PROLOGUE

L-4: AGUINALDO—5 Years Before Day 1

He thought the experiment would work, but even if it failed, he knew he could bluff his way through. The Filipinos held their Dr. Luis Sandovaal too much in awe for them to doubt anything he did.

Sandovaal ignored the crowd around him. President Magsaysay stood quietly by the airlock, along with the rest of the Council of Twenty. Sandovaal stared past the group, past the habitats and experimental fields, and gazed instead upon the sweeping curve of the cylindrical colony's far side, where Filipino children played floater-tag in the zero-G core.

Sandovaal's whole life revolved around success: taking outrageous chances, working long hours until he felt absolutely sure his experiments would prove out. Admitting to being only "second best" seemed as bad as conceding defeat. The field of applied genetics evolved too fast for stragglers.

That had always made it necessary for Sandovaal to take certain … *chances* … with his bioengineering research so he could remain the best, the most innovative. He had come to carry on his researches at L-4, the gravitational stable point 60 degrees ahead of the Moon in its orbit, four hundred thousand kilometers away from Earth—where the rest of the planet would be safe in case anything went wrong.

That self-imposed exile had proven a blessing, giving him unlimited academic freedom and free reign to direct his own research laboratory on board the Filipino colony *Aguinaldo,* the largest of the three human stations at L-4 and L-5. The Filipinos were proud of his presence there, to the point of designating him the colony's chief scientist.

Sandovaal drew himself up to his full five-foot stature and spoke to the crowd in front of the airlock. With his blue eyes and shock of white hair, he didn't look much like the other *Aguinaldo* inhabitants.

"President Magsaysay, distinguished senators. Today the *Aguinaldo* is a mere shell of what is to come. Generations from now the empty fields behind you will be filled with our children's children, and because of the design of our colony, living space will still be plentiful.

"But adequate living space does not imply that there will always be room for growing our food. Plants need open area to grow—area that will be at a premium several years from now. People will not be willing to live in crowded conditions so that their food may flourish. But I have discovered a solution. Although the *Aguinaldo* may be limited in its area, there is a way to tap an *infinite* amount of space in which to grow the crops that can sustain us."

President Magsaysay gave the hint of a smile. "Good, Luis. The Council of Twenty are all proud of you and your accomplishments." He swung an arm around the airlock bay. "But why did you bring us out here, away from your laboratory?"

Sandovaal nodded to his assistant. "Dobo, prepare to eject the organism." It was a hybrid that combined the nervous system and motor capabilities of a Portuguese man-of-war jellyfish with the cellular structure of a plant—a transgenetic organism that extended Sandovaal's research beyond the simple wall-kelp that was even now supplementing the feed for their small population of animals.

Sandovaal turned his attention back to the Council. "This problem concerned me for some time. I tried several ways of genetically forcing plants to become denser, use less light, so that they would not take up so much room. Then I realized that we have all the space and light we need outside the *Aguinaldo."*

Dobo Daeng ran his fingers over the control panel. A green lightcell changed to red. Sandovaal motioned the Council of Twenty

to the viewport. The Filipinos murmured questions in low voices and crowded next to Sandovaal as they peered out the large crystal port. Sandovaal gave a smug smile.

"I have genetically altered this animal to have a dominant survival characteristic that takes advantage of its plant attributes. When it is exposed to a vacuum, the organism will increase its surface area. This allows it to capture more light and increase its ability to photosynthesize. Implanted mineral packets will allow the creature to grow—"

"In a vacuum?" interrupted Magsaysay.

"Yes. That is the point, Yoli. If this proves successful, our next step will be to have this organism grow outside. *Outside!* Think of the food source we could harvest."

Sandovaal pushed through the Council of Twenty and moved right up to the viewport. The organism's cigar-shaped body floated out of the airlock attached to a long tether. Stubby "wings" extended from either side of the meter-long body; lights outside the airlock illuminated the creature. It spun slowly as the line played out.

"By tomorrow the creature's wings will have grown several centimeters. And in two weeks, they will extend for meters. If it survives that long."

Sandovaal pressed his lips together and waited for the accolades. Magsaysay clasped his shoulder as the Council of Twenty nodded among themselves.

Sandovaal did not stay to participate in the political small talk. He had much more important tasks to attend to. He strolled back to the bioengineering lab modules, muttering to himself.

