

The New Dark Ages were first spoken about on Earth, not on Mars. For some time it was hard to get accustomed to the term: an obvious allusion to the era of ignorance and barbarism that reigned in Europe after the fall of the Western Roman Empire seemed a bit far-fetched. When the term reached the Colonies, everything was already going head over heels, and the not-too-appropriate comparison with the early Middle Ages quickly gave way to analogies with other Dark Ages — astronomical ones — a period at the dawn of time, when the universe, having expanded, became transparent to light, but did not yet contain anything that could shine. There were no stars, no planets, no galaxies — not a single speck of light in the impenetrable blackness. And it was a much better description of humanity's future: darkness was looming everywhere, and no one knew what was ahead.

# PROLOGUE

*Amundsen-Scott Antarctic Station, South Pole  
September 19, 2141*

Jayleen Honkala had been at the station for a week, and she would have gotten used to it if it weren't for the quilted silence that pressed on her brains, and petrified twilight. This was the most annoying. At the South Pole, the sun rises and sets once a year, so when Jayleen got out of the residential building and raised her head, she was always confused by the mystical uniformity of the dawn sky — the same smooth gradient from thick blue at one end to an almost complete absence of color on the other. It was impossible to get used to it: the dim, eternally tired light arouse a strange feeling in her chest, which Jayleen could not find a name for and from which instinctively shrank.

It was not as if the sky hasn't changed at all. The colorless part of the celestial dome pressed an orange stripe down to the horizon, under which, a degree and a half below the horizon, the sun hid. The luminary moved in a circle, pulling the strip behind, but did not appear, so it never affected the level of light. Everything around was gray: gray and therefore like rotten ice, gray station buildings, gray stripes of clouds overhead. Just behind her, above the abandoned geodesic dome, among a handful of almost invisible stars on a grayish background, Jupiter shone coldly.

Jayleen climbed the ice hillock and glanced at the array of drilling risers in the distance. Four days ago, her study tour began here. Fifty-five-year-old Dr. Stellan Young, the head of the Amundsen-Scott station, stuffed a pipe with tobacco explaining the purpose of these bizarre objects around the central buildings: ground tanks for refueling aircraft, the landing area for tiltrotor aircraft, antenna field, abandoned geodesic dome...

The territory of the station was divided into three sectors: the Clean Air Sector intended for atmospheric observations; the Quiet sector without any ATVs and heavy equipment because seismic and other vibration-sensitive experiments were conducted there; and finally, the Dark Sector, the area where the detectors for studying dark matter were placed. And that's what Jayleen was looking at — under the risers, deep in the Antarctic ice, was the world's largest neutrino observatory *IceCube 2.0*.

Jayleen heard unhasty footsteps and looked around. A thin man with a shark-like nose was walking along the path barely marked in the twilight. Dr. Young. Stellan noticed that she was looking at him and waved. Jayleen waved back, and as Stellan approached, she noticed that the head of the station was holding a cup of steaming tea.

"How are you?" Young asked.

He specialized in marine biology, and since they were two thousand kilometers from the nearest sea, Young was mainly engaged in administrative work at the station.

Jayleen shrugged.

"I don't know yet," she said, immediately realizing that Stellan might misunderstand her, and quickly added, "But I'm glad I'm here."

"Really?"

"All serious projects are put on hold now, so this..." Honkala pointed in the direction of the risers, which darkened in the distance, "is not so bad."

She was the only graduate from her year who managed to find a job in her degree field.

"Well, yes," Stellan blew at his tea and took a sip. "And your parents?"

"What about the parents?" Jayleen didn't understand.

"How did they react to the fact that you got a job as an assistant at the polar station?"

"I can't say they were delighted but didn't try to discourage me." In fact, they were not surprised. Jayleen's mother ran a consulting firm in Palo Alto, and after her daughter quit the job of a financier six years ago and joined the Department of Astronomy at Berkeley, she was not surprised. Her mother

offered Jayleen a job with her company only once, and when the woman refused, she no longer insisted. Her father just gave up on her. "In the end, they seemed to be happy that I was leaving."

Young grinned.

"You were just sick of each other after quarantine, right?"

"So true." The University of California in Berkeley switched to distance learning in February 2140. "Twenty months as if under house arrest."

Stellan peeped at Jayleen.

"Was it scary?"

With the exception of short-term weakening, the Clodis pandemic raged for two years. Fifty station technicians, led by Dr. Young, whose job was to keep the equipment operational during the winter of 2140, were stuck at the station for another year. The *winterers* were able to find out about current affairs through satellite TV, and videos there were petrifying — rows of hospital beds on the rain-soaked streets of New York, a mass grave the size of a quarry in the suburbs of Atlanta, crowds of homeless people who climb over a wall on the border with Mexico...

"No," said Jayleen.

"Absolutely?"

"Absolutely not," she shook her head.

In those twenty months, the *CLODIS DigiTracer* application on the smartphone had only reported several times about Clodis patients or people who had been in contact with patients, but only in neighboring areas: Crestwood Hills, Holmby Hills, Westwood Village. That's all. During the quarantine period in the Bel Air region, no case of clostridia infection was recorded, so Jayleen saw neither the looters who ravaged the business center of Los Angeles, nor ghost-like patients who wandered the boulevards, spewing out liters of liquid shit.

"We have a house in the west of Los Angeles," she explained.

"Santa Monica?" The man raised an eyebrow.

"Bel Air."

"Cool," Stellan nodded.

And then he fell silent, like Jayleen's friends and acquaintances always did as soon as they learned that she lived in an area where houses cheaper than ten million were considered tasteless.

Frowning, Jayleen looked at the strip of light above the horizon and said, "It's strange. Because of these constant twilights time seems to have stopped."

"It's not for long. Two more days and the sun will peep out. There," Young pointed at the mountain range to the right of the risers, "and then, circling, it will rise," his finger drew a few circles in the air, "it will rise and won't disappear until the twenty-third of March next year. You'll still have time to miss the twilight, believe me."

"And what was the sound this morning? Did you hear? About an hour before breakfast?"

"Squeak?"

"Yeah."

"Cracks are formed in the shield under us."

"Is that okay? Is that what should be?"

"No. I've been here for ten years, but I don't remember things like that." Young's nostrils swelled. "Can you smell it?" Jayleen sniffed, then nodded. It smelled like a rainy day in the cemetery — the scent of dense, infused moisture. "The glacier is melting," Young explained, then repeated, "It shouldn't be like that."

A hundred steps behind them stood a dark building with narrow vertical windows, the first of two identical residential buildings. Young looked around and glanced at the dashboard of the electronic thermometer attached above the main entrance. It showed + 0.6°C. Although there was no need to look — they both were standing outside only in their vests on top of woolen sweaters.

"How often do the temperatures drop that much here?" Honkala asked.

"In recent years, constantly. Sometimes up to plus five, but always in December-January, in the middle of summer. Never at this time. Forty-degree frosts lasted until the end of September last year."

Jayleen looked around. Residential buildings consisted of separate modules standing on one-and-a-half-meter concrete blocks. This should have prevented them from being buried in snow, but there was no snow this winter, making the buildings look like a herd of ATVs-crockers from *Star Wars*, an old science-fiction film that Jayleen came across online during quarantine.

“One hundred years ago, the temperature dropped to minus eighty,” Young said, stepping from foot to foot and grimacing as he heard the squelch of mud instead of snow crunching under his feet, “so zero without the sun is a bit scary.”

They fell silent. Young sipped his tea and finally said, “Today is your first shift?”

In half an hour, at ten o’clock New Zealand time, Jayleen had to be on duty at the data center.

“Yeah.”

“Good.”

Stellan finished the rest of the cup.

“Shall we go?” He nodded in the direction of the residential buildings.

“I’ll stay a little longer”.

Stellan followed the path back. Jayleen watched him, then turned to the risers, deep beneath which thousands of garlands of photosensors were soldered into the ice.

The first *Ice Cube* was built in 2010 near the place where the pipes used for drilling are now laid. The detector consisted of eighty steel threads lowered into wells two and a half kilometers deep. Photosensors were located on each of the threads between 1450 and 2450 meters in depth. The aim was to detect neutrinos coming from the Sun. Neutrinos are the most common particles in the universe. They are formed in the bowels of stars, when supernovas explode, or when cosmic rays collide with atoms of matter, but at the same time, these particles are surprisingly *timid*. If it were possible to create a lead rod with a length of a light year, which is almost ten trillion kilometers, a neutrino would fly from the end to the end of it without hitting a single atom. Very rarely, neutrinos still interact with matter; for example, collide with a proton in a water molecule. During these collisions, elementary particles are formed, which, when scattered, leave a light trail. This trace can be captured by photosensors, the only problem is that it is difficult to distinguish from background noise. Because of this, neutrino detectors are located deep underground, in water, or under the ice.

