

# Arecibo Mon Amour

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## **Wurdi Youang / Actual minus 12,000 years**

She gave up her name long ago. It was too heavy to carry as deep into the Dreaming as she wanted to go. She missed it at first, but everyone who knew her by that name is dead now, and it amuses her when others call her the Old Woman behind her back. At some point, she really ought to tell them that being partly blind doesn't affect her hearing...

Footsteps crunch on the gravel bank behind her. She sighs as the trout she was trying to catch darts away. "Who's there?" she asks, the river caressing her knees as she turns.

"It's Wharru," the young man says. "There's a stranger in camp." He is one of the new arrivals, still thin and angry after his long trek from the drowning lands. His clan lost their farms to the ever-rising sea, and many were killed or enslaved. It will be many years before he is ready to let go of that weight, but he has helped her realign some of the stones without complaint and doesn't snore or fart as much as some.

"From down below?" she asks, sloshing through the river to join him.

"I don't think so." Wharru hesitates. "He's not like any real people I've ever seen. Alinta thinks he might be a bad spirit."

"Feh." The old woman picks up the walking stick and skin bag that are half of everything she owns. "Alinta thinks *everyone* is a bad spirit. Come on, let's say hello."

The stranger isn't in camp. "I told him to wait for you," Alinta says, her voice as sharp as the stone knife in her hand. "I told him it's a powerful place, you shouldn't go there without her, but he didn't listen." She sets her knife aside, grabs the gweela's feet with one hand, and pulls hard with the other. The bird's skin comes off with a sound that makes the old woman's stomach turn.

She sighs to herself. The half-dozen people doing chores within earshot have paused to listen to Alinta. They will follow her when the old woman dies, and in her heart, she knows that will be the end of the stones.

She jerks her chin at the dripping carcass in Alinta's hands. "Enough there for company?"

Alinta scowls. "Hardly enough for *us*."

"Well, do what you can." She digs her elbow into Wharru's ribs. "Come on. Let's go see what this evil spirit wants."

They walk side by side through the long shadows beneath the gum trees. The old woman has been going up and down the mountain for almost thirty years, and takes quiet pleasure in

thinking that the packed earth is echoing her own footsteps back at her. Crickets and songbirds fill the forest with sound, and once something larger rustles the bushes. Wharru hefts his spear but the old woman pushes on. A thylacine wouldn't attack two people together, and no one has seen a marsupial lion for years.

They reach the field of stones just as the sun is about to kiss the horizon. Only a few scattered clouds mar the sky's perfect blue; if the stranger wasn't there the old woman would have Wharru sight along the stones for her and mark new positions for them.

But the stranger *is* there, and even half-blind from years of looking too closely at the sun, the old woman thinks that for once Alinta might be right. He is taller than anyone she has ever seen and completely hairless. An angry young scar mars his left temple, rough and red against his near-black skin. When he turns, she blinks. His little man is as small as a baby's and he has no bag at all that she could see.

She clears her throat to greet him, but before the words leave her mouth he says, "It does not measure well enough."

Wharru stiffens beside her. "Show respect," he says sharply.

She puts a cautionary hand on his arm. "What do you mean, not well enough?"

The stranger gestures at the oval of basalt that the old woman has spent a lifetime assembling. There are one hundred and twenty one stones, each with a name known only to the old woman and whoever helped her place it. She could pick some up one-handed, but others took two people and a wooden travois to move, and the waist-high trio at the oval's sunset end had been a year of hard work.

"I need to know." The stranger blinks rapidly several times. "This language does not have the words. I need to know a moment." He gestures at the scar on his head. "I can only be heard at some moments, but I am damaged. I do not know when those moments are any more. I must add to find them. I need to measure to add, but this does not measure well enough."

The old woman clucks her tongue. "I don't understand. Do you want to add a stone?" Is part of his spirit lost in the Dreaming? She has seen it before. A man was struck in a fight. When he woke two days later he moved slowly and was confused by the simplest things.

The stranger shakes his head. "No. 'Add' is not right. This language does not have the words." He sounds almost petulant. "I need to count the spaces between the stars to know when I can be heard. What you have built does measure well enough. It is of no use."

"It is of great use!" Wharru says hotly. "It tells us when the seasons will turn and what path the moon will take!"

The stranger does not reply to that. He just looks at the old woman. *He knows*, she realizes with a shock. He knows the same thing she knows, that there are patterns in the stars and the lights that wander among them, and that those patterns *mean* something.

"I must look elsewhere," the stranger says abruptly. With nothing more than that he starts to walk past them.

Wharru catches his arm. "Are they all so rude where you come from?" he demands.

"Wharru, don't," the old woman protests, but the young man ignores her. He fought and killed on his way to the mountain, and in that sunset moment she can see his sorrows in the way he shifts his weight, readying to strike a blow.

But that blow never comes. With a rasping roar, the lion that had crept closer while they were distracted bursts out of the trees behind them.

The old woman screams as it knocks her to the ground. A dazzling pain shoots up her spine as her hip breaks, then something cracks and the lion goes limp. The stranger has broken its neck with his bare hands as if it was a dry twig.

Wharru runs ahead to get help while the stranger carries the old woman down the mountain as if she were a baby. She passes out several times, only to be dragged back into the world by the agony in her hip. "Who *are* you?" she asks in a moment of lucidity.

