Next Stop: Mars

Skyler Kleinschmidt

Story bit her lip, staring at the object in front of her. It sprouted tenaciously from the ground, was thin and green, and it was covered in a fine layer of gritty Martian dust. She reached out, and, 140 million miles away and a few minutes later, a robotic hand gently brushed the dust off the plant, which had been genetically modified to grow in the inorganic regolith of Mars. With Mar's surface atmospheric pressure almost 60 times less than that of Mt. Everest's peak on Earth, the robot Story was controlling lived and worked in an inflatable greenhouse on a world alien to her own. Story gazed down the row, where the defiant streaks of green stood in stark contrast to the rust-red surface which had not been paired with the color in millions of years – perhaps not ever. The greenhouse sheltered the burgeoning life from the worst of the Martian climate, with a higher pressure, more stable temperature, and increased humidity than was possible otherwise.

"How does it look, Story?" asked a voice in her ear.

"It looks fine, Dr. Kerman," she replied into her headset. Sitting just a few feet away, Dr. Gene Kerman was also taking part in the immersive virtual reality that was the human-robot interface for the Mars base. "It looks like Stanley is kicking up dust on the seedlings as we move around tending to them, though. I don't know if it will block too much sun. Do we want to maybe swap Stanley with another robot from another module?"

"Let's just take it slower with Stanley for now, and set up an experiment. We'll keep all but a few plants dust free, and see if the coated ones suffer any ill effects. Plus, the other robots are on a tight schedule to construct the other base modules. We just had another 3D-printed module land yesterday."

The 3D-printed habitats came from bases set up on Phobos and Deimos, Mars' two miniature moons, which Story could occasionally see flit by above. Phobos, 3,700 miles in altitude over the Martian surface, orbits Mars almost three times a day. Deimos, at over 14,000 miles in altitude, took slightly longer than a Martian day to complete its orbit. The two moons were named after the two sons of the Greek god of war, Ares. Phobos and Demos meant "fear" and "terror," but Story never saw the diminutive satellites as anything but fascinating. The two moons were probably captured asteroids, composed of rock rich in carbonaceous material. Mining robots, using counter-rotating drums at opposite ends, were able to gain purchase in the low-gravity environment of the moons and collect regolith. It was then possible to process the material using massive ovens, powered by solar panels, to generate material that could be heated until molten and extruded to 3D-print large shapes. The abundance of water in the carbonaceous material meant hydrogen and oxygen, two necessary components for rocket fuel, could be harvested with solar energy to power electrolysis. The breakthrough that would accelerate Mars development was removing the need to ship large things like heat shields, habitat modules, and fuel tanks to Mars from Earth's surface. With 3D printing of large, relatively simple parts possible, the only things needed from Earth were small, exotic, and complex, like people, computers, and seeds.

"It's entirely possible that you'll end up on Phobos or Deimos, Story," Dr. Kerman said. "Instead of having to simulate a movement, then waiting four to twenty-one minutes, depending where Mars is in

its orbit in relation to us, for a robot to perform that movement, you'd be able to operate with nearly zero delay. Now that the 3D printers are up to full speed, progress on the human-habitable bases on the moons should be rapid. Plus, it takes less fuel to get to a Martian moon and back than it does to go to our own moon and back from Earth. Now that we can fuel up at a convenient location, the crewed missions are much closer to taking place."

"I'm still glad we're starting on the first Mars base before any of the moon facilities are human-ready, though," replied Story. "These are amazing systems, but aren't perfect. I think it's smart to work out all the teething problems and get valuable experience this way, plus, we need as much lead time as possible for the plant growth experiments. I still can't believe I'm one of the people pioneering space."

"Yes, there are so many unknowns with something that's never been done before," agreed Dr. Kerman. "The time delay of interacting with our robots is helpful in this case – it teaches us to be patient, plan our moves, and stay calm when reacting to something. Without having time to identify previously unforeseen risks, it would be difficult to come up with ways to mitigate them, especially when astronauts are involved. We always have to look beyond the predictable outcomes."

Having reached the end of her row, Story performed the motions that would take Stanley the robot back to its charging station. Already she was thinking of the next day's tasks and how best to approach them. With a ready supply of fuel and raw material now in place, the pace of development of the Mars colony was about to explode.

One day, perhaps, Story would set foot in the very Mars habitat she helped prepare, signifying humanity becoming Earth independent and inspiring generations to come.