Until the mid-XXI century, neutrinos from deep space had been studied in the *Ice Cube*. Eventually, the detector was exhausted, and in 2048 it was removed from operation wells. At the beginning of the 2120s, interest in neutrinos flared up again. At that point, it became clear that WIMPs<sup>1</sup> — massive particles that should clarify the nature of dark matter — don’t exist, that dark matter is more complex than imagined, and probably not inferior in complexity to visible matter. New theories began to emerge, some of which predicted that the interaction between dark matter particles would generate neutrinos of certain energies. Since the early 2130s, scientists have begun to put back into operation and modernize old observatories — the *Ice Cube* at the South Pole, the *Kamiokande* in the mountains of Japan, and the *Antares* in the Mediterranean — to study existing clusters of dark matter. A closer analysis of the neutrinos emanating from them was intended to help determine which of the models proposed by theorists was correct and to clarify the nature of dark matter.

The old *Ice Cube*, which consisted of eighty wells, recorded no more than two dozen neutrino collisions a year, and normally less than ten. In May 2132, the US National Science Foundation provided funding for the construction of *Ice Cube 2.0*. The work was completed in February 2140. The new detector consisted of 5050 threads with one hundred and ten sensors on each and after commissioning was promised to record one and a half hundred neutrino events a year.

Jayleen stared at the scarred ice, thinking about the miles of glacier beneath her feet, and imagining the effort it took to pierce it to its full thickness.

The connection between neutrinos and dark matter was the subject of her master’s thesis. From the scientific point of view, the work was relevant, but its practical application in the world, which was

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<sup>1</sup> WIMP (short for Weakly Interacting Massive Particle) is a hypothetical massive elementary particle that was considered a candidate for the role of the main component of dark matter in the 21st century.

only recovering from the most devastating pandemic since the turn of the century, was questionable. Jayleen defended it six months ago, remotely, of course, two months later she received a Berkeley diploma, and then nothing changed. She couldn't find a job. Jayleen spent most of her time in the basement of her parents' house, sticking to the AR game console. And then, in the midst of an unbearably hot summer, when neither games nor TV series entertained her, Jayleen came across the news from the Polar Programs Division of the National Science Foundation about the completion of the construction of a neutrino detector at the South Pole. Not knowing why Jayleen sent her resume and received an invitation to an online interview. As a result, the Polar Programs Division offered a six-month contract and a field assistant position at Amundsen-Scott Polar Station.

Jayleen smiled, remembering what she had imagined when she first heard *field assistant*. Hunching over in the wind, numb from the cold, she clutched a tripod with test tubes, and next to a senior researcher, covered in snow and icicles sticking out of his nostrils, looked for something among the ice blocks. In fact, everything turned out even more banal. For the most part, her job was to stare at the monitor, not to touch anything, and to make sure no one else touched it. A century ago, the detector had a separate building over the drills, where the computers for data processing were placed. At the beginning of 2133, the hardware was moved to the Data Storage and Processing Center (simply, the Data Center) in one of the residential buildings, and Jayleen did not even have to leave the building. Dr. Thelma Barrett, who looked at least a thousand years old, headed a research team working in the *Ice Cube*, and after Stellan's tour around the station explained to Jayleen how it works, "The system beeps when something like a neutrino is detected in a selected area of outer space. The servers record data automatically. You are required to check that everything is saved in the log file. This will happen infrequently". The old woman looked at Jayleen with an expression as if she had no doubt that by the time the updated *Ice Cube* catches the first high-energy neutrino, the girl would no longer be at the station. "Very rarely". In fact, the program stored the data itself, just because each neutrino event was considered extremely important, and the operator had to make sure that everything worked properly.

Jayleen glanced at her watch. Five to ten – time to come back. She looked at the array of drilling rigs for the last time, then turned around and walked toward the buildings.

22:05 NZST<sup>2</sup>

Generally, the data center premises seemed cramped due to the muster of server cabinets and the lack of windows. To the right of the entrance hung a smart board with a duty list, to the left was the operator's panel, and the wall above it was covered with a dozen screens. Most were inactive. The smell of accumulated dust made the air rough.

After the soft semi-darkness of the polar sky, the bright light of artificial lamps unpleasantly cut the eyes. Frowning, Jayleen sipped her coffee from the coffee machine and made sure the necessary monitors were on. As soon as she got behind the panel board, Stellan Young's head appeared in the doorway.

"Ready?"

Jayleen shrugged. Ready for what? They do not launch rockets into orbit.

"Don't overwork," Stellan winked and was about to leave, but at the last moment Jayleen asked.

"Should I wake you or Dr. Barrett in case of an emergency?"

She meant not a real emergency, of course. Jayleen asked permission to turn to Young directly, bypassing the terribly acrimonious Thelma.

"What emergency situation?"

"A fire, for instance."

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<sup>2</sup> NZST, New Zealand Standard Time - 12 hours ahead of Coordinated Universal Time (UTC) on the Greenwich meridian.

Because people and cargo are transported to the station via Christchurch, New Zealand, Amundsen-Scott staff lives in New Zealand time.

“In the *Ice Cube*?” Stellan snorted. “These are just detectors that amplify the light signal. Under kilometers of ice. I’m a biologist, and I don’t know for sure, maybe something could happen, but I don’t think it’s worth worrying about them burning down.”

Jayleen blushed so much that Stellan felt sorry for her.

“Well, if the system announces the capture of several neutrinos in a row, then I think yes, you can wake Dr. Barrett up,” a faint smile twitched her cheeks, “to celebrate. In other cases, nothing bad will happen if you wait until morning.” Then he nodded, “Good night.”

“You too, doctor Young!”

As Stellan’s footsteps receded, Jayleen turned on the tablet, went on YouTube, and raised her eyebrows. The video ‘*Zoe ascends Olympus Mons, part 4*’ was already on the top of the list on the *Popular* tab. And it was only posted an hour ago. It was the final video of a vlog series by the world’s most popular YouTuber *ZoeFromMars* about ascending Olympus<sup>3</sup>. In the first one, Zoe talked about Morten Rongstad and Tord Enberg, founders of *Martian Adventures*, and the journey from Newbourne to Base Camp at the foot of the volcano. In the second one, Tord and Morten led Zoe to escarpments<sup>4</sup> in the northeast of Olympus. In the third one, Zoe left the Base Camp and started the ascent. The video ended with the arrival at half-buried modular dwellings, similar to those in which the first colonists huddled together eighty Earth years ago. Zoe and her companions spent a night there before heading to the top. The fourth and last vlog episode was to show the ascent to the caldera<sup>5</sup>.

Jayleen pressed the *play* button and clung to the tablet.

Tord, Morten, Zoe, and her camerawoman left the camp at dawn. Every few hundred meters, cracks blocked the path they took. Through the narrowest of them, Norwegians built overpasses, and wider ones they had to bypass. The slope was slowly getting steeper, and Zoe helped herself with her hands. In some places, she had to climb on all fours but still continued commenting.

“It’s freezing. It’s so cold here. There is a heat-reflecting tape inside my spacesuit, and at Newbourne’s height, it’s enough. When I jog in the morning I don’t normally turn on the heating at all. Now the heating system is running, but I…” She raised her hand to the helmet, bent, and spread her fingers. “Hands are getting numb.”

“It’s like winter on Earth,” Morten commented. The image shifted, and a tall man in a pressurized space suit appeared on the screen. The pressure inside such suits is lower than atmospheric<sup>6</sup>, and because the sound waves in the rarefied air spread differently, Rongstad sounded like a cartoon character. Jayleen just couldn’t get used to it.

Zoe laughed. “I’m not that old, Morten.” In the elastic suit, the air was supplied only to the helmet, the pressure was sufficient, and therefore her voice sounded without distortion. “I don’t remember witnessing cold winters on Earth.”

The guide spread his arms.

“But I have been in an almost complete vacuum on top of the highest planetary mountain.”

Eventually, they reached a steep drop-off.

The caldera resembled a giant impact crater in the middle of a sloping plain. Inside there were several round formations of a smaller size — calderas in calderas.

“The atmosphere is almost invisible.” Zoe pointed to the opposite edge of the caldera. Morten and Thord leaned on trekking poles on either side of her. “Here is this orange, barely visible stripe — this is it. The pressure here is lower than at the surface, there is no haze of Newbourne, and the sky above the head is almost black.” The flow of the speech broke. Zoe arched her back and dropped her head. Against the Norwegians in awkward pressurized suits, she seemed tiny. “It’s amazing how different

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<sup>3</sup> Olympus (Latin: Olympus Mons) is an extinct volcano on Mars, the highest planetary mountain in the solar system. Its height is 26 kilometers above the surrounding plain.

<sup>4</sup> Escarpment is a steep ledge that separates areas of the surface with a steeper slope.

<sup>5</sup> Caldera - a hollow with steep walls and a flat bottom, formed by the collapse of the volcano top.

<sup>6</sup> With atmospheric pressure, they are too rigid and unsuitable for long-term use in outer space.

everything here is. Cold sun, black sky, and... I don't know if you can see... despite the height, there are still clouds. Gray and disembodied, like ghosts, sweep over the caldera.”

