable Stupid Son of a Bitch from the State of Ignorance asked, "How many men does NASA propose to send?"

Priya said, "One. And it'll be a woman. Me."

"You," he said flatly. "A little slip of a brown girl."

She bit her tongue. Took a deep breath. "An experienced astronaut who has extensively studied both extraterrestrial contact and asteroids. And who can live on twelve hundred calories a day. Which is a vital consideration for a mission of this duration," she added for those who hadn't been paying attention earlier.

Congressman Stupid cleared his throat and said, "No offense, Miss Gupta, but if we approve this boondoggle, we'll be sending a man up there. A white man."

A murmur swept through the chamber, but there was no bang of the gavel, no outcry of protest. So Priya said, "No offense, Congressman, but if you can say that and expect to be re-elected, then we are all well and truly screwed, alien invasion or no."

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Mark cooked dinner for her that night. The TV was off. Neither of them wanted to hear the outcry from the conservatives accusing her of disrespect for the government that they showed no respect for, either, nor from the religious nuts who were already accusing her of making a pact with the devil, nor from the liberals who wanted to spend the money on vaccines and food for starving nations. Priya didn't even want to think about it at the moment, but she couldn't put it out of her mind.

Halfway through the meal, a delightful shrimp scampi on linguini with garlic toast on the

side (“Good thing we’re both eating this or there’d be no smooching you for a week.”), she said, “You know, I’m beginning to wonder if I want to go out there after all. All the evidence seems to point toward hostile aliens bent on wiping out humanity before we can get a foothold outside the Solar System. What could I possibly accomplish besides setting them off even more than we have already?”

“You could make contact,” Mark said. “We need to do that whether they’re hostile or benevolent. We need to find out what they’re doing and why.”

“They’re moving asteroids around. That much is obvious. And as for why, I think that’s pretty obvious, too. Why else are so many doubles in Earth-crossing orbits?”

Mark considered that for a bite or two, then said, “Why do none of them come closer than a couple of million miles? With no impacts in the foreseeable future? If whoever’s out there wanted to be able to smack us down on a moment’s notice, you’d think they’d keep one ready to go.”

“So you think they’re just hanging out to watch us and using the asteroids to sweep in for a closer look every now and then?”

“Maybe. Or maybe they’re keeping the asteroids away. Maybe they’re watching over us, not just watching us.”

“That would be nice if it were true. But why don’t they answer our hail now that we know they’re there?”

He took a sip of wine. “Could be a test. We have to be able to reach them before they’ll respond.”

She snorted. “Oh, we reached them all right. You’d think that would have been enough.”

“You know what I mean. Columbus didn’t reach the new world by sending a message in a bottle. He had to come here himself.”

“And live to tell the tale.”

“You’ll make it.”

“Or you will. Senator Shithead isn’t the only misogynist racist in Congress. I probably killed my chance of a mission anywhere, much less to Dimorphos.”

Mark shook his head. “Nonsense. You’re the most qualified, most logical choice. Of course you’ll go.”

* * *

But when the mission was approved and the crew announced, it was Mark’s name at the top of the list, with Priya as backup.

She spent a day sulking, and another day feeling guiltily relieved, then she put aside her anger and her grief and her anxiety and helped Mark train for the flight. He insisted that she train right alongside him, because something could happen to him at the last moment and she could wind up going after all.

Whoever went would be riding in a modified Starship crew module. The thing was as big as a bus, with plenty of room for a couple dozen people if they were just going to the Moon and back, but for the extended trip to Dimorphos, every cubic foot of space would be taken up with food and oxygen and supplies to keep even a single person alive. The margin was tight with Mark’s extra mass, but doable. With Priya it would be a breeze.

The Hera mission swept outward. The faltering economy improved as people, convinced humanity was doomed, spent their savings on sports cars, boats, vacations, and lots and lots of survivalist supplies. Priya wryly noted that there was enough high-velocity lead being stockpiled in underground bunkers to deflect Didymos if it was all fired at the asteroid. She got hate mail and death threats for that, but she had been getting those for months now.

Hera reached the asteroid and sent back a flyby image of a dome under construction that looked just like the one that DART had smashed. Little creatures or robots or something dotted the surface of the asteroid, but they were only a foot or so long, too small to show up well in the images. Were they truly space aliens, lifeforms that lived in vacuum? Nobody knew. But it was clear they were rebuilding their outpost.