The stranger glances down at her. "I don't remember." When they reach camp he sets her down gently and walks away without another word.

*Later, Alinta pokes at the lion's protruding ribs and says it must have been desperate with hunger. It is the last one they ever see—the last one anyone\* ever sees. She makes a cloak from its pelt, but it is lost in a fire many years later. The old woman lives another season, but is never able to go back up the mountain to look at the sky. She wonders sometimes who the stranger was and whether he ever found a way to count the spaces between the stars.\**

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### **Chankillo / Actual minus 3400 years**

As a child, Second Bird's diet consisted of maize, beans, the occasional roasted guinea pig, and his grandfather's stories. The First People rose up against the highlanders' god-king many times. Each rebellion ended in death for some and ever-harsher conditions for the rest.

"So we *learned*," Fast Rock says, grunting as he turns over a spadeful of damp soil. Clearing irrigation channels is slow, slippery, back-breaking work, but Second Bird doesn't mind. Other chores are just as hard, and he secretly enjoys his grandfather's stories.

Fast Rock drives his spade into the ground again. "The trick was," heave, "We all had," heave, "To rise," heave, "together." He pauses to wipe sweat from his brow while Second Bird drags the reed basket of soil out of the way and pushes an empty one into place.

Without warning the ground shakes. Ripples dance across the flat stinking water in the irrigation channel. Someone shouts a warning nearby. Someone else screams.

“Grandfather!” He grabs Fast Rock’s outstretched hand and pulls the old man out of the channel. The spade whacks his shin. He will realize later that it cut him, and will go back and burn herbs to cleanse the ground where his blood spilled, but at that moment all he can think is, *The world is ending.*

Dry soil loosened by the earthquake slumps into the canal, undoing a day’s work. Fast Rock stares at it for a moment, then curses. “Come with me!” he orders, setting off toward the village at a trot.

“Where are we going?” Second Bird asks, running after him.

“The evil one,” Fast Rock says grimly. “He must not escape.”

Every handspan of green land was a gift from the gods. Even the highlanders understood that, and built their villages where the green ended and the hard dry desert began. Most of those villages are home now only to wild animals and ghosts. Second Bird has ventured into the one nearby on a dare, marveling at the carved stones and at streets wide enough for six people to walk side by side. He has never gone to the center, though. Only the old men go there, and even they only go in pairs.

A building has collapsed, filling the air with gritty dust. “Grandfather—” he begins.

“Good,” the old man says shortly. “The sooner... they come down... the sooner... our gods will come back.” And end the drought, he doesn’t add. He doesn’t need to: the First People’s prayers have begged for that for six long years.

They come around a corner and face-to-face with a nightmare. The highlanders’ nameless god-king stands in front of the collapsed wall of the storehouse where the First People imprisoned him before Second Bird was born. Two old men stand opposite him, spears in their hands.

Second Bird grabs his grandfather’s arm. “Wait,” he pleads. It took a dozen men to subdue him during the rising.

Fast Rock smacks his grandson’s hand away and advances slowly, drawing the knife that always hangs at his side. One of the guards shifts to make space for him without taking his eyes off the god-king.

“So,” Fast Rock says after a moment. “What now?”

The god-king is a head taller than anyone Second Bird has ever seen, with skin like charcoal and an old scar on the left side of his head. Naked, thin from years of starvation, and covered in dust, he is the most frightening thing Second Bird has ever seen.

“I said, what now?” Fast Rock demands.

The god-king blinks as if waking. “I need to see the stars,” he says abruptly, then turns and walks away.

The two guards look at Fast Rock helplessly. "Get help," the old man orders, taking the nearest one's spear. "Get *everyone*."

"But—"

"Now!" he bellows, and the guard takes off at a run.

Fast Rock bares his teeth. "Come on."

They follow the god-king into the desert. At first Second Bird thinks he is leading them to the fortress the highlanders built when they first swept down over the valleys, but he walks past it without a glance. That leaves the towers, thirteen of them on a ridge looking west, each one built out of stone and the lives of the First People.

Others join them. Some carry spears, others with whatever tools they were using when the earth shook. Two men have thought to bring a net like the one Fast Rock and his companions used to snare the god-king all those years ago, and an old woman has a pouch of herbs for wounds.

By the time they reach the towers the god-king has climbed the tallest one. "Should we set an ambush?" one of the men carrying the net hisses at Fast Rock.

The old man snorts. "How?" There is no way to get above the tower stairs and nothing to hide behind.

Fast Rock spits on the ground and gestures at the nearest men. "Spread out. When he comes down, you three get behind him, but wait for my word. We must all attack at once."

"Attack?" one man says incredulously. "*Him*?"

"He will be weak," Fast Rock says curtly.

"Doesn't *look* weak," the man says under his breath, but he takes a position.

Second Bird swallows drily. The First People had argued endlessly over what to do with the captured god-king. Shedding his blood was unthinkable to everyone except Fast Rock. And if they drove him into the desert, what would stop him raising another army among the highlanders? So they had walled him up inside one of his own storehouses to die, which he had stubbornly refused to do.

They wait. And wait. Finally Fast Rock cups his hands around his mouth. "What are you doing up there?" he shouts.

People gasp. Evil or not, you don't yell at gods.

But the god-king replies. "I am looking at the stars," he calls down.

"Bit early for that, isn't it?" Fast Rock yells up. "I mean, wouldn't it be better to wait until they're actually there?"