The camerawoman pointed the camera at Zoe, and, despite the inky shadows on her helmet, Jayleen distinguished her slightly parted lips and caught a gleam in her gray-blue eyes. Zoe looked into the camera and spoke as if holding her breath not to cry. Her gaze was tremendously powerful, and under its pressure, a sudden thought came to Jayleen's mind — could she be like Zoe? Not a YouTuber, no. Jayleen realized that she was not witty enough, completely devoid of healthy self-irony, and not even half as charismatic. But could she go to Mars and do something she likes? For decades after the first landing in 2057, the Martian colony remained a tiny semi-autonomous settlement, something like the *Deep Space Habitat* station, only on another planet. Only fanatics and freaks who wanted to die in style were eager to go there. However, everything changed in 2112, when the first baby was born on Mars. Since then, the colonists simply had no choice, and the Colonies were becoming more autonomous every day. Now not only people like super-professionals or the rich who can afford to live on another planet have gone to Mars, but ordinary people as well. So Jayleen looked at the woman in a stylish skintight suit, who flew to Mars in her teens, quickly adjusted to the life on the planet, and began to earn a living by...

*Di-i-n-don-ng.*

The sound froze in her ears.

Jayleen turned away from the tablet and looked at the monitor. Most of the screen was occupied by a three-dimensional model of the *Ice Cube*: the topographic grid at the top depicted the surface of the ice above the detector, and down from it white lines dropped — *threads* with photosensors. But that was not all. After the signal, on two dozen *threads* in the center of the screen, dense chains of colorful spheres hung. The color of the spheres on the chart varied from red through orange and yellow to deep green, and the size in each chain first increased and then decreased.

In the upper right corner was highlighted:

|                      |                                |
|----------------------|--------------------------------|
| APPARATUS            | <b>ICECUBE 2.0</b>             |
| DATE                 | <b>19 Sep 2141</b>             |
| TIME                 | <b>22:36:58.939251776 NZST</b> |
| EVENT_NR             | <b>01</b>                      |
| PROJECTED_EVENT_TYPE | <b>COSMIC NEUTRINO</b>         |
| T_INTERVAL           | <b>0...4000 ns<sup>7</sup></b> |

Jayleen slumped back in the chair — something had just gone through the *Ice Cube*! With the help of color, the program encoded time, and the size of the spheres that corresponded to the intensity of the signal. Jayleen ran her finger over the interactive panel, forcing the scroll slider to lower. The table with the data received from photosensors opened.

The first collision! Dr. Thelma Barrett arrived at the station two weeks earlier, and during this time they launched the *Ice Cube* several times in test mode. But in recent days the detector has been working non-stop, yet has not detected any collisions. Only after Jayleen got behind the screen...

*Di-i-n-don-ng.*

Jayleen focused on the monitor, but she was looking askance and incredulously, as if afraid to destroy what she had just seen. Half a hundred threads to the right and below the scattering of spots depicting the first neutrino event, new clusters of multicolored spheres grew. The caption in the corner of the screen changed:

|           |                    |
|-----------|--------------------|
| APPARATUS | <b>ICECUBE 2.0</b> |
| DATE      | <b>19 Sep 2141</b> |

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<sup>7</sup> Ns (engl.) — nanoseconds

|                      |                         |
|----------------------|-------------------------|
| TIME                 | 22:37:12.738475935 NZST |
| EVENT_NR             | 02                      |
| PROJECTED_EVENT_TYPE | COSMIC NEUTRINO         |
| T_INTERVAL           | 0...3500 ns             |

The air conditioner was buzzing over her head. Jayleen didn't move for a quarter of a minute, then smiled, still not daring to avert her gaze from the monitor. Two neutrino events in less than a minute. The *Ice Cube* was supposed to record an average of one collision every other day, but since the detector had been *silent* in recent weeks, it was not surprising that today it caught two neutrinos at once. Barely a few seconds passed.

*Di-i-n-don-ng.*

*Din-dong!*

Three new multi-colored clusters appeared on the monitor.

|                      |                         |
|----------------------|-------------------------|
| APPARATUS            | ICECUBE 2.0             |
| DATE                 | 19 Sep 2141             |
| TIME                 | 22:37:34.058372858 NZST |
| EVENT_NR             | 05                      |
| PROJECTED_EVENT_TYPE | COSMIC NEUTRINO         |
| T_INTERVAL           | 0...3000 ns             |

Jayleen frowned. For a moment she felt something like a burst of euphoria, but within a second realized she had to wake Dr. Barrett and grew gloomy. But yet... There was something else. She should have been happy, but instead, she could not help feeling weird. Five collisions per minute is not something out of the real world, but it would have taken a few months or up to a year to record so many.

As soon as she thought about it, a living hell began.

*Di-don-di-don-di-don-di-don-don-don-don-don-di-di-di-di-di-dididiiii...*

Jayleen grouped like a person reaching top speed in a car. The signals overlapped, their combination at first resembled a downpour piercing the dome of an umbrella, but they quickly turned into a crackling sound that later transformed into an annoying hum. Thousands of colorful spheres appeared on the detector model, and the numbers opposite EVENT\_NR changed so rapidly that they seemed to bounce. Eighty... hundred fifty... five hundred... a thousand neutrino collisions.

Jayleen looked around, and a faint smile appeared on her lips. It was a hoax. She was on her first duty today, and her colleagues at the station decided to make fun of her. Turning her head, Jayleen stared at the door of the data center, waiting for Dr. Young, one of his assistants, or even Dr. Barrett to appear. But no one came, and the moaning that came from the speakers did not subside. The smile faded.

Jayleen turned to the monitor. If it was not a joke, then what? What if the signals were real? She recalled a professor who taught quantum field theory at Berkeley talking about neutrinos. At the lecture, the professor raised her hand sticking her finger out, and said that sixty billion neutrinos pierced her fingertip every second. Jayleen glanced at her index finger. Sixty billion. Every second. Millions of trillions a year of which the *Ice Cube*, the world's largest and most modern neutrino detector, could catch several hundred at best. Now the program reported hundreds of recorded collisions per minute. If it's not a prank, if it's not someone's silly joke, the buzz that made Jayleen grit her teeth showed that neutrino flux from outer space had grown by hundreds of thousands... (she rubbed the forehead with her fingers: math wasn't one of her favorite subjects)... millions of times. Maybe more.

'Ah, screw that,' Jayleen jerked away from the table. It is better to be ridiculed than to miss something important.

She rushed out of the data center, ran down the hallway to the stairs leading up to the second floor, but immediately got hesitant. Dr. Young or Dr. Thelma Barrett? In the summer, the station employed two hundred scientists, but in the winter there were only service staff — maybe fifty people.



Dr. Barrett occupied one of the ‘summer’ rooms down the hall, while Stellan lived in a larger ‘winter’ apartment on the second floor. Lingering for a moment, Jayleen hurried up the stairs to the second floor. She ran past the lounge, reached Stellan’s apartment, and knocked on the door.

“Dr. Young?”

Silence.

*Knock-knock!*

“Dr. Young!”

Jayleen raised her hand to knock for the third time, but the door suddenly jerked. Stellan was dressed in sports shorts, a sleeveless hoodie, and rubber crocs.

“Oh! Jayleen! Long time no see!” he rubbed his eyes, wrinkles dispersed in the corners of his eyes “What is it? The fire?”

It would be easier to explain everything like this: thousands of signals about neutrino events are coming from the *Ice Cube*. However, Jayleen was afraid she was mistaken and instead muttered, “You have to see something.”

The smile didn’t go away, but it faded when Stellan noticed the corner of her mouth twitching.

“All right,” he said, crossing the threshold.

Jayleen entered the data center first. She squeezed between the server cabinets, leaned over the chair, and glanced at the upper right corner of the screen. The computer counted eighteen thousand collisions. Eighteen thousand! It was hard to say more precisely — the first three digits of the number opposite EVENT\_NR changed so fast that it was impossible to keep track.

“What’s that sound?” A buzz flooded the room, and Stellan turned his head, searching for its source.

Jayleen pointed at the monitor.

“Here.”

Young leaned over.

“What is it?”

He knew what the neutrino event report looked like, and had seen charts more than once while working at the station, but by then the image on the monitor had changed beyond recognition: the threads of the detector disappeared under a solid spot that resembled a huge multicolored wisteria. But the wisteria was changing and pulsing, unfurling new raceme with red, orange, and green flowers.

“Reports of the collisions,” Jayleen said, “almost twenty thousand.”

“I mean this buzzing... it’s...”

“Neutrino notification. There are so many that they merged into one sound.”

Stellan pulled the slider down. New tables appeared below the chart every second.

“Well, congratulations,” he glared at Jayleen with disapproval, “you broke the *Ice Cube*.”

“What?”

“I’m kidding,” a smile lit up his face. “This is a mistake. An error. Maybe, a short circuit. Or water has penetrated the insulation.”

“Well...”

“Oh, come on! We might record several hundred collisions a year if we are lucky. But now, it’s already too many?”

Jayleen squinted at the number to the right of EVENT\_NR.

“Twenty-two thousand.”

“Something went wrong somewhere, and it’s showing us neutrinos from the southern hemisphere.”

“Atmospheric?”