Not long afterward, astronomers noticed something odd: Dimorphos acquired a wobble in

its orbit. It was speeding up as it swung around in the direction approaching Earth, and slowing down on the other side, falling closer to Didymos when it was around behind it and rising up higher when it was on the Earth-facing side. Then they realized it wasn't Dimorphos's orbit that was changing, but Didymos itself, the big asteroid. But it was moving onto a path that took it even farther from Earth than before. The aliens were moving it a way from the Earth, not toward it.

The difference was only a few thousand miles; an almost insignificant amount on the scale of the Solar System, but it clearly meant something. But what? A warning? A peace offering? A thumbed nose?

"They're probably testing their repairs," Priya said to an interviewer who asked her opinion. Of course the news story twisted her words, proclaiming "Aliens test asteroid-moving ability in preparation for attack on Earth!"

The Starship project proceeded apace. Fuel flights rocketed into orbit, stockpiling propellant for the long burn. The crew module was loaded with supplies, including thousands of hours of movies, thousands of digital books, and thousands of hours of music, in part to trade with the aliens if cultural exchange was possible, but mostly to keep the passenger sane on the long way out there.

And three days before launch, Mark developed vertigo.

"You're what?" Priya demanded when he told her. They were both in his bed, where she'd given him a hero's send-off for most of the night.

"I'm dizzy."

She laughed. "You're shagged out," she said.

"No, I mean it. Everything is swirling around." He tried to sit up, but twisted around and fell heavily back into the bed. Then he turned his head sideways and threw up.

"Don't choke!" Priya pushed him hard over so he was on his side. "Breathe out first!"

He coughed, gasped, coughed, then took a deep breath. "Gah. Get a towel."

She grabbed two from the bathroom, threw one over his mess, and handed him the other. "Maybe it's food poisoning," she said. They had been eating well in his last few days on Earth.

"Maybe." He wiped his face and tried again to sit up. She helped him upright, but he had to close his eyes to keep from throwing up again. "Everything's swirling around," he said. "Fast. Teacup-ride fast."

"That's not good."

And indeed it wasn't. When they finally got him to the flight surgeon, a half-full barf bag and many dry heaves later, the flight surgeon diagnosed a swollen inner ear. "I hate to break it to you, bud, but you're not flying in that condition."

"How long before the swelling goes down?" Mark asked.

"A week, maybe two. But that's not the real issue. Once this sort of thing develops, you never know when it's going to happen again. And the natural rush of fluid to the head in microgravity will just make it worse."

"So my career is shot."

"Maybe not. There are medications you can take. Surgery if that doesn't work. Alan Shepard beat it and made it back into space, and you can, too. But not in three days time."

Mark turned—carefully—to Priya. "See," he said, laughing softly. "I told you it'd be you."

"Not like this!" she said. "I don't want to take your place!"

But there was little choice. Mark was grounded, and she was next in line.

The death threats became more serious. Her entire apartment building had to be evacuated after three separate drive-by shootings. She had to bunk in the crew quarters at NASA. Even Mark had to stay there, as the internet filled with conspiracy theories that he had "chickened out and passed the torch to his n—"

"I sometimes wonder if we'd be better off with alien overlords," he said sadly on the eve of her departure.

"Maybe I'll ask them to invade," Priya said. "If they aren't already planning to."

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Launch day. Priya rode the gantry elevator to the top, transferred into the Starship—named simply and appropriately *Envoy*—and strapped in. Practiced routine took over, and in what seemed like an eyeblink, the thirty-three Raptor engines lit, and she felt the entire stack shove her back into her couch. The low cloud deck flashed past, the sky turned dark, and within minutes she was in orbit, catching up with the fuel depot.

Refueling took the better part of a day, assisted by the crew of a regular Falcon mission. And in one more twist of the whirlwind, Priya lit the engines again and was off.

Didymos and Dimorphos were swinging back around toward Earth on their two-year orbit. Priya's velocity and their velocity combined to close the distance. This wasn't a transfer path, where she would sneak up on her target and slowly match course with it. This was going to be like a carrier landing, full thrust again at the end and hope her navigation was spot on.

When the outward burn stopped, she was moving at well over escape velocity. Not as fast as Hera on its flyby trajectory, but plenty fast. The Moon was visibly moving away, off to the side. Earth was directly behind her, seen only in the aft camera view, but receding like a marble dropped down a well.