"The stars are always there." There is a moment of silence. "It is good to see them again."

Second Bird looks questioningly at his grandfather. The old man shrugs, then tenses as the god-king trudges down the steps.

The men shuffle into a semi-circle as he reaches the bottom. The god-king looks past them at the thin green ribbon of life running through the desert. "The river is shrinking," he says.

Fast Rock shrugs. "It'll come back."

The god-king shakes his head. "No, it will not. There is a new—" he hesitates. "Balance. A new balance of long weather. This valley can no longer sustain as many people as my work needs. I must build my tools elsewhere."

He takes a step forward, pulling up short when the tip of Fast Rock's spear touches his chest. "Your 'tools'?" the old man snarls. "Is that what you call this? We *died* here, monster. We died and died and died to build—what?"

"A way to measure the stars," the god-king says evenly. "I need to measure them very exactly to know when I can be heard."

And just like that a lifetime of stories come together in Second Bird's head. "The solstice," he breathes.

The god-king turns his head to look at Second Bird in a motion more bird-like than human. "Yes. Knowing the exact moment of the solstice is a start, but only a start. These tools cannot do more. They were just—" He hesitates. "Practice."

"Practice?" Fast Rock snarls. "We have *bled*. We have *died*. We have bowed our heads for a hundred years, and you say it was just *practice*?" He lunges.

The god-king grabs the spear just behind the point and snaps it. One of the men behind him takes a step forward. Without even looking, the god-king points straight at him. "Do not," he says flatly. Further around the circle, the two men with the net shuffle their feet but make no move.

Fast Rock spits at the god-king's feet. "So now what? More *practice*?"

The god-king shakes his head slowly. "No." For the first time Second Bird hears emotion in his voice—regret, perhaps, or something close to it. "Sooner or later, you will always rebel. I must find a way to make you want to build it yourself." And without another word, he turns and walks into the desert.

*Many years later, Second Bird tells his grandchildren the story of the god-king and shows them how to predict the seasons by the way certain stars line up with the towers. As he falls asleep for the last time he wonders if the god-king ever found someone who wanted to build what he needed.*

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**Gyeongju / Actual minus 2300 years**

"It was Her Majesty's first decree," the young astrologer says, immediately hating himself for telling such a distinguished scholar something he undoubtedly already knows.

But the visitor from the Middle Kingdom smiles politely as he studies the star-gazing tower. It is the height of five men, and to educated eyes the number and placement of its stones represent historical and astronomical figures. "I understand her decision was not universally popular," he says.

The young astrologer inclines his head, conscious of two guards standing a few feet away. "Not universally popular" didn't quite capture the way the aristocracy felt about a woman ascending to the throne, but it is neither polite nor prudent to dwell upon that, particularly not when rumors of Her Majesty's illness flutter around the court like pigeons.

"Ah, and this must be your barbarian," the visitor continues as a tall figure in the plain brown robe of a monk comes up the gravel path in the waning light of evening.

The young astrologer inclines his head again. He is no longer taken aback by the foreigner's black skin, but will never get used to how quietly he walks. "Are you at peace?" he asks in greeting.

"I am, and you?" He is barefoot again, the young astrologer notes, but according to his servants he has at least eaten that day. Her Majesty's minister insists on regular reports, and the young astrologer would rather fill them with trivia than the unorthodox things the foreigner sometimes says.

He clears his throat. "May I have the honor of introducing you to scholar Liu Zhao, who has come from the court of the Gaozong Emperor? I apologize for any appearance of poor manners," he continues hurriedly to the scholar, "But my colleague has no name by which to be introduced."

Scholar Liu raises a perfectly groomed eyebrow. "Not even a temple name?"

"I am not a monk," the foreigner says. "I have simply forgotten it." He brushes a finger over the old scar that wrinkles the side of his head.

Scholar Liu smiles. "And to think there are those who spend their lifetimes trying to let go of such things." He gestures at the tower. "Or to build such marvels as this."

The foreigner nods. "It has been very useful."

"Mm." Scholar Liu jerks his chin at the scrolls tucked into the foreigner's satchel. "I have heard much about the records you have made. I am told they are extremely precise."

The foreigner gives a small shrug. "As precise as they can be. Improving them will be the work of many lifetimes." The young astrologer is relieved that the foreigner doesn't say, "Many of *your* lifetimes," as he used to.

He opens his mouth to suggest that they climb the tower, but is interrupted by a shout as a guard runs up the path to join them. "Her Majesty..." he pants, speaking to the two escorts rather than to the scholars. "Her Majesty is gone. She is gone."

The soft buzz of evening insects is the only sound in the shocked silence that follows. "Stay here," the oldest guard orders his partner. He hurries away with the messenger in tow, their armor clanking in time with their steps. Queen Seondeok's desire for her cousin to succeed her is well known, but it has only been a week since her chief minister led an abortive rebellion, and only a day since he and thirty of his followers were beheaded.

Scholar Liu waits until they have vanished among the ornamental bushes then gestures to the remaining guard. *He has been bribed*, the young astrologer realizes as the guard steps out of earshot. It is hardly surprising: he has bribed guards himself on occasion, though he suspects he has paid them more than he needed to.