The *Ice Cube*, despite being located at the southernmost point of the planet, is designed to record neutrinos coming through the Earth’s thickness from the northern hemisphere. When cosmic radiation collides with atmospheric atoms, countless atmospheric neutrinos are formed. Their energy is negligible and has no value to researchers. However, there are so many of them that not even a two-kilometer layer of ice cuts off all of them. Among the known elementary particles, only high-energy neutrinos from space

are able to pierce the Earth, and that is why the *Ice Cube* processes signals coming from underground and ignores everything that pours down from the sky. Sometimes, when testing and adjusting the sensors, the detector operates in reverse mode (that is tested on neutrinos from the atmosphere) and this is what Young meant: there was a failure; *Ice Cube* began to record data on low energy atmospheric neutrinos in the southern hemisphere.

“Yes,” Stellan nodded, “it’s just random signals.”

Jayleen tucked her hair behind her ear. So, she worried in vain. Although... weird. She did not switch anything, and did not interfere with the work of the program — notifications appear on their own. She was ready to swear that the first five neutrinos came from underneath. However, she did not want to argue. Young is more experienced.

“What now?”

“We will turn everything off and tomorrow morning try to figure it out.”

In a second another display gave out a signal.

“And what is this?” Stellan turned his head.

Jayleen moved the chair to the monitor next to her.

“Request for a video conference from... Tsu... Tsuji...” under the avatar in the center of the screen hung the inscription ‘Tsujihara Moromao calls’.

“It’s *Kamiokande*,” a relaxed expression dispersed from Young’s face. “Answer!”

The 150-ton *Super Kamiokande* water detector was located at a depth of one thousand meters in the shaft of the Kamioka zinc mine near Tokyo and was the second largest neutrino telescope in the world after the *Ice Cube 2.0*.

Jayleen clicked ‘Accept the call’.

“Hello?”

A wrinkle-free face with a straight parting hairstyle and neatly trimmed mustache appeared on the screen.

“Good evening. My name is Dr. Tsujihara, I work...” the man looked no more than forty, he spoke slowly and with an accent, as if he was chewing stones. And then he noticed Young. “Oh, Stellan, hello!”

*Oh, Steya, hal-o!*

“Moromao,” Dr. Young answered with a slight nod, “how are you?”

The Japanese man replied that he was fine, but Stellan read in his eyes that the man wanted to say something completely different.

“Something happened?”

“You will think we are mad. I have a feeling that it’s only a problem with the hardware or...” his eyes slipped aside, “or with software. But we restarted everything twice, and I want to make sure that you don’t record any...” Tsujihara uttered a Japanese word, something like ‘izioo’, but quickly corrected himself, “...abnormalities on the *Ice Cube*.”

Before the Japanese finished the phrase, Stellan whispered, “Goddamnit.”

“Excuse me?” Tsujihara leaned his head toward the screen.

Young looked at Jayleen and stared at her as if she were to blame for what was happening.

“They have the same.”

“Stellan?” came from the screen.

“Shoot! But how...” Young turned to the monitor. “Moromao?”

“Yes?”

“How many collision signals do you have?”

Tsujihara smiled like a man who knows he will say something nasty now.

“You will be surprised.”

“Say it.”

“Thirteen thousand, Stellan.”

“We’re at almost thirty,” Jayleen whispered.

Deciding that he was misunderstood, Dr. Tsujihara repeated, “Three. Thir-teen.”

“Thirty,” Stellan shook his head as if talking to himself. “*Kamiokande* has lower sensitivity.”

“Thirty thousand?” Moromao paled as if he had just heard of the death penalty for a crime he had not committed. “So you have... too?”

Young touched Jayleen’s shoulder and told, “Call the French at the *Antares*. Someone from there is on the contact list. Call anyone who’s online now.” The large neutrino observatory *Antares* was located at a depth of two thousand meters in the Mediterranean Sea off the French coast. “And call Sherman Springfield at *Homestake*.” Stellan’s old friend, who had been working at the Amundsen-Scott station for some time, four years ago, headed an ultrapure heavy water neutrino detector in the abandoned Homestake gold mine in South Dakota. Young didn’t know if they worked, but decided to call anyway.

“All right,” Jayleen frowned. “But it’s night in Homestake... I guess.”

It was actually morning, but Stellan did not care.

“It doesn’t matter!” He shouted. “Someone has to be on duty.” Then he waved his hand. “Wait. Let me do that. Get up! Move!”

He tugged Jayleen’s T-shirt, ordering to make room at the keyboard.

“And I...”

“Wake Thelma up.” Stellan raised his voice seeing her flustered. “Immediately!” Then opened the contact list and started calling.

At the door, Jayleen looked around and glanced at the monitor. Forty-five thousand collisions. Then she hurried down the hall to Thelma Barrett’s room.

The Doctor was already asleep and opened the door only when Jayleen started hitting it so hard that the door jamb shook.

“What?” Seventy-one-year-old Thelma had a pale face and a wary look as if expecting a trick. “What do you want?”

*‘The detector reports tens of thousands of collisions,’* such a simple phrase, but Jayleen avoided looking into Thelma’s eyes. Instead, she mumbled, “Dr. Young is calling you.”

“Do you know what time it is?”

Jayleen glanced at the smartlet on her left wrist.

“A quarter to eleven.”

“I didn’t ask about the time, you idiot. I asked if you understood that at this time...” Thelma waved her hand. “What does he want?”

*‘The detector reports tens of thousands...’*

“You have to go to the data center. Something has happened. Emergency situation.”

Thelma run an eye over the corridor behind the girl and slammed the door shut. Jayleen was left alone. In half a minute the door opened again.

“You’re still here?” The woman pulled her robe and girded herself.

Jayleen stepped back, passing her forward. Tagging behind, she was looking at Thelma’s neck, which was strewn with senile spots the color of buckwheat, and was thinking not so much about what motivated the woman to go to the Antarctic station instead of calmly living out her life, as about who allowed her in here. Blowzy and crumpled after an interrupted sleep, Dr. Barrett looked as if she would not be able to survive until the beginning of next week, not even saying about the end of the polar summer.

However, the appearance turned out to be deceptive. Thelma pushed the door of the data center so that it slammed against the wall, and croaked sharply from the doorway, “What’s going on?”

Stellan looked around and finally said a phrase that Jail could not utter, “The *Ice Cube* reports tens of thousands of collisions,” he said, glancing at the screen and immediately correcting himself, “More than a hundred already.”

“More than a hundred?” Thelma blinked sleepily.

“More than a hundred thousand,” Stellan nodded.

The woman rolled her eyes. “Are you drunk? It’s just a glitch. It would be impossible to get such results, even if a supernova exploded close to our solar system.”

Stellan pointed to the monitor with Moromao’s face.

“This is Dr. Tsujihara from *Kamiokande*,” he said, shifting the finger at the second screen where the face of a woman probably five years older than Jayleen froze. “Katia Trottier from *Antares*.” A finger moved up to the dark monitor with the caption at the bottom of the screen ‘*Sherman Springfield camera’s off*’. “And Dr. Springfield is online from *Homestake*. They have the same thing. Everywhere.”

“Good to see you, Dr. Barrett,” Trottier smiled.

“Do you know each other?” Stellan raised an eyebrow.

“My former student.” For a moment Jayleen thought that Thelma would finally say something kind, add some banality, which is usually said in such cases, but no. The old woman squinted, as if studying the girl’s face through a magnifying glass, and then said, “I can’t believe I haven’t met you at the McDonald’s counter earlier.”

Suddenly the monotonous buzz stopped, and the computer beeped briefly and displayed a message:

ERROR 1608. Unable to process data.

"What does it say?" Thelma frowned.

Jayleen moved the pointer to the error code and ran her eyes over the information that floated under it.

“Code sixteen-zero-eight... system error... some data will not be saved.”

“We have the five-hundred-terabyte capacity,” Thelma said, “don’t be silly.”

Jayleen clicked ‘*read more*’, “It says here: a random contemporaneity... or too many signals... light traces from two or more neutrino collisions overlap... the program, despite decreasing the parameter T\_INTERVAL, cannot distinguish individual neutrino events, and therefore notifies about the inability to save information about them.”

Something flashed in Thelma’s eyes. Not yet a concern, no, rather confusing interest. Error is one thing, but when a computer reports that it is unable to process data — quite another. The data was supposed to come from somewhere. Clinging to the edge of the table, the old woman crouched over the monitor. Multicolored *wisteria* continued to grow and change. It seemed like racemes would leak over the screen soon.

Dr. Barrett muttered, “You got to be kidding me...”

“What could it be?” While Jayleen was gone, Stellan took some coffee from a coffee machine and now was tapping his fingernail on the cup. “A supernova?”

Hours before the gravitational collapse, catastrophic processes begin in the interior of a supermassive star that compress the nucleus so heavily that protons turn into neutrons, producing countless neutrinos. Photons take time to break through the upper layers of the star, while neutrinos leave the nucleus freely and thus become the first evidence that the star is about to explode turning into a supernova.

Tsujihara replied, “Well, if we assume that a blue supergiant in the final stages of evolution which is twenty times more massive than the Sun and which we managed not to notice is now floating past the solar system, then – yes, this flash may signal that in a few hours it will turn into a supernova, but...”