She reported her condition as nominal and told mission control she was going to get a couple of hours of sleep. She put the radio in standby, turned off the internal cameras, unbuckled her safety harness, stripped out of her flight suit, and set out to find the nuclear bomb.

There had to be one. Probably just a suitcase nuke, only one or two kilotons yield, but that would be plenty to spoil Priya's day if some hothead in the Pentagon decided to set it off. And who knew what the aliens would do in response? They didn't seem to have cared much about a kinetic impact, but Priya guessed a nuclear weapon might just piss them off enough to respond.

It took her four hours to find it. It was in the equipment bay, disguised as an oxygen tank. She only discovered it when she realized that this tank wasn't actually plumbed into anything. It just had a wiring harness leading to a connector spliced into the main bundle.

"Cut the blue wire, or the red wire?" she asked quietly as she studied it. How would she have wired the thing if she had placed it here?

She certainly wouldn't have set it to explode during a power failure. So she reached out and pulled the connector apart.

There was no digital timer on the side of the tank. No androgynous voice calmly counting down her last few seconds. Even so, her heart pounded loud in her chest, and she could hear the blood whooshing in her ears. But aside from that and the ever-present air circulation fans that ran constantly on any crewed spacecraft, the ship was silent.

She had to rummage in the tool chest for a wrench to free the bomb from its bay, then wrestle it though the cabin to the airlock. It was about the size of a large beach ball, and she had a bad moment when it looked like the airlock door was an inch too small for it, but the nuke wasn't perfectly spherical. In the right orientation it fit in the lock with room to spare.

Which was a good thing, because the lock didn't have automatic controls. She had to suit up again and climb in with the bomb, then cycle the lock and shove the bomb out into space. She gave it a good kick with both feet, hanging onto the airlock grab rails as she did, and was happy to see it tumble away at a pretty good clip. "Okay, so I just violated the Outer Space Treaty on nuclear weapons," she said. "There were mitigating circumstances." Then she closed the airlock and went back inside.

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Nobody mentioned it, of course. It was possible nobody even knew, wouldn't know until they tried to power up their ace in the hole and discovered it unresponsive.

Weeks passed. Mark's condition improved, as Priya knew it would. Whatever he had done to give her the mission, he wouldn't have done himself permanent harm. In fact, she bet he hadn't done himself any harm at all. The flight surgeon had to have been in on it; all Mark had needed to do was swallow an emetic a few minutes before "waking up" and declaring himself dizzy, and that was that.

He became the capsule communicator, her link with the ground. They pushed the limit on

personal conversation amid the instrument checks and daily briefings. As the distance between Priya and Earth grew, the light-speed lag grew with it until they were waiting half a minute for replies, then a full minute, then two. Priya listened to Mark's choice in music, watched his movies, read his books, ate his food, marveling at how well he had anticipated her tastes. He must have studied her apartment with a magnifying glass to know her so well. If she ever doubted that he had thrown over his position on the flight for her, the dozens of bags of Peppermint Patties clinched it. He didn't even like them.

And Didymos finally rose out of the darkness. Another long burn of the main engines, a minor course correction, another shorter burn, and the familiar rock face drifted slowly up to meet her. At first Dimorphos wasn't visible, but as she drew closer it swung around from behind Didymos, a smooth ball one-fifth the size of its larger companion.

She was suited up and strapped into her command couch. If she crash-landed and split open the crew cabin, she would at least have air and time enough to investigate the dome, which was once again complete, or so it looked in the telescope view.

But the navigation computer performed flawlessly, matching her velocity with the tiny moon and bringing the ship to rest less than its own length away.

"I'm here," she said simply, knowing it would take almost a minute for the news to reach Earth and another minute for Mark's response to return. "Still no response from the inhabitants. I'm blinking my navigation beacon in prime numbers, but I don't see any lights on the dome. It looks like they've finished it. No sign of our impact. If we left a crater, the dome has filled it completely. Or maybe they—"

"We copy your arrival," Mark said. "Congratulations on being the first human being to reach an asteroid. Hold station for a few minutes and see if the dome builders respond. Try blinking your navigation beacon in prime numbers."

Priya laughed. Her voice came out ragged between panting breaths, and her heart felt like it was going to tear itself out of her chest. Now was the time the aliens would blast her into atoms if they were going to.

"No response," she said, not sure whether it was a report or a prayer.