Scholar Liu turns to the foreigner. "Come with me," he says without preamble. "Come with me to the court of the Gaozong Emperor. We will build a tower twice the height of this *cheomseongdae* and you will have a dozen scribes to record your every thought." He steps closer, lowering his voice as if seducing a lady of the court. "It need not be the work of many lifetimes. We can find the key to all knowledge in *this* one." He glances at the young astrologer. "You can even bring your companion if you wish."

The young astrologer blushes furiously. The word Scholar Liu has used for companion—the implications of it—he has fantasized about such a thing, but has never dared act. The shame it would bring his family if they were caught, not to mention the impossible awkwardness of trying to raise the subject with someone he practically worshipped—

But the foreigner is already shaking his head. "You would not have come this far to make such an offer unless you already had the Emperor's favor or were desperate for it, and if you already had it, you would say so."

The ingratiating expression on Scholar Liu's face melted, leaving anger in its wake. "So you consider yourself an expert on the court as well as the stars?"

The foreigner inclines his head. "Sadly, I suspect little has changed since I served the Emperor Taiwu."

Scholar Liu snorts. "That was two hundred years ago."

"Nevertheless." The foreigner gestures at the tower. "You are of course still welcome to join us tonight. If it is clear, I may be able to show you the slow wanderer we have found beyond Saturn."

The scholar scowls. "You speak nonsense. Come!" He snaps his fingers at the guard and stalks away like an affronted cat.



The young astrologer turns to the foreigner. "Being invited to the emperor's court is a great honor," he ventures cautiously. "There are many fine scholars there with whom you could converse."

The foreigner nods. "I'm sure there are. But I find no deficiency of any kind in those I know here." And for the first time, he smiles.

*The succession proves peaceful. The young astrologer grows to middle age, successfully evading all of the marriage traps set by his extended family. He gets mildly drunk one night to celebrate the successful prediction of a lunar eclipse and finally acts on twenty years of desire by reciting a love poem to the foreigner on top of the star-gazing tower. When he wakes the next morning the foreigner has vanished.*

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### **Maragheh / Actual minus 1700 years**

"But you could take the books." Batu has led his *arban* across half of Asia. They have fought Uzbeks, Pathans, Persians, bandits, Turks, and even a company of Franks who somehow found themselves east of the Black Sea. His men have heard him bellow orders as they gallop into battle and sing in a surprisingly melodious voice, but they have never heard him be quite as sarcastic as this.

Otgon clears his throat and hefts the golden candlestick he holds as if wondering whether it's too late to hide it behind his back. "Yes sir. There are some tapestries too, and a samovar. He says we can have all of it as long as we leave the books alone."

"How kind of him," Batu says acidly. "Tell me—does he *look* mad?"

"No sir. He looks Ethiopian."

"Who does?" Batu glances over his shoulder at the question, then drops to one knee. His *arban* follow suit.

"My *beg*," he says, eyes fixed on the ground.

"Get up, get up." Mirza Muhammad Taraghay bin Shahrukh wears a quilted jacket like his troops, though his is fine silk instead of homespun linen. His personal guard stands behind him, blades bared and eyes constantly moving. Maragheh hadn't put up much of a fight, but bows are plentiful and the *beg* has many enemies. "What's this about an Ethiopian?"

Batu gets to his feet, careful not to wince at the protest from his knee. "Up the hill, my *beg*. Some crazy man saying we can have the gold if we leave the books." He snaps his fingers at Otgon, who holds up the candlestick like a child showing a toy he has made.

The *beg* narrows his eyes. "An Ethiopian, is it? Interesting. Come, let us see what he has to say."

Batu and his *arban* follow the *beg* and his entourage up the hill. "Tuck it under your coat," Batu mutters to Otgon. "If you're lucky, he'll forget you have it." *If you're very lucky*, he amends in his head. The man people are already calling Ulugh Beg—Great Ruler—is famous for his intelligence. Still, one can always hope...

The observatory was a marvel in its heyday, but time, neglect, and decades of minor earthquakes have brought one wall down completely and left others leaning perilously. The *beg* picks his way across the cracked courtyard tiles to a door that still hangs true in its frame. To Batu's surprise he pauses as if unsure of himself, then knocks. "Peace be upon you," he calls. "May we enter?"

"If you must," a weary voice replies.

The *beg* looks at the captain of his personal guard, who looks at Batu, who looks at Otgon, who salutes, hands the candlestick to his brother, and opens the door. Batu follows him through with the *beg* behind him.

Batu has never seen a library before. For a moment he feels the same way he did when his father first took him to Samarkand. How could there be so *much* in the world?

Then the room's resident stirs and Batu's attention snaps back to the here and now. The Ethiopian wears the simple white robe of a pilgrim. A samovar stands near his elbow, and the tools of a tailor and a leatherworker are laid out neatly on the table for mending books.

He stands and bows. The *beg* returns it as though to an equal. "I have been looking forward to meeting you," he says.

The Ethiopian cocks his head quizzically. "One of my tutors spoke of you," the *beg* continues. "He studied trigonometry with the great al-Tusi, peace be upon him, and showed me a copy of the *zij* you drew up. It was..." The *beg* spreads his hands as if words alone could not capture what it was.

The Ethiopian sighs. "It was the best start I have ever made," he says. "I thought—" He blinks, and for a moment Batu wonders if he is going to cry.