“It’s bullshit,” Thelma interrupted him with scarcely disguised contempt in her voice. “There is no supergiant hundreds of light-years around ready to explode.”

“At least it wasn’t there last night,” Katia said.

Dr. Barrett gave her a devastating look.

“Then what the hell is all this?” Stellan spread his arms as if trying to tear the monitor off the wall. I mean, for real?”

Thelma shook her head. “Theoretically, some obscure activity in the galactic center...”

“Illegal nuclear reactor,” Springfield said.

“A self-made nuclear bomb,” proposed Tsujihara.

“Nonsense. It’s all nonsense,” Thelma shook her head. “If it was a bomb, we would not be discussing it now.”

“Then what?” Stellan repeated the question.

“Well,” the woman stared at the table. “Something we haven’t yet encountered.”

*That’s not the answer*, Jayleen thought.

Everyone was silent for a quarter of a minute, and then Thelma pointed at Jayleen and said, “Turn on the news.”

“What kind of news?”

“Any news channel.”

Jayleen found a free chair, turned on the workstation, typed ‘*24h news channel*’ in the search line, and followed the first link in the list of results.

“Not Fox, please,” Thelma hissed. “Something for people with brains.”

Jayleen clicked ‘*Go Back*’ and turned on ‘*World News*’ on the BBC. A shouldered bruiser in pixel uniform, with a shaved head and a square chin, either uncertainly or reluctantly was talking about the elimination of an illegal batch of Telomide from Mars. The reporter could not squeeze out of him more than two or three simple sentences. For a moment, Jayleen, Stellan, and the doctor froze waiting for the ‘*Breaking News*’ sign, but the interview continued.

“What’s there?” Katia Trottie asked.

Jayleen shrugged. Nothing. Then she turned to Dr. Barrett.

“Should I look for something else?”

“No. Determine the direction where the neutrinos are coming from.” Responding to Young’s question, Thelma explained, “We need to contact Arecibo, the Canary Islands, and the Atacama<sup>8</sup>... with other large telescopes. Let’s explain the situation, ask to cancel the planned observations, and give them direction. Let them watch. I don’t know what it could be, but if it doesn’t burn us, in a few hours we will get the most fantastic celestial photos in the history of astronomical observations.”

While Jayleen was connecting the monitor with wisteria to the station, Dr. Springfield’s worried voice came from the dark screen above. “Has anyone already thought about how dangerous it is? I mean, all these neutrinos pass through us as well.”

“I don’t know,” Thelma said. “So far, I think, it’s okay, but if the flow does not subside long enough...” she did not finish. No matter how *shy* neutrinos are, with such a density of flow, they will eventually fry up everything alive.

With two touches, Jayleen activated the extended keyboard and focused. Direction. Source. Don’t think about the danger. Four days ago, using the same monitor, Thelma Barrett explained to her how to determine where the particle came from: the data from the photosensors should be transferred to a subprogram that considering the position of the Earth would determine the location of the point on the celestial sphere from which the neutrino flew and, if possible, will connect this point with the nearest space object. Jayleen opened a table with data on one of the first collisions, selected the necessary parameters, and then froze. Her fingers froze over the virtual keyboard.

This is nonsense. Why is she doing this?

Stellan’s words came to mind.

*(Something went wrong somewhere, and it’s showing us neutrinos from the southern hemisphere)*

Jayleen gripped her chin with her fingers. The feeling that she was doing unnecessary work was irrational and unreasonable, and yet Jayleen could not get rid of it.

Why?

Why does she think that determining the direction does not make sense?

*(showing neutrinos from the southern hemisphere)*

Jayleen imagined the globe, imagined a polar station at its southernmost point, imagined trillions of neutrinos piercing the planet from north to south, and then...

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<sup>8</sup> Not far from the city of Arecibo in Puerto Rico there is one of the world's largest radio telescopes; on the island of Palma in the Canary Islands the Great Telescope of the Canary Islands designed to observe the most distant objects in the universe is located; in Atacama desert an optical reflector telescope with a mirror diameter of 39 meters is placed, which one of the largest in the world too.

(this is just background noise)  
(from the southern hemisphere)

... it came to her. The spine seemed to be electrocuted.

“Dr. Barrett!”

“Determined?” The old woman raised her eyes.

“No. I was thinking here... *Kamiokande*... *Antares*... this is the northern hemisphere.”

“So what?”

“If I’m not mistaken,” Jailen hesitated, and Thelma waved her hand meaning ‘*Speak up fast!*’

“Their sensors, like in the *Ice Cube*, are tuned to capture neutrinos that pass through the Earth’s crust.”

“Yes, and what?”

“So how can they capture the same signals, I mean, the signal from the underground, if they are in the northern hemisphere?”

Jayleen spoke hectically but hoped Thelma would understand. Damn, the old woman should have guessed first!

“Jayleen, this is not what we all should worry about now,” Young said.

“No, no, wait.” Thelma blinked, like a person who is being photographed for a passport and knows that nothing good will come of it. “She is right.”

Stellan raised his eyebrows. Jayleen continued a bit bolder.

“We are at the lowest point of the southern hemisphere, here.” She drew the Earth with her hands and pointed to the location of the Amundsen-Scott station. “If we’re getting a signal from underground, then for a detector in the northern hemisphere,” the finger slid up along the invisible sphere, “the same signal would have to come from the sky, so it would be completely lost in the background noise of atmospheric neutrinos.”

Stellan and Thelma exchanged looks. The doctor stood closer to the girl, and Jayleen felt Thelma getting tensed up. Young needed a few seconds more, to grasp what Thelma and Jayleen had already realized: if neutrino observatories, which are located in different hemispheres, simultaneously record the intense neutrino flows from the underground...

“Holy crap!” The man coughed the coffee through his nostrils. “Earth’s core?”

“It keeps getting worse,” Springfield said helplessly.

“Something in the core?” Tsudihara whispered from the screen.

Thelma looked at her feet as if expecting the ground beneath her to open.

“Yes. Maybe. I don’t know.”

“What exactly?” again Young.

“I don’t know!” She repeated. “I’ve been observing the sky all my life. I don’t know what has to happen in the nucleus so it releases that many neutrinos!”

“We need to contact specialists,” Springfield suggested. “Geologists? That’s what geologists do, right?”

Thelma shook her head.

“I doubt geologists will know more than we do about high-energy neutrinos.”

“Wait.” Jayleen raised a finger. She decided to transfer the data to a sub-program to determine the direction, started the calculation, and now, frowning, looked at the dialogue box in the corner of the screen.

“What?” altogether.

“It’s not the core.”

“How come?” Thelma leaned over.

“I calculated the vector for the first collision. The trajectory of the collision is at an angle of forty-eight degrees to the axis of the planet.”

For a moment the data center fell into a tense silence. Everyone was trying to comprehend what they had heard. Four neutrino detectors located in different parts of the globe recorded flashes of high-energy neutrinos. At first glance, this was possible only if neutrinos came from under the Earth’s crust, not from space. Only the *Ice Cube* is located at the pole, i.e. just on the axis of the planet, respectively,

the angle of neutrino arrival should be equal to zero or be as close as possible to zero. Since this angle is much larger, the neutrinos were not emitted by the nucleus, which means that... Glazed eyes, confused looks, tightly pursed lips — no one really imagined what this all could mean.

“Four simultaneous flashes in different parts of the celestial sphere?” Mumbled Katia Trotter.

“Impossible,” said Dr. Barrett.

“Theoretically, the source may be one,” said Moromao without much certainty, “but its location... it should be placed so that signals come from underground for all of us. This, of course, is hard to imagine...”

“But we can easily check that,” said Katia.

She turned around and spoke French to someone outside the camera’s field of vision. In a moment, a middle-aged woman in a lab coat brought her a globe and scraps of wires. Then Katia niggled with all that for another minute, piercing the globe with wires at different angles.

In the end, she summed up, “No options. For three observatories, it might work. There are still a few spots underground the signals might be coming from, but no matter how you turn it,” she demonstrated the globe to the camera, “when we have four detectors, for one of them neutrinos will still be arriving from the sky.”

So the signal is not from the nucleus... but not from space.

“The source is under the ground, but not in the core?” Stellan suggested.

“It sounds even more unreal,” Thelma snorted.

“No more than two hundred thousand collisions in half an hour,” Stellan countered.

“It would not be unreal if they came from the core,” Springfield muttered.

“No, no,” Thelma shook her head. “There must be something else. Some explanation.”

Suddenly, Sherman Springfield came alive.

“It is slowing down!”

“No,” Stellan disagreed.

“It’s getting weaker,” Springfield insisted. “Here, on my side.”

“Me too,” said Tsujihara.

Thelma pressed her palms to her temples, then turned to the screens.

“Dr. Tsujihara, Dr. Springfield, Katia,” she said in a tone that calmed the controversy. “We used to deal with single events and, determining the direction, we talked about a celestial body that could be a source of it: a quasar, a supernova, or a distant galaxy. Now we have a stream, neutrinos have been bombarding the detector for half an hour, and if the source of the flow is located in space, the direction recorded by photosensors must change, because the Earth rotates. That is, if we consider random events, their vectors must be different. But if the source or sources are in the Earth’s interior, they rotate with us, and therefore, the recorded vector will not change, no matter how long we observe the flow.” She looked at the faces on the screens. “Do you understand?”