The ship was drifting a bit. She could match velocity and hover a while longer, but she hadn't come out here to hover. "I'm going to land it," she said.

"Oh, you already thought of that," Mark said. "And no response. Somehow I'm not surprised."

She didn't so much land on Dimorphos as dock with it. The asteroid's gravity was almost negligible. She could probably have drifted up alongside and simply let the ship come to rest against it, except the spacecraft still had mass and she could shear off a thruster or an antenna before it stopped. So she swung it around and aimed the landing legs at the surface and brought it in slowly with gentle nudges of the maneuvering thrusters. Her windows all faced sideways and upward, so she watched the camera view. It felt like backing up a Prius.

The asteroid surface looked like a freshly groomed construction site, which was pretty much what it was. Small, shiny metal spider-like vehicles about the size of house cats crawled across the ground, scooping up loose regolith and carrying it to the hopper of what was probably a furnace that smelted the stuff into its metallic components. A pile of slag in back of the furnace confirmed her guess and somehow disappointed her, too. Shouldn't advanced alien technology be well beyond creating slag piles? Other spiders took foot-long ingots of metal from the furnace and carried them to the dome, where they disappeared into a tiny port that might have been an airlock or might have been a simple hole in the side of it. The dome that DART had destroyed hadn't been full of air; there was no reason to suppose this one was, either.

The spiderbots didn't seem to notice her approach. As she brought the ship in, one of them crept along directly beneath it. She slowed her descent until it had cleared the landing site, then accelerated again. She needed at least a couple of feet per second of impact velocity to activate the tethers.

Of course at the last moment the spiderbot swerved back directly beneath one of the legs, and the docking probe speared it like a ripe tomato. Then the probe sensed the hard surface

and fired its explosive charge, driving the two-foot spike right on through the spiderbot like a spear gun through a fish.

“Crap,” Priya muttered. “Here we go again with the unintended destruction of alien property.” But three green lights winked on in the navigation display. “At least we’ve got positive lock on the tethers.” She felt a bump as the reels pulled the landing pads tight against the rock.

She tried again with the navigation beacon and called a general hail on the radio, but there was still no answer. Mark said, “Looks good for landing.”

She tapped at the screen. “Shutting down navigation,” she said. “Inertial guidance off. Thrusters disarmed. Fuel pumps off. Accelerometer—oh, wait, let me get a reading. Ha! Five pointed one times ten to the minus sixth, just as we calculated. Are we good or what?” She continued down her checklist, and only after she’d finished the shutdown sequence did she realize she’d forgotten the history quote.

“Copy you down,” Mark said.

“Right. Um, yes, the *Envoy* has landed.” Brilliant.

She looked out the window toward the dome, narrating what she saw even though the cameras were seeing and recording even more than she could from her single vantage point. “Still no sign of awareness that I’m here. I see several multi-legged vehicles that I assume are construction robots crawling slowly from place to place. They don’t seem concerned that I just speared one with a landing spike. Sunlight is glinting off the side of the dome. It’s fairly bright, but the dome doesn’t look polished. Just shiny, like aluminum or steel that’s been freshly milled. No lights. I do see several round outlines that might be ports or windows or something, but they’re the same shiny surface as the rest of it. I see one rectangle about the shape of a door that’s solid black, like an opening to the inside. I assume that’s the entrance.”

She took a deep breath. Her heart rate had slowed down a little with the routine of landing, but it was edging upward again. “I don’t really see any point in waiting. I’m going to go check it out.” Before I lose my nerve, she didn’t say, but she was certainly feeling it. She thought she’d left her anxiety far behind, but now that she was here, literally only feet away from an alien artifact—and quite possibly aliens themselves—she could see swirling tracers in her vision and hear her breath coming ragged in her earphones.

“We’re getting infrared from the black rectangle,” Mark said. “But whether that’s heat from the interior or just absorbed sunlight, we can’t tell. It’s black-body radiation, no spectral signature.”

“We’ll find out soon enough what it is,” Priya said.

She unbuckled and twisted around to the cargo lockers. Her suit had two video cameras built in, but she also picked up her phone, which she kept charged for recording her personal journal. And from down in the bottom of locker twenty-six she pulled out the cardboard disposable camera. Thirty-six exposures on good old Kodachrome film. Even if the aliens pulled a Jodi Foster on her and wiped out her digital data, there was at least a chance that they wouldn’t know about photographic film, nor how to fog it.