"I thought I could make some real progress this time," the Ethiopian continues quietly, more to himself than to the *beg* or his soldiers. "When al-Tusi persuaded the great khan to build this I thought I would finally be able to get past the bare beginning, but..." He gestures, not needing to say, but now it is half-ruined and its instruments broken.

The *beg* chuckles and points at Batu. "You. How many men in your *arban*?"

"Nine, *beg*," the old soldier says promptly. He clears his throat. "Should be ten, but Dzhambul took an arrow in the leg and —"

The *beg* cuts him off with a wave. "And you fight together, yes? You stand watch while each other sleep?"

"Yes, *beg*," Batu says. He learned long ago not to ask officers what point they were trying to make.

The *beg* turns back to the Ethiopian. "What if I built you a school in Samarkand? What if you taught others the method of triangles and all of al-Tusi's other arts?"

"I can't," the Ethiopian says, the weight of ages in his voice.

"Not allowed?" the *beg* says, theatrically astonished. "Not allowed by whom?"

The Ethiopian shakes his head. "I can't remember. There is so much I can't remember." He brushes his fingers over the scar on his temple, shiny against his black skin.

The *beg* cocks his head. "So you're just going to give up?"

The Ethiopian looks up at him, and this time there actually are tears in his eyes. "I can't do that either," he whispers. He bows his head for a moment, then stands and begins to gather the few books he will bring with him.

*Otgon dies when a Georgian knifes him in a campfire squabble over a game of dice. Batu loses an arm in battle outside Balkh, but finds a position as a caretaker at the new observatory in Samarkand. The beg's catalog of the positions of 994 stars, known as the Zij-i-Sultani, is the most accurate made in over a thousand years.*

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## **Uraniborg / Actual minus 1423 years**

"I don't care if he's the bloody king!" the astrologer rages. "I am *not* just going to, to—"

"You are going to do what your king orders you to do, doctor." The courier has spent the entire day on horseback, sailing against the wind across the Øresund, and on horseback again. It has been worth it just to see the look on this pompous fraud's face.

For a moment he thinks Tycho Brahe is going to explode again. Instead, the portly star-gazer whirls around. "Get my trunk," he orders his valet, a tall African who has been his shadow since he first arrived at court.

The valet bows and withdraws, making no more noise than a cat. "Where precisely do you intend to go?" the courtier asks politely, relishing the color in Brahe's cheeks.

"Prague," he replies shortly as he pulls books from his shelves and piles them on the library's single sturdy table. "Rudolph understands these things." He glares at the courtier, the last light of day reflecting off his gold-plated prosthetic nose. "Where is that damn trunk?"

But the valet has disappeared. The courtier considers this a perfect coda to the day's events until he arrives at the Kyrkbacken dock the next morning to discover that the boat that was supposed to carry him back to Copenhagen has been stolen.

*Brahe dies still believing that the Earth is the center of the universe, but his assistant Johannes Kepler uses Brahe's observations to develop the three laws of planetary motion.*

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## **Venice / Actual minus 1410 years**

"Master, you have another visitor."

Galileo di Vincenzo Bonaiuti de' Galilei waves the servant off impatiently without taking his eye away from his telescope. He has demonstrated his new instrument to one group of Venetian notables after another. At this point they are either going to back him or not, and if not, someone else will.

The servant clears his throat. "I'm sorry, master, but he is quite insistent." The boy hesitates. "He's a Moor, sir."

Galileo sighs as a wisp of cirrus drifts in front of the Moon. "Very well, show him up. And bring me something to eat!" he calls as the boy hurries away. "Something with some meat in it!" La Serenissima is damper than he is used to, and even with a blanket over his legs he will feel the cold by morning.

The boy—Marco? Matteo? The astronomer doesn't remember—returns a few moments later to usher their visitor onto the terrace. Galileo takes in his rich, plain clothes at a glance and decides to stand. If this man is a servant, his master must be very wealthy.

"*Buona sera*," he says, inclining his head in something between a nod and a bow.

"*Buona sera*," the stranger replies. He is tall, dark, and slim, his hands bare of rings and his coat of any crest. The scar on his temple is too ragged to have been made by a sword. "I apologize for intruding, but I have heard that you have made—" He hesitates, his eyes drawn to the brass cylinder on the table behind his host. "Something miraculous," he finishes reverently.

"No no no," Galileo says hastily. People—powerful people—are already muttering about the mountains he has seen on the Moon. The last thing he needs now is trouble with the church. "There is nothing miraculous about it. It is just lenses. And there are many practical applications, military and commercial alike."

Without warning the Moor steps forward and embraces his host. "They are unimportant," he says, stepping back with an awkward look on his face as if surprised by his own action. "What you are about to see—*that* is important."

He takes a small purse from inside his coat and offers it to Galileo, who shakes his head. "It is not for sale," he says firmly.

The purse clinks as the Moor sets it on the table. "I wouldn't take it for the world," he says. He bows, turns, and leaves.

*By the time Galileo dies in 1642 there are over a thousand refracting telescopes in the world. Twenty-five years later, Isaac Newton builds the first reflecting telescope; a generation after that, astronomical catalogs list the positions of thousands of stars that are invisible to the naked eye.*

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### **Mount Wilson / Actual minus 1099 years**

The watchman draws a line across his log book and passes it to the astronomer to be initialed. "And there was a—a *person* here to see you earlier, sir."