Moromao nodded. “Yes, doctor.”

“We need to determine the directions where neutrinos came from and were recorded by the detectors. Let’s use several time-spaced collisions.”

“I’m already working on it,” Katia replied.

“Me too.” Jayleen activated the keyboard and her fingers flew over the tabletop.

There was silence for a while. Springfield was right, the flow was slowing down. The buzzing became fragmented and eventually came to naught, breaking up into individual sounds. Jayleen noticed the change only when she finished her calculations and, biting her lip, stared at the screen.

“So what do we have?” Thelma tapped her fingers on the back of the chair Jayleen was sitting in. “Is the vector stationary? Is it moving?”

Jayleen swallowed loudly. What did Springfield say? The further away, the worse.

“Neither stationary nor moving.”

“What?” The woman squeezed the back of the chair so hard that her fingers cracked.

Stellan groaned. Jayleen began to explain.

“I took two events with a difference of three minutes. The vectors are different, but... The probable source of the first neutrino is Aliot, the brightest star in the constellation The Little Dipper. The source of the second is Alcor in the Big Dipper. The angular distance between them is eight-hundredths of a radian<sup>9</sup>. Four degrees, twenty-nine minutes, and thirty-five seconds, to be exact.”

She pointed to the number at the bottom of the dialog box

**4° 29' 35"**

“Three minutes?” Thelma Barrett clarified.

“Yes.”

The woman cursed.

The acceptable error limit of the updated *Ice Cube* did not exceed three angular seconds. The globe rotates at fifteen degrees per hour, and the planet rotates three-quarters of a degree in three minutes, so a difference of four and a half degrees between events could not be caused by the Earth’s rotation or the detector error.

“What the hell that means?” Stellan was confused.

“The source is not here, it is in space, and...” Thelma squeezed the chair as hard as if she wanted to break a piece off. “And this is not a single source. I would say sources. At least two in our sector — in the northern hemisphere.

“Three.” Jayleen continued adding the data to the calculation program and determined the direction for other neutrinos.

This time Dr. Barrett did not respond.

“And no, wait, not three.” For a moment, Stellan and Thelma brightened, as if hoping that Jayleen would say she got it wrong and that the source was actually the same. Instead, the woman said, “It’s already four.” Silence. Jayleen’s fingers fluttered over the keyboard. “Five. Well, in fact, each signal I processed came from a different point in the sky.”

“Angular distances?” Thelma asked in a hollow voice.

“All objects are close, but the distances between them are greater than could be explained by the rotation of the Earth. One second.” Jayleen brought the list to the screen. “So, Pherkad, that is, Gamma Ursae Minoris. Blue star HD 147321 in Small Dipper. Eta Draconis. Next... e-em... Eleventh in Small Dipper. Edasich or Iota Draconis. Galaxy NGC 6217 in Small Dipper... Thuban or Alpha Draconis... Aldhibah, also in the Dragon constellation... Should I continue?”

“No.” Dr. Barrett pressed her palms to her lips. “Katia, what do you have?”

Trottier looked at the camera.

“Lambda Pavonis.”

Thelma slapped herself on the thigh. “It’s the opposite side of the sky!”

“Galaxy NGC 6752,” Katia continued.

“Where is it?”

“Also in the Peacock constellation, but far from Lambda. It can’t be measured certainly ... HD 190984 star. The same direction.”

Sherman Springfield came forward, “Delta Serpentis.”

“Damn!” Thelma was breathing hard.

Dr. Tsujihara from *Super-Kamiokande* was the last to speak, “Galaxy M104 Sombrero in the Virgo constellation... Galaxy NGC 4697 in the Virgo constellation... Star HD 103774 in the Crow constellation.”

It seemed as if the whole universe had ignited.

Dr. Barrett’s haunted look darted between the monitors.

“What the hell is going on?” her trembling voice cut through the stagnant air of the data center. The woman shook her head as if waiting for someone to hand her instructions on *‘How to act when the*

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<sup>9</sup> Radian is a unit of measuring angles. 1 radian is an angle arc length of which is equal to the radius  $\approx 57.3^\circ$ .



*sky is on fire*. “Have we just recorded a neutrino flow five orders of magnitude higher than usual from dozens of different directions in the celestial sphere?” She shifted her gaze to Jayleen, then to Stellan, and then repeated, “What the hell is going on?”

Jayleen was silent. Signals of new collisions were getting less and less frequent, and it resembled the drops dripping from the roof after the downpour.

“Spica Star in the Virgo constellation,” Moromao’s voice broke the silence.

Thelma glanced at the monitor with a blank incurious stare.

“It’s the brightest star in the Virgo constellation. If I’m not mistaken, it must be somewhere over us now. We could see it.”

“It’s not dark enough outside,” said Jayleen. “We won’t see anything.”

It was hard for Telma to block out her thoughts, so she answered five seconds later.

“Two hundred thousand collisions... In half an hour... And neutrinos always come first. I don’t know what’s happened there...” She pointed to the sky. “but I’m afraid that when the light from those events reaches the Earth, instead of worrying about whether we will see it, we will have to think where to hide so that it does not burn us.” After a small pause, she looked at the table. “Whose tablet is that?”

Jayleen replied that it was hers. Thelma grabbed the gadget and hobbled away from the data center indecently fast for her age.

“Where is she going?” Stellan raised his eyebrows.

Jayleen shrugged. The head of the station got up and looked out into the corridor, “Looks like she’s going outside.”

Jayleen muttered, “She took my tablet.”

“Yeah.” Young crossed the threshold and followed Thelma.

Jayleen sat for a while, staring at the monitors with Katia’s and Tsujihara’s confused faces, and then also scrambled to her feet.

Putting on their vests, Stellan and Jayleen got out of the residential building. Thelma was standing half a hundred meters from the entrance, holding the tablet in her outstretched arms and, turning, led it along the horizon. As she approached, Jayleen saw that the doctor had launched a night sky app. There were no stars, but the mobile tracker didn’t need them. Using the time, date, GPS coordinates, and position of the tablet, it showed a map of constellations on the screen and indicated the location of visible planets.

Dr. Barrett was approaching a bright spot on the horizon when a pentagon appeared on the screen between Leo and Libra with broken lines attached to its four vertices. The caption *VIRGO* got displayed in the middle. Half of the constellation was hidden below the horizon, and the lines below it were dotted.

“I was wrong.” Thelma’s nostrils swelled. “Virgo is too low. Spica is under the horizon.” She glanced over her shoulder at Jayleen. “What else did they say?”

“E-em.” Jayleen frowned. “Something in the Corvus constellation.”

The woman was slowly lifting the tablet until she found a simple quadrangle with the caption *CORVUS*<sup>10</sup>.

“Darn, Crow is just over the Sun now.”

“And the Peacock,” Jayleen recalled. “Trottier talked about Lambda in the Peacock constellation.”

Peacock’s constellation appeared above their heads. Thelma set the tablet at a piece of sky with the caption *PAVO*<sup>11</sup>. The application highlighted the constellation, consisting of a triangle, a pentagon, and three lines; the stars were marked with grey dots and showed their names: Peacock, Beta, Delta, Lambda, etc.

“Here it is,” Dr. Barrett whispered. “Lambda Pavonis”

Jayleen Gonkala and Stellan Young froze on either side of the crumpled woman, who seemed to have lifted her hands above the head in prayer, and, raising their heads, stared at the screen, where the

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<sup>10</sup> (lat.) Crow

<sup>11</sup> (lat.) Peacock

tracker showed the dot with the caption "λ Pavo". All three could barely breathe. This is what happens during a summer storm: you freeze at the window, waiting for lightning, which is about to shatter the sky... but lightning does not appear. Minutes passed, Thelma got tired, and changed hands several times, not lowering the tablet, but nothing happened. The sky remained dully grey, too dark for the shadows, too light for the constellations to be visible.

*In the air over Edward Lake, Central Africa*

*3 hours 43 min after neutrino flow recorded at the Amundsen-Scott station*

The fourth hour of Turkish Airlines' Airbus A650 flight TK43, which was returning empty from Johannesburg to Istanbul, was coming to an end. Forty-five-year-old Alara Taifur, a green-eyed brown-haired woman with thin lips, was sitting in the captain's chair. Her partner, whom she had been flying with for the past eight years, had recently retired, and two weeks ago his place in the co-pilot's seat was occupied by 30-year-old Erdem Menderes. They left Istanbul on Monday morning, transporting chemicals, medical supplies, and some spare parts for agricultural machinery to South Africa, and were now returning empty-handed — the legitimate South African government had managed to get by until the end of the pandemic, but there was still nothing to export.

The sun was moving towards the red glow on the horizon. There were no clouds in the sky. The airplane was moving so smoothly that it didn't seem to be moving at all.

Erdem was looking ahead relaxed and sleepy. Alara craned her neck looking at something in the right window of the cabin. Earlier, before Clodis, she constantly flew this route. Then, the woman stretched out her hand and said, "There."