Of course winding the little buggie with spacesuit gloves could be an exercise in frustration, but she’d practiced it a dozen times back on Earth and managed to make it work.

She tucked the phone and camera into leg pockets. “Okay,” she said, disconnecting her suit from the ship’s air supply and pulling herself up to the docking hatch atop the capsule. “I’ve got eight hours of oxygen if I don’t hyperventilate. I’ve got cameras. Radio is working. I’m as ready as I’ll ever be.”

She twisted the handle and pulled the hatch inward. Pulled herself upward into the airlock.

Mark said, “The olive branch! Don’t forget the olive branch!”

“Oh, holy . . . right. The olive branch.” Priya pushed herself back down into the cargo bay and opened locker twenty-six again, rummaged around until she found the freeze-dried peace offering in its vacuum-sealed bag. It looked surprisingly good after its months in storage, but Priya wondered how much of that was the fact that this was the only sign of life on board other than herself. She swallowed a lump in her throat and said, “Olive branch, check.” It was too big for a pocket, so she tucked it under one of the suit’s waist straps.

She pulled herself back up into the airlock and tugged the hatch closed after her. "Up" being a more or less visual referent than anything else. She opened the valve that let the air out, feeling her pressure suit stiffen as it did. Her breathing seemed to become even louder than before, but she hoped that was only because she'd lost the ambient sound from the ship now that there was no air to transmit it.

She clipped the end of her tether to her waist, then popped the outer hatch and swung it outward, following it until she was half out of the circular ring. This was more of a spacewalk than a surface expedition. There would be no walking over to the dome. The first step would launch her into orbit, or possibly escape velocity.

"Heart rate's one-twenty," Mark said. "Take some deep breaths."

He was reacting to her telemetry while she was still in the airlock. She was up to one-fifty now. Deep breaths were probably a good idea.

She closed her eyes. Imagined sitting on a couch with a fuzzy kitten in her lap. Purring.

Back down to one-thirty. Okay, that was probably as good as it was going to get. On down the side of the ship, handhold over handhold. It was a long ways down. She reached the ground and planted her feet on it, holding herself down with both hands on the rung at waist height, and this time she remembered to say, "We come in peace, for all mankind." A stolen phrase, but there was nothing more appropriate to say at the moment. She just hoped any aliens listening understood what she meant, and cared.

She looked across the thirty feet or so that separated her from the edge of the dome. The far side of the dome was actually beyond the horizon. "I feel like *Le Petit Prince* here," she said. "The horizon is about fifty feet away. And the *Envoy* is even bigger than a baobab."

She hooked a carabiner to a loop on the landing leg and slid her tether into it, then pulled out several dozen feet of slack. She was going to have to float across to the dome, and she wanted to make sure she could pull herself back to the ship if she missed. From a pocket she retrieved a magnet with a big T-handle. It wanted to pull her around toward the bolts in the landing leg, but she turned away.

"Okay, here goes," she said, just as Mark said, "Amen to that."

She ignored him and positioned herself so her feet were up against the landing leg and her body was horizontal to the ground, then very gently extended her legs.

The robot-scraped regolith slid past just a few feet from her face, coming closer. She had angled a little too steeply toward the ground. She reached out and touched the surface with her fingertips, just barely, and her angle changed by a few degrees. Too high now, but the dome was tall enough that she would still hit it. Question was whether there would be anything to grab when she did.

She watched her own distorted reflection grow larger. She reached forward with the magnet and waited for it to pull her in, but instead the magnet just hit the surface and bounced away. "Okay, not magnetic," she said. She looked frantically for a handhold, a ridge, a tunnel, anything she could grasp, and found a set of criss-crossing flanges about half an inch high. Too small to get a good grip on with her gloved hands, but enough to pinch between thumb and forefinger and bring herself to a halt.

"I think these must be the tracks the spiderbots use to crawl around on the surface," she said.

Very carefully, she pushed herself down the curve of the dome until she was at the base of it, then she pulled herself around to the black rectangle. It was so black she couldn't tell if it was a solid thing or a hole into a pitch dark interior. It was about twice her height, and just about half that in width. She reached out tentatively and encountered resistance. Solid, then.

There was a yellowish loop sticking out about halfway along its long axis, near the left edge. She twisted around to get a good look at it.

"It's a door handle. With a thumb latch. Looks like brass." She reached toward it with the magnet, and it didn't stick. "Not magnetic. I bet it's brass." She laughed out loud. "It's a friggin' brass door pull."