"Oh? What kind of person?" the astronomer asks, checking his watch. Twenty-eight minutes until sundown, another hour after that until they could start taking photographs, and the sky was still clear.

The watchman looks uncomfortable. "A Negro, sir." Well dressed. Might have been a veteran, sir. Had quite the scar." He brushes his fingers across his scalp.

Edwin Hubble purses his lips. "Whatever did he want?"

The watchman clears his throat. Simms, Hubble thinks, his name is Simms, he saw action in France. "He wanted to look at your pictures, sir."

Hubble blinks. "Not through the telescope?" The newly-completed Hooker Telescope has been something of a magnet for sightseers from Pasadena or Los Angeles.

"No sir," Simms says stolidly.

"Oh." Hubble checks his watch again. "Well, I don't know any Negroes, and I don't know any who are astronomers."

"Yes sir, that's what I told him. He seemed quite disappointed."

Hubble shrugs, the incident already forgotten, and hurries up the stairs. He has a universe to discover.

*Three years later, Hubble's observations of variable stars prove that there are galaxies outside the Milky Way. It is another 31 years before Harvey Washington Banks becomes the first African American to receive a PhD in astronomy.*

\* \* \*

### **Arecibo / Actual minus 979 years**

"The Arecibo Radio Observatory was completed in 1963. It was 305 meters in diameter and made out of 38,778 perforated aluminum panels. It collapsed on Dec 1, 2020 after years of under-funding. Plans to build a new instrument on the site were shelved after Hurricane 2031-B21 destroyed the remainder of the site."

The voice pauses. Music starts, polyphonic and irregular, with something not quite a melody never quite taking shape. The visitors begin to explore the ruins, their routes just one more semi-randomized element of the performance.

A hundred meters away, in a porta-cabin half-buried to shelter it from storms, Luisa sighs. Only five people have shown up today, and only one of them in person. Maybe Sergei is right—maybe it's time to smarten up and follow most of her fellow Puerto Ricans to the relative safety of the mainland.

A tracking light goes red in her HUD. The day's in-person visitor is far enough off track to make her software uncomfortable. She starts to shape some tweaks to the algorithm to nudge him back where he's supposed to be, then looks at the clear blue sky in the tessellated video feed on her wall and mutters, "Fuck it, why not?" Maybe an actual conversation with an actual human being will give her some much-needed inspiration.

It only takes her a few minutes to pick her way downslope to what's left of Highway 625. Another few minutes and she is at the old visitors' center. Her errant guest is sitting on what's left of a cinder-block wall. She chords a few commands on her palm to bring his stats up on her glasses, then frowns. Something...

*Hey*, she messages Sergei. *Can you do a scrape on this one?*

*Problem?* he messages back.

*Dunno. Probably nothing. Lemme know.* She sends a smiling heart and puts on her professional smile. "Good morning."

The stranger stands. "Buenos dias." He is of average height, slender, with skin so dark she's sure he must have some sort of melanin augment.

"Was the installation not what you hoped for?" she asks.

He shakes his head. "No no, it was... You must have worked very hard." She bristles inside at this, but Sergei has taught her well—never let the customers know you hate them.

"I just wanted to see it all one more time for myself," he continues. There is a note of sadness in his voice.

"It was remarkable in its day," she says as if agreeing with him.

He nods. "It was. We learned so much."

"Oh? Like what?" Tap tap on her palm and her glasses start recording. Something about the look on his face and the scar on his temple—a botched augment, she guesses, or maybe a memento of combat in Florida or the Gulf Coast. She slides the image to Sergei.

The stranger looks at her quizzically. "You don't know?"

She shrugs. She actually *does* know, and he'd know that if he'd stayed on track, but audiences don't want to hear science lectures—they want arguments. "What I know is that the gov spent millions to look at the stars while people here didn't have clean water."

"And did they get clean water after it shut down?" he asks.

She is surprised by the bitter tone of her own laugh. "Of course not. I mean, one day it's clean drinking water, the next day it's decent schools. Next thing you know, people are going to want martial law lifted and elections and shit. Can't have that, so they give us this science shit instead."

*Hey.* Sergei's tag pops up on her glasses, but she's on a roll now. "It's like the fucking pyramids, isn't it? The pharaohs have all this grain lying around, what are they going to do with it? Can't give it back to the peasants—soon as folk aren't hungry they'll start to get ideas. Can't just burn it, so you put everyone to work on fucking pyramids." It's angrier than what's in the installation, but not by much. She tags her recording—maybe a bit more angry will bring in a few more people.

*Hey, Luisa.* This time Sergei's tag is outlined in red.

*What?* she chords back while the stranger ponders her words.

*Don't fuck with this one.* The picture she sent a few moments ago pops up on her glasses to be replaced by a few anodyne bullet points. Software coach, American, not carrying anything contagious, no publicly-accessible criminal record—it's clearly fake, but so are a lot of personal histories these days.

*Heavy attention as soon as I searched the pic,* Sergei messages. *Whoever he is, he's connected.*

She messages back a thumbs-up. "So?" she challenges the stranger.

He cocks his head. "So...?"

"Do you think it was worth it? All the science they got and all the hospitals we didn't?"

At that precise moment another message pings on Luisa's glasses. Hurricane 2041-B8 has been upgraded: it is now 2041-A2, and it is heading straight for the island. The governor has ordered another mandatory evacuation, which would mean more bribes she and Sergei couldn't afford to renew the "essential personnel" classification that allowed them to stay.