Sandovaal ignored the regular day/night schedule imposed by rotating shutters on the lightaxis. He worked until he had exhausted himself, realizing after several hours that it was Sunday and he could not expect his assistant Dobo to arrive, since Dobo's wife would insist on attending Mass and relaxing with him. Sometimes Sandovaal didn't understand other people's priorities.

He returned to his own quarters and slept for little more than an hour before the insistent ringing of the door chime brought him awake again. He slid open the door, rubbing his eyes and automatically snapping at the short, florid-faced man waiting for him.

"Dobo, why can't you—"

But Dobo seemed agitated and cut off Sandovaal's words. The mere fact that his assistant would dare to interrupt brought Sandovaal to silence. "Dr. Sandovaal, you must come to the viewport end! Quickly! Something strange and wonderful has happened. Perhaps you can tell us what it is. The others are gathering there."

Dobo turned and hurried back to his waiting jeepney before Sandovaal could say anything. His curiosity piqued, Sandovaal joined him. As they drove, he could see other Filipinos jetting or pedaling their way across the core to the cap on the cylinder. After parking the jeepney with the other vehicles at the wall, Dobo cleared a way through the crowd for Sandovaal.

Pressing his face against the hexagonal quartz sections, Sandovaal stared in astounded silence. He saw the familiar sea of stars, the glints of nearby debris at L-4, where the first superstructure for the new station *Orbitech 2* was under construction, the great glare of the gibbous Moon.

But he also saw a giant, translucent wisp of material covering part of the viewport. It seemed extraordinarily thin, yet extended for kilometers. Fragments hundreds of meters across tore away due to the colony's rotation and hovered in the L-4 gravity well, where they would drift under pressure from the solar wind.

Many other people watched the flimsy material, fascinated, possibly frightened. Some looked toward Sandovaal, as if expecting him to produce a comprehensive answer after only a simple glance. He saw President Magsaysay alighting from a jeepney.

Sandovaal turned to Dobo. "Well, has anyone thought to have a piece brought inside for analysis?"

When Sandovaal did complete his inspection in the laboratory—with Magsaysay and some of the senators from the Council of Twenty breathing down his neck—he discovered that the transgenetic organism had grown far beyond even his wildest estimate.

Months later, in a simultaneous announcement to *Nature* and the *New York Times,* Dr. Luis Sandovaal presented his discovery. The original creature looked not unlike a manta ray. It puttered around, swimming in the zero-G core, eating small amounts of wall-kelp and photosynthesizing, completely innocuous. But when ejected into the hard vacuum of space, it underwent a drastic survival measure—a transformation in which its volume expanded to maximize surface

area. The tiny flippers in the body core crushed down and smeared out into a layer only a few cells thick. This let it absorb as many solar photons as possible for photosynthesis. The end result was a beautiful, but thoroughly impractical wing-like body spanning scores of kilometers: a giant organic solar sail that could live on its metabolic reserves for perhaps weeks.

Sandovaal did not admit that he had failed to produce a radical new food source—the tissue proved too thin to be of use—but instead played up the basic discovery in the field of transgenetic biology.

The Earth press and intercolony communications dubbed the life-forms "sail-creatures." Sandovaal would have preferred something more elegant, but the name stuck.

CENTER FOR HIGH-TECHNOLOGY MATERIALS ALBUQUERQUE, NEW MEXICO

Colors rippled as Karen Langelier tuned the laser to a different wavelength. The color jumped as it locked onto the new material's resonance structure, glowing a deep red. A long, thin liquid strand of phenolic began to crawl up the beam. She pressed the laser goggles against her high cheekbones to lean over the vacuum vessel. Afraid to breathe, she watched as the phenolic drew out, thinner and thinner, approaching the limit of visibility.

Just as she began to adjust the probe, the delicate strand broke. Globules of pulsating bubbles crashed into each other throughout the vessel, striking the walls.

"Damn!" Karen turned from the vacuum vessel. "Three strikes and I'm out today!"

The new article in the *Online Review of Scientific Instruments* seemed clear enough—laser filamentation was a well-documented process, known for decades. She had arranged the experiment to duplicate the test conditions. It wasn't like she was new at this, either. Maybe there was some problem with the phenolic she had used.

Karen knew she would be a grouch tonight when she got home, and Ray would probably spend the evening talking about the cases