She grasped the handle and steadied herself, then banged on the door with the magnet. It

left no mark, and she heard no noise.

“All right, I’m going to try it.” She pushed down on the thumb latch and pulled on the handle, bracing herself against the side of the dome as she did.

The door swung open. It was way thicker than a normal door, about a quarter of its width. Something about the dimensions triggered a memory, and she laughed again. “It’s a monolith. From *2001: A Space Odyssey*. The dimensions are one-four-nine, the first three squares.”

Mark said, “Copy your successful transfer. You’re go for ingress if you can find an entry point.”

“I’ve found it, you numbskull,” she muttered, but she was smiling. Smiling and hyperventilating at the same time. Her suit flashed a warning. Amber, not red. She held her breath until it went away.

Lights blinked on inside the dome, long glowing strips overhead illuminating a corridor that led straight inward. “Okay, now we’re cooking,” Priya said. “That’s the first indication we’ve gotten that they even know we’re here.”

Her vision was shot with tracers again. She had to take a few more deep breaths, close her eyes, and envision an entire basket of kittens. Then she pulled herself inside.

Her tether trailed in after her. Hmm. If the door closed behind her, it would snip the tether. Not good. She wasn’t eager to unclip it, but there was a convenient loop just outside the door that seemed obviously made for the purpose. So she unclipped, latched the tether to the loop, and pushed her way on inward.

“You still receiving?” she asked. It was a long two minutes, but she waited until Mark said, “Still copy you. Leave the door open, though.”

“Ya think?” She pulled herself forward. The corridor was narrow enough that she could put a hand on either side and pull herself along.

She was about thirty feet in when the light changed. She looked back to see the door swing shut. She didn’t hear the boom, nor feel it, but she was pretty sure it had closed solidly.

“Mark, do you copy?”

Air rushed in. Her suit lost its rigidity. “If it’s all the same to you,” she said, looking around at the bare metal walls, “I’m going to leave my suit on.”

She pushed onward. Mark didn’t reply. Mission control was probably going nuts about now, but Priya wasn’t about to retreat to the ship just to ease their anxiety. She was going to have to explore the dome sometime, and she was already here, so they could just wait for her report. Or for the aliens to throw her body out the door.

The corridor ended in a large hemispherical room. It looked as empty as a balloon, but as she pulled herself in and oriented herself to stand upright against the flat metal floor, a column of light flickered into being in the center and filled out to create a hologram of—Santa Claus?

“You’ve got to be kidding,” Priya said.

A soft, yet resonant voice said in her headphones, “Yes, actually, I am. I’m hoping to calm you down. Your vital signs are borderline dangerous.”

“Tell me something I don’t know.”

Paintings and tapestries appeared on the walls. Furniture materialized: A comfy couch, a low coffee table with magazines on it, a kitchen table and chairs. A window opened up onto a forest with birds and butterflies flitting about.

And the floor slowly became a floor. The asteroid was either under thrust to somewhere or the alien had turned on artificial gravity. It stopped at about a quarter normal, just enough to let her stand upright, but not so much that she would be uncomfortable after her long flight in zero gee.

“Does that help?” the red-suited hologram asked.

“A little,” she admitted. “But I’m not exactly comfortable talking to a childhood myth. Can you show me your true form?”

“My true form now is a tangle of circuitry and quantum gates. But in the very distant past . . .” Santa began to blur and shift, losing the beard and the garish red coat to become a green-and-purple upright cylinder with a tuft of yellow fronds waving like palm leaves from the top. Half a

dozen tentacles stuck out at seeming random from the central body, and dozens of smaller tentacles held the base of it off the floor. It might have been a tree, or a sea anemone, seen through a waterfall.

Priya gulped. She'd asked for it.

"Mind if I record this?" She held up her phone.

"Go ahead," said the alien. It held its tentacles out to the sides in what might have been a welcome.

She activated the phone's video camera with the stylus nub on her little finger, held it out aimed at the alien, and got out the disposable camera with her other hand. There was no way to be sneaky about it, so she just snapped three shots and tucked the camera back in her pocket.

Then she said, "First off, just so we're clear, the impact that destroyed your previous outpost was a mistake. We didn't know you were here. We're sorry for the damage." She took the olive branch from under her suit's waist strap and held it out. "This is a symbol of peace among the people of Earth. We offer it in the hope that we can coexist."