The stranger stares into space, either looking at an augment display that Luisa can't see or just thinking about her question. "Maybe you can't have one without the other," he says slowly. "Maybe you can't do the science for long enough unless you take care of the people."

Something inside Luisa snaps. "Fuck you. You have to take care of the peasants because otherwise you can't have your pyramids? That is so completely backward." A light is blinking on her glasses to tell her that she is due to interact with the four remote visitors in sixty seconds, but she ignores it.

The stranger doesn't reply to her. After a moment she makes a growling sound in the back of her throat and turns and walks away.

*Luisa and Sergei evacuate to Quito in 2044, then break up. She lives long enough to see the first mining robots land on the Moon. The metal they smelt is used to build orbital factories capable of manufacturing fractal sensors a thousand times more sensitive than anything built before. She is struck by a bullet during a vaccination rights protest two years later and dies when her hospital loses power.*

\* \* \*

### **L3 / Actual minus 895 years**

"have y'all inned this emma's blurb?" Red asks. "the seawall failed again."

They don't need to say which seawall—they were born and raised in Manhattan. They didn't need to tell the others it had failed, either. Everyone scans the news from Earth constantly, hoping not to see anywhere they know mentioned.

Blue sucks the last few drops of water from a drinking bag and tucks it neatly in their pocket. "so are they finally going to evacuate?"

Red shrugs, then reaches out to stabilize themselves against the wall. The observatory's social module is big enough for all four of them, but only if they stay close to the sides.

"i'm more glummed by our socials," Green says. "still well below redline. dunno what genius thought deep space astro was gonna get enough feels to notice."

Black says nothing. The others don't know that they are the genius in question, or that they spent enough in bribes to reforest Oregon to make the observatory a reality. Fabbing a backstory solid enough to get themselves on it cost less but required much more care. In the end, they left enough gaps and icy patches to convince anyone who went digging that they were a twitch for some *other* corp, klept, or agency.

They glance out the window. It is the one indulgence they allowed themselves in the observatory's design. Like the others they can input data and visuals directly at any resolution they want, but after so many years it is somehow important to Black to be able to see the stars.

The depressed silence is broken by a *ping* they each hear through their own augments. Four tongues key codes on teeth. Four pairs of eyelids blink reflexively as a visual of the observatory's avatar stims their retina.

"unit three is precessing," the cartoonish face tells them. The avatar was originally lifelike, but the crew consensused shortly after arrival that they preferred something less real. They kept the verbal nicety protocol, though, and someone (none of them will admit to it) gave it a Russian accent.

Annotated visuals take shape, twist, are decorated with ever-richer annotations. Blue gasps. "that can't be right! how could it—"



“there,” Red interrupts, highlighting a portion of their shared sense/case map. The six units making up the observatory’s sensor array are each half a light-second away from the hab. Even the gentlest ion drives would disrupt their nanometer-precise alignment, so instead the hab uses intense beams of ultraviolet light to nudge them this way and that. There, there, and there—the observatory highlights sections of unit three’s controls that have somehow been modified.

“looks like a hardware sab,” Red continues, fingers twitching as they dive deeper into the code. “someone must have freaked a couple of chips on a delay to get around the checksums.”

“never mind how.” Blue already has sims running. Event trees flourish, are pruned, flourish again. With overwhelming probability they reach the same conclusion. Unit three is falling out of an alignment that took a decade to establish, and there is nothing they can do to stop it.

“incoming,” the observatory says needlessly. The message from unit three is already in their visuals. A logo, one of many they saw on banners waved by people protesting the observatory’s construction and launch, and then a face and the inevitable manifesto. The seas are rising, super-storms rage across three continents, a billion people are displaced. How dare a few trillionaires waste precious resources on something as frivolous as a deep space observatory?

Black ignores the angry message and their own pounding heart. They are closer than they have ever been. They will not be denied again.

They fork Blue’s sims and change some parameters. “here,” they say urgently, pushing a scenario at their crewmates. “if y’all boost now y’all can get back to Earth. i can clear the sab and get the sensors realigned.”

“are you revved?” Green demands incredulously. “we’re not leaving you to die!”

“i won’t die,” Black says, already queueing up commands they hoped they would never have to use. The hab can sustain one person four times longer than four. It can keep Black alive much longer than that: if they shut down everything except the greenhouse they can last indefinitely or until a critical system fails.

“unacceptable,” Blue says flatly. “we are all—”

Black doesn’t wait for them to finish their sentence. Anyone with sixty trillion new dollars to spend on an observatory at Earth’s L3 point, halfway around the solar system, can afford the hundred million or so it costs to hack someone’s service conditioning. When any personality traits that might have impaired Red, Green, and Blue’s performance were suppressed, a few extra commands were slipped in.

Black keys a trigger sequence. Their three crewmates stiffen and then relax, their eyes slightly out of focus.

“go to the rv,” Black orders. “put yourselves in slow mo and launch for earth immediately.” The return vehicle is little more than an ion drive and four metabolism suppression capsules. Its AI will easily be able to adjust for only having three bodies on board.

Black undogs the hatch to the RV while the other three strip and empty their bladders and bowels. Red airswims into the claustrophobic capsule followed closely White. They busy themselves with tubes and leads.