"Where?" The co-pilot turned his head.

"In the east. Do you see?"

Erdem discerned only the green canvas of the rainforest.

"There three years ago there was a big city," Alara said. "Mbarara. Regional center. And now everything has run wild."

The pilot looked closely, but still saw nothing.

"Did they leave it because of the temperature?"

"No."

He glanced at the map on the screen: a tiny plane crossed a blue spot with the caption *Lake Edward* and approached a line with 0° latitude.

"We are crossing the equator."

"Yes, there is the East African Plateau below us. A kilometer, sometimes more, above sea level. Plus the mountains around. And there, just ahead of us," she pointed north, "the Ruwenzori Mountains, I still remember snow on top of Stanley. Further ahead there is a volcano Virunga, and there," the hand moved a little further east "spurs of Imatong. South Sudan is over there. Or it's better to say, there once was South Sudan."

The first wave of deadly heat covered the Congo Basin in the early 2120s. In five years, the air under the canopy of the rainforest warmed up to plus fifty, and in cities, even at night, temperatures did not drop below thirty degrees Celsius. Over the past decade, wet and hot air masses have been constantly breaking through the chain of mountains that stretch along Uganda's western border flooding the central part of the East African Plateau. The air temperature soared to plus forty and remained the same for weeks. Nevertheless, before the outbreak of the Clodis pandemic, the Ugandans were holding on somehow.

"Why did people leave these places?"

Alara shrugged.

"I don't know." Her friend worked as an expediter for humanitarian convoys in Kenya and said that the Ugandan health care system collapsed after the first Clodis outbreak. People flooded the streets; Busara Adongo, the president at that time, tried to quell the protests but fled to Tanzania, where he died of Clodis, and then everything just fell apart. Since then, the world received information about Uganda

only from satellite images. Now the situation is slowly improving. IATA<sup>12</sup> put Kampala on the list of active airports, and a few days ago the UN announced the formation of a transitional government. “It seems to me that they do not have the opportunity to send someone and see what is happening in the west.” She shrugged again. “No one knows if people actually live there.”

The co-pilot leaned to the window and glanced down. Darkness was approaching from the east, and from such a height the water in the lake seemed dirty gray.

“Imagine landing here,” he muttered.

“Why on earth?” Alara raised her eyebrows.

“Well,” Erdem made an incomprehensible gesture with his hand, “suddenly something happens and we’ll have to land the plane.”

“What will happen, for example?”

“Well, what if the engine will fail.”

Alara glanced suspiciously at the co-pilot and thought if she should ask when his engine failed on the flight simulator last time but said nothing about it.

“We have enough fuel to reach the North Pole with one engine on.”

“Just imagine.” Erdem looked at the bushy lake shore. “I used to fly to New York and was thinking about it all the time. Especially at night. Suddenly this, suddenly that. You imagine situations, you contemplate how you will act. What if in the middle of the Atlantic Ocean, the engines fail and there is nothing else left to do but land on water? What if lightning strikes the plane in a cloud? I always felt more confident above the ground. I don’t know...” Noticing Alara staring at him, Erdem added, “No one taught us to land on water.”

The woman shook her head as if saying with all her facial expression ‘*why the hell did you become a pilot then?*’ Erdem Menderes did not quiet down.

“I mean, when you fly above the ground, in any case, there will always be a place to land. A bunch of airports nearby, a highway, and finally you can find a field. But here...”

“What about it?”

He pointed to the jungle below.

“Even if we are lucky enough to land, we will get boiled here faster than someone saves us.”

To the west and north of Lake Edward, there were ridges thousands of meters high, so Alara knew that in the event of an emergency landing heat stroke did not threaten them, but instead added, “Or Islamists will find us and cut off our heads.”

“You said there is no one beneath us.”

“There is no one in Mbarari. But we’re flying over the mountains. And the heat here is definitely not a problem.”

Erdem looked at the display. Lake Edward moved slowly down the screen.

“I don’t mind the heat, but Islamists?”

“I’m telling you, no one knows what’s beneath us. In the mountains, the temperature is tolerable for life, and it is possible that after the transport system collapsed, Clodis did not reach these places.”

For a while they were both silent; the hum of engines filled the cabin.

“Are you serious?” Erdem glared at her. “Is it possible that Islamists are there?”

The woman looked to the north. She flew here hundreds of times and saw with her own eyes how slowly but steadily once fertile lands in northern Uganda became devastated.

“They could no longer hide in the Southern Sahara, but they could go either to the north, to the Mediterranean coast, or to the south, here. And during the pandemic, I did not hear anything about Cairo or Alexandria being invaded by the bearded men armed with Kalashnikovs.”

“You’re hopeless,” Erdem said.

Alara ran her fingers over her lips, hiding a smug smile.

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<sup>12</sup> International Air Transport Association

The next moment, the onboard computer gave a warning signal, and the cabin noise changed. Both pilots stared at the displays on the control panel. The vertical bar labeled ‘*ENG 1*’ — an indicator of the left engine power – was dropping and eventually shrank to a horizontal line.

“Engine failure number one!” Erdem blurted out.

Alara was not superstitious, but she looked at him with an expression as if she wanted to tear his tongue out. It was his evil eye!

The airliner tilted and leveled. The autopilot, compensating for the loss of thrust from the left side, readjusted the control planes on the wings and tail. The woman looked out of the window and inspected the engine. There was no visible damage. She looked back at the display. No reports of malfunction, fire, or short circuit. The fuel level is sufficient, the pumps are live, and the fuel pressure is within normal limits. The engine just stopped. Hellish stuff!

“Declare an emergency,” Alara put her hand on the sidestick controller, preparing to take control of the plane in case autopilot turns off.

Erdem was to lead the talks with the Alexandria Air Traffic Control Center. The co-pilot adjusted the headphones and pressed the transmitter button.

“Pan-pan, pan-pan, pan-pan<sup>13</sup>, TK forty-three... Alexandria-control, this is TK forty-three, are you receiving me over?”

A few seconds passed and the Egyptian dispatcher responded, “TK forty-three, I’m receiving you over.”

“We have an emergency situation. Engine failure №1.”

“Clarify your location.”

Communication and data exchange was performed via satellite, but TK43 was still too far away for the dispatcher to see it on the radar.

“Just passed the equator.”

“Confirmed. Your decision?”

Erdem glanced at Alara. In the west — the Congo Basin. In the north — almost dead Sudan, Nubian and Egyptian deserts. There is no point in going back. Four hours to Cairo or Alexandria. Maybe more, considering that they only have one operating engine.

“Entebbe.” Alara decided not to take any risks. “Kampala Airport”.

Erdem pressed the transmitter button, “Alexandria Control, this is TK forty-three, landing in Kampala, at Entebbe Airport. If possible, of course.”

“TK forty-three, confirmed, I’m contacting the air traffic controller in Kampala.”

Alara lowered an interactive plastic panel in front of her, where the onboard computer displayed a control card with a list of actions in case of engine failure. Attaching the panel, the woman accidentally touched the window and pulled her hand away. She felt as if her elbow was scalded with boiling water. She frowned, raised her hand, and touched the carbon fiber-reinforced glass with her all five fingers. The beams were scorched by a piercing, burning cold.

Alara hissed. The glass was so cold that the woman could not keep her fingers on the surface for more than a few seconds.

“What?” Erdem asked.

Alara looked at the temperature indicator: -72 °C. Eyebrows slipped down at the nasal bridge. Minus seventy-two!

“Temperature...”

“What?” The co-pilot didn’t understand.

The plane trembled — the strip of smooth air ended.

“Look.” The moment Alara pointed to the display, the temperature dropped another degree: -73° C.

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<sup>13</sup> Pan-pan (Fr. *panne* - breakdown) - a voice signal of radiotelephone communication, indicating the occurrence of an emergency situation, but for the time being, does not pose an immediate danger to anyone's life and immediate assistance is not required. A ‘*mayday*’ signal is used to declare an emergency.

“Oh,” Erdem froze with his mouth open.

Alara looked at the height indicator. Airbus was taking the three hundred and thirtieth echelon<sup>14</sup>. At such a height above the equator, the temperature usually does not drop below -35 °C. Just a few minutes ago it was like that.

“It’s an error,” said the co-pilot.

“Touch the glass.”

He pressed his hand against the glass and immediately pulled it away.

“Shit.”

At that moment, the indicator on the display changed again: -74 °C.

“Such temperatures were last recorded here during the Ice Age,” Alara said.

“I don’t understand...”

He was interrupted by the creak of atmospheric noise, and then they heard a voice in the earphone, “TK forty-three, Kampala-approach on the line, what’s the situation?”

The Ugandan dispatcher spoke as if with his mouth full, and at first, Erdem understood only ‘*Kampala-approach*’ from the whole phrase.

“Kampala-approach, this is a cargo Turkish TK forty-three, repeat please.”

“What’s the emergency?”

“Kampala-approach, engine failure №1, emergency landing is requested.”

“TK forty-three confirmed... I see you on the radar. Make it to the right, zero-one-five, go down and maintain two-five-thousand.”