The alien's skin rippled slowly from bottom to top. Its voice remained that of a patient old man. "Thank you. That's very kind, and appreciated. We can definitely coexist." It glided forward on its writhing foot tendrils and reached out with two of its upper tentacles for the plastic packet, and Priya was surprised when the packet left her hands and moved across the room with the hologram, who placed it on a shelf that flickered into being as it approached.

The alien turned back to Priya and said, "You'll be wanting to know if we're hostile or benevolent or what. We're mostly benevolent. You've got a very dirty Solar System, with way too many asteroids in way too many eccentric orbits. We've been redirecting them from impact trajectories for about forty million years. Too late to save your dinosaurs, and I have to apologize for Tunguska and Chelyabinsk, but we've been pretty successful overall."

Priya felt a shiver run down her spine, but it was a shiver of delight. "I knew it," she said. "The number of binary asteroids in Earth-grazing orbits is way out of line with the rest of the population. And they all miss Earth by millions of miles. The odds of that happening by accident were almost zero."

The alien rippled from the base upward again. "I was wondering when someone would see that. You're right on the cusp of figuring out a lot of things. When you do, there's a whole Universe waiting for you."

Priya's arm was growing tired even in the low gravity. She switched the phone to her other hand. "What kind of universe are we looking at? Are we talking *Star Wars* here, or *Star Trek*, or *In the Ocean of Night*, or *2001*, or *Contact*, or what?"

"Definitely 'or what.'" The alien waved its tendrils around. "The distances involved are far too great for the creation of empires. If faster-than-light travel is possible, we haven't figured it out yet. Even trade is mostly done by information exchange. You're going to get visitors every now and then, but not often, because the galaxy is a big place and spacefaring species are few and far between. But curiosity is probably intelligent life's strongest trait, so you'll find young civilizations exploring their neighborhoods." The alien paused and gave a little shiver. "They're not always benign. The last ones through were about two thousand years ago and were kind of jokesters. I reported them, and they're probably still busting rocks on Ceti Alpha Five, but that doesn't really help you a whole lot."

Two thousand years ago. Priya didn't know whether to laugh or cry. What would happen when people heard about this on Earth? They wouldn't believe her, not even if her recordings remained intact. They couldn't afford to.

She said, "Mission control is probably going crazy by now. I've been out of contact for what, ten minutes? Can you relay my video and audio to my ship so they can listen in?"

The alien twisted its upper body left and right. "Sorry, no. I can tell you anything you want to know, within reason, and you can record anything I say, but I'm forbidden to broadcast directly to your planet. Or to visit it. That seldom works out to anyone's advantage."

"So it's all on my shoulders and nobody is likely to believe me."

“Correct. Understand that we’ve done this many times before throughout the Galaxy, and we’ve learned that as frustrating as this may seem to you, it’s the best way to avoid inadvertently damaging your society. Merely discovering our existence is often fraught with danger, but that much is unavoidable when you reach this stage in your development.”

“Could I at least go outside and tell them I’m all right?”

The alien rippled upward again. “If you wish. It will take a few minutes to pump the air away.”

Priya heard the thrum of the pump starting up.

“A pump?” she asked. “No force fields holding the air back?”

“Air is slippery. Pumps are more reliable.”

“Why not an airlock, then?”

“Because the pump works well enough.”

She nodded. Okay, aliens would have different ideas about what was important and what wasn’t. If this was the extent of the weirdness, it was pretty insignificant.

“Sorry to put you out,” she said. “I just don’t want them to worry.”

“I understand. It’s actually very thoughtful of you.”

She wanted to sit down, but the couch wasn’t shaped right for her spacesuit with its life-support backpack. So she settled for leaning against the wall with her legs at an angle. Friction held her in place, and she could loosen up her tight muscles for a minute or two, at least.

“Do you have a name?” she asked. “I’m Priya.”

“You’re going to laugh. I’m—” a hissing sound with a pop and a click at the end. “*Ssspok*.”

She did laugh. “You’re kidding me. Spok?”

“Unfortunately, yes. Mr. Rodenberry must have hit upon it independently. There was nothing I could do about it.” The alien made a sort of sideways twist, the way a person might wring out a washcloth. A shrug? “I can at least spell it without the ‘c.’”

Priya could feel her pressure suit expanding, and the sound of the vacuum pump was growing weaker. But she still had a couple of minutes.