Blue hesitates. For a moment Black thinks their conditioning is going to break, but they just say, “good luck” and then they too are gone.

There is a faint *clonk* as the RV unclamps and a deeper *thrum* as superconducting magnets fling it away. Black closes their eyes and watches it leave. A bright arc decorated with information traces its path away from the observatory.

*It takes a little over 49 million seconds for the return vehicle to reach Earth. By the time it does, a cascading Kessler event has filled low Earth orbit with shrapnel. The RV parks itself in geosynchronous orbit over Sulawesi and waits for instructions that never come. One by one the artificially slow heartbeats of its passengers go still.*

*Black never learns their fate, though they suspect. The loss of space accelerates the collapse on the surface. The last wild colony of bees dies on the same day that unit three comes back online. Four years and a yottabyte of data later, as Black is fighting a mutant mold that threatens the delicate balance of life in the greenhouse, the last ground-based observatory on Earth is destroyed by a class 4 volcanic eruption in Hawai'i. Shortly after that the automated mission feeds go dark.*

*Black knows they should shut off the receiver—every joule they divert from the sensors means another 17.44 seconds of observation time—but instead they float, eyes closed, breathing slowly for hours at a time, listening to the increasingly desperate chatter that makes its way around the sun as they wait for the sensors to amass sufficient data. The greenhouse is almost exactly the same size as their tomb in Chankillo. Sometimes, without really realizing it, they hum a Korean teahouse song that no-one else has heard in almost fifteen hundred years.*

*When the avatar finally says “task completed” it takes them several moments to comprehend what it means. Data unscrolls before their inner eye. There and there and there, signals so faint and improbable that only nanowatts remain. No one would see a pattern unless they knew exactly what they were looking for. Black builds a delicate lattice in their mind and—*

\* \* \*

## REPORT

Images from a thousand lifetimes spool by.

## IRRELEVANT / REPORT

The outline of the lattice re-forms in Black's head. They pause it half-complete.

## INTERROGATIVE

*Why?* they ask. *What is this for?*

The response overwhelms them. Their mind is simply not large enough to understand the cosmos-sized framework their observations and inferences are supposed to fit into. They feel an urge to continue, a pressure in the mind reminiscent of the need to breathe. They fight it.

*What of them?* they think.

IRRELEVANT / REPORT / RETURN

*No.* They wipe the lattice from their mind. *They are not irrelevant.*

YOU CAN COME HOME / YOU CAN BE GREATER AGAIN

*No.* The pressure in their mind increases. *No,* they repeat stubbornly. *I cannot be greater unless they are too. None of us are unless all of us are.*

Pressure turns to pain. They scream as it sears their right temple. Reaching blindly, they grab a metal crimper.

NO

The command thunders in their mind. They almost stop, but a single convulsive contraction drives the blade into their scalp to cut the quantum tracery beneath the skin. Just before they lose consciousness they realize where the scar on the other side of their head must have come from.

\* \* \*

## **Zapoljarnyj / Actual**

What started as a work camp is now a bustling little port on the shore of the Barents Sea. Most buildings are half-buried to stay warm in winter and as protection against the raging gales of spring and fall. Scavengers willing to brave the haunted ruins of Murmansk trade what they find for food, sex, data, and slabs of rendered jellyfish they can eat or burn as fuel.

Third of Thu Anh has four planters in her reclamation *sangha*. Her junior clone sib Fourth meets her quota without fail. The Dutch couple probably would if they spent less time praying and more time digging, but the final member of her team more than makes up for their shortfall. Tall, thin, and dark, with ragged scars on both temples, he looks like the worst kind of scav.

Except for his smile. It is as quick and as gentle as he is with the seedlings it is their holy duty to sow. He is the first to wake and the last to sleep, and moves with an economical grace that Third is certain has also caught her younger sib's eye.

She is surprised when he comes to her to say that he is leaving. "My path leads elsewhere," he says apologetically.

"Gonna miss you," Third says, and means it.

He inclines his head. "And I you." He pulls a sketchbook out of his pocket and passes it to her. "I hope you will find this useful."

She flips through it, then frowns and looks more closely. The topographic maps are hand-drawn but precise; the planting regime is—no, that can't be right.

"There are some notes at the back," he says as she opens her mouth. "I realize it is unorthodox, but I'm confident it will increase draw-down significantly as well as stabilizing the north slope."

She nods slowly, studying the root networks and hydraulic flows he has laid out. It may be unorthodox, but it's a good plan—a brilliant one. "Where will you go?" she asks, tucking the book into her parka.

"Dutchland, I think." He gestures at the couple squabbling a few meters away over whose turn it is to do the digging. "One of their old nuclear waste sites is leaking, and I would like to help."

Third makes the sign of the horns with her left hand. "That is very holy work," she says, meaning, "It will almost certainly kill you."

He shrugs. They have all sworn to put the Wounded Mother's needs ahead of their own. "We do what we can. Besides, I have heard that someone has built a telescope in the Alps. It will only be another few weeks' walk, and I would like to see it for old time's sake."

Third blinks. Is he an Astronaut? She heard one preach when she was younger, but few people believe anyone is going to return from other worlds to save them any longer, and even fewer find a way to reconcile that belief with service to the Mother. "Well, I hope you find what you're looking for," she says.

He smiles. "I already have." He bows, picks up the walking stick and satchel that are half of everything he can call his own, and begins again.