“So, Spok without a ‘c,’ are you an artificial intelligence or an uploaded personality or what?”

“I’m not an artificial intelligence. That would be very bad. A word of advice: don’t go there. There aren’t many rules for emerging civilizations, but that’s one of them. If you create artificial intelligence, we make you stop. Understood?”

Priya swallowed hard, then nodded. “Yeah, but again, I’m just me. If you won’t communicate directly, I can’t promise anything about the rest of the human race.”

“Just make sure the word gets out. If the rest of your people refuse to heed the warning, we’ll shift to plan B.”

Priya remembered the congressional hearing. “The world’s being run by idiots and billionaires,” she said. “If you’re counting on wisdom or caution to win out, I think you’re expecting too much of us at the moment.”

“It’s surprising how motivating plan B can be once it’s begun.”

“I suppose you’re not going to tell me what it is.”

“Correct.”

She could barely hear the pump now, and her suit felt about as tight as it had on the way over. “Ready to blow the hatch?” she asked.

“Almost,” said Spok. “Another minute.”

She shifted her position against the wall. “So if you’re not an artificial intelligence, then what are you?”

“I’m a biological personality, recorded and held in storage to await your arrival here.”

“And you’ve been here forty million years?”

“Yes.”

“Without going crazy.”

“The subjective time has been much less than that. I’ve been inactive for most of it. And there are copies of me on several other shepherd asteroids, so we act as corrective feedback

for one another.”

“Is this something you can do with a human mind, too?”

Spok made the twisty shrug again. “In theory, yes. It would take some calibration of the equipment. Your brains don’t work the way mine does. Or did. But that’s undoubtedly one thing that will come with further contact with other civilizations.”

The gravity slowly diminished. Priya straightened up, holding onto the doorframe to keep from drifting up to the top of the dome. “Hold that thought. I’m going to go check in.”

She pulled herself down the corridor to the black monolith door.

“Hold onto the handle,” Spok said, his voice as strong in her headphones as when she was in the room with him. “There will be residual air that will blow outward.”

“Right. Thanks.” She grasped the handle—the same brass loop with thumb latch as on the outside, and pushed the plunger. Sure enough, the door swung open, drawing her out with it, and swung her around in a tight arc. The door banged up against the side of the dome, and she banged into it a moment later, clutching the handle for dear life. Different ways of doing things, for sure. A cloud of dust blew outward toward the horizon. She waited for it to dissipate, then righted herself and clipped her tether to her suit.

“Houston, this is Priya. I’m outside again. Everything is fine. I’ve met the . . . the intelligence that runs the place, and I’ve established that it’s not a threat. Quite the contrary; it’s been protecting us from asteroids for forty million years, deflecting them a way from us, not toward us. I’m going back inside to learn more about it, but first I want to—”

“Calling *Envoy*. Come in *Envoy*. Priya, can you hear me?” Mark sounded frantic.

“—to upload the video I’ve taken so far. Hold on.” She set her phone and suit cameras to upload to the capsule, where the video would be automatically relayed to Earth.

“I’m likely to be inside for a while longer this next time around. The alien says it’ll answer my questions, so I’m going to ask it everything I can think of. So don’t worry if you don’t hear from me for a few hours. I’ve got plenty of air in my suit, and Spok—that’s what it calls itself—can pressurize the dome for me. I—”

“Priya! Thank God you’re okay. When your signal cut out like that we feared the worst.”

“It’s far from the worst.” Priya looked up at the stars, and over at Didymos just half a mile away. It was a rocky wall covering almost a third of the sky. If Spok and its robots could turn Dimorphos regolith into building materials, she was pretty sure humanity could do the same with Didymos. And there was a lot of Didymos there to turn into habitat, and spacecraft, and power satellites, and who knew what all.

She looked back to the dome. Inside was a being whose sole purpose was to look after humanity’s best interests, and it wasn’t some mystical fantasy that she had to take on faith. Rather it was a real being, with real capabilities and real knowledge that it was willing to share. Maybe its original manifestation, as Santa Claus, had been more appropriate than she’d realized.

“Oh yeah,” she said, smiling, “It’s about as good as we could ask for.”

Jerry Oltion would like to thank Trevor and Emily and the rest of the Analog crew for expediting this story so it would see print before the DART mission whacked the asteroid in real life. The target date is September 26th, which will probably make this the fastest-obsolete story in the history of science fiction. Or perhaps the most prophetic?