“Kampala-approach confirmed: zero-one-five, height twenty-five thousand.”

Alara set new parameters for the autopilot; the plane turned east and began to descend.

“Okay, let’s try to restart. Ready?”

Since she was piloting the liner, Erdem was supposed to restart the engine on his own, but, despite the growing trembling, the plane was still following the course. Due to the empty cargo compartment, they did not even have to get off the echelon — the power of one engine was enough to maintain altitude, and Alara decided to help the other pilot.

“Yes,” he nodded.

The woman read the first item from the checklist, “Fuel.”

The co-pilot reached for the switch on the display that connected the #1 engine to another fuel tank but did not have time to press anything. The rhythmical hum was replaced by a thunderous roar, and the plane shook. The light in the cabin dimmed. Alara lifted her head, and peered out the front window, but her gaze seemed to hit a brick wall. The Airbus flew into the cloud. Swollen from the moisture steel-gray curls splashed on the windows and fuselage. The wipers turned on automatically, smearing turbid drops on the glass. It felt as if the liner had got into the center of a snowstorm.

“Hail?” Erdem shouted.

“No.” The words barely made their way through the noise, so the woman had to shout. “Just a cloud... we flew into the cloud!”

The Airbus jerked so much that Alara clattered with her teeth, risking biting her tongue, and her voice rattled nastily.

“Where did it come from?” A second ago the sky was clear up to Sudan. Erdem pointed to the display. “The weather radar isn’t showing anything even now.”

Alara tightened her seat belts, and then looked out of the side window. She wanted to see the engine, but to no avail — the cloud was impenetrable, and within a meter of the fuselage she could make out nothing but a piled-up mash of ice crystals or droplets.

The shadows in the cabin thickened even more.

“Where did it come from?” Erdem repeated irritably. He was thrown from side to side so hard that he had to grab the edge of the chair with his hand.

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<sup>14</sup> 33,000 feet or 10.06 kilometers.

Alara looked at the display. The co-pilot was right: the weather radar showed clear skies ten miles ahead.

“Sometimes it happens... too much moisture in the cloud... instead of reflecting radio waves, it absorbs them, nothing returns to the receiver... and the system believes that everything is clear in front of us.”

With the corner of her eye, the woman noted that the temperature outside had dropped another degree, but then suddenly she was distracted by a new warning signal.

Erdem almost fell back in his chair.

“What a...?”

“The second engine!” Alara shouted. “Engine number two failure!”

“Fucking shit!”

“I can’t believe it...”

In an instant, the autopilot turned off. The woman gripped the control stick on the side panel tighter. Erdem pressed the transmitter button and shouted in a high-pitched voice, “May! Mayday! Mayday!”

“TK forty-three?” Replied the dispatcher from Entebbe.

“May! Mayday! Mayday!”

“TK forty-three, indicate the nature of your emergency.”

“Engine failure number two!”

“Engine number 2 or number 1?” The dispatcher decided that the pilots made a mistake and are now trying to correct themselves.

“We lost both!” Erdem growled. “Both engines!”

“E-e-e...”

“And there is terrible turbulence!”

“TK forty-three, we have prepared the runway number seventeen for you... your lane is one-seven. Confirm, please!”

Under the best conditions, with a loss of a thousand feet, their plane could only fly three miles, that is, one could count on no more than one hundred and eighty kilometers. Erdem set his gaze on the map and panicked.

“We won’t make it! More than two hundred kilometers to Entebbe!”

“Calm down!” Alara shouted.

“We won’t make it!”

Alara focused on the interactive panel. A bright red inscription "RESTART ENG 1.2" was flashing at the top of it. The cold and the cloud did not matter anymore; the main thing was to restart the engines.

“Fuel,” she said firmly.

Erdem Menderes was startled and did not react, his hands were shaking.

“Fuel!” Alara growled.

Erdem came to his senses.

“Switching tanks,” he pressed the corresponding button on the display.

Alara noted that steam was coming out of his mouth.

“Supplemental pumps!”

Two more clicks.

“Both are on.”

“Engine mode selector — on the ignition!”

Erdem reached for the switch above his head.

“Ignition mode confirmed.”

“Low thrust control levers!”

“Low thrust control levers.” Erdem shifted both levers all the way back. “Confirmed.”

“Speed?”

A green dot on the display opposite ‘AIRSPEED, kn’ was lit.

“Optimal.”

“And...” Alara held her breath. “Restart both engines!”

Erdem knew that nothing depended on the force of the pressure, but he stuck his fingers in the turbine icons on the display so hard that his nails turned white. Eventually, he withdrew his hand and waited for a bit, but the power indicators didn’t even twitch.

“Negative!”

“Start of APU<sup>15</sup>!”

Erdem pressed the *APU* button, waited for the green signal to appear, and said, “APU is launched.”

At least something. At least they will not be left without electricity.

“What about the city you talked about?” Erdem squinted at her.

“Mbarara?”

“Yes.”

“It’s abandoned, there is no one there.”

The plane was shaking as if they were racing in a car on a bumpy rural road.

“The inhabited ones are unattainable.” Erdem had to bend down so she could hear him. “Is there a runway?”

Alara didn’t know. And it didn’t matter.

“It’s too late. At this latitude, night comes instantly.” Even if there is a runway, there will be no landing lights on it. “We won’t be able to land when it’s dark and so cloudy.”

One after another, several alarms rang out.

“What again?” The woman gritted her teeth.

A long list of failures unfolded on the monitor in front of the co-pilot, and Erdem began to read, “Loss of GPS signal... loss of satellite communication... altitudes conflict.”

“Altitudes conflict?!”

The Airbus A650 onboard computer determined altitude either directly by the data value of the external pressure recorded by the sensors of the air signal system (ASS), or by radar, which determined the height above the terrain. In the second case, to calculate the absolute altitude, the altitude determined by the radar was added to the height above the terrain (the computer received it from the satellite that followed the aircraft). The program compared both data values. If they differed, it indicated a malfunction in one of the systems, the computer reported altitudes conflict and turned off most of the automatic functions. Alara knew this, but she had never encountered anything like that.

“Probably ADR/PTS<sup>16</sup> transmitter failure.” suggested the co-pilot. “There is nothing to give us the navigation data now.”

This meant that the satellite did not see them. The woman felt as if they were completely alone in the heavy clouds that shook and jerked the plane. All this was followed by an even more irrational need to make sure that there was still someone outside the cockpit who cared about the fate of their aircraft, so Alara pressed the transmitter button, “Kampala-approach... Kampala-approach... confirm?”

“TK forty-three, connection confirmed”

“We have additional problems... with avionics.”

“How can I help?”

Without taking his eyes off the list of failures on the display, the co-pilot suddenly interrupted her, “A speed jump...”

For a quarter of a century, Alara hasn’t heard the phrase ‘*speed jump*’ in the cockpit. There was no mode, either regular or emergency on the flight, it could be applied to.

“Kampala-approach, hold the line.” She turned to Erdem. “What did you say?”

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<sup>15</sup> Auxiliary power unit

<sup>16</sup> Aircraft Data Relay & Position Tracking System, ADR-PTS - satellite on-board data transmission and real-time location tracking system.

“The speed suddenly changed from four hundred to almost five hundred and forty knots<sup>17</sup>.”

A thousand kilometers per hour. A little more, and the plane will fall apart up in the air from the overload.

“How... No... We would have felt that...” She looked at the monitor but realized that without the satellite connection, she had nothing to compare their speed with.

“Something happened to the sensors,” Erdem said, panting. Despite the cold in the cabin, drops of sweat appeared on his forehead. “The ASS has gone crazy!”

“*Icing*,” Alara thought, “*the sensors got covered with ice.*”

The dispatcher’s voice in the earphones barely made its way through the outside noise, “TK forty-three, are you all right?”

“Kampala-approach, wait...” She wanted to find out first what was wrong with the speed indicators, but the dispatcher didn’t wait.

“TK forty-three, you’ve disappeared from my radar.”

Alara and Erdem looked at each other.

“What?!”

“Can you confirm your course? Height...? Any visual landmarks...?”

“Kampala-approach, we flew into dense clouds, visibility is almost at zero. The course...” Alara glanced at the display and froze with her mouth open. When the ADR/PTS system failed, the computer should have switched to a magnetic compass, but the compass hand twitched like insane, and the data values changed chaotically: 64... 329... 185... 19... A tiny exclamation mark flashed red on the left.

“*Compass? Damn it, even a compass?!*”

“TK forty-three,” the dispatcher reminded them of himself.

Alara lied, “We continue zero-one-five.” In fact, Alara had no idea where they were going.

“TK forty-three, did you say *dense clouds*? There are no clouds on my radar up to Kisangani<sup>18</sup>.”

“Kampala-approach, we are jolted ruthlessly. Headwind...” She looked at the monitor and got horrified again. One hundred and forty-two knots! Anything over seventy on this planet is considered a hurricane. This is simply impossible.

“Okay... TK forty-three, I understand... go down...” the bubbling of the dispatcher sounded a little offended as if he thought they had been playing a hoax on him. “The radar here shows good weather conditions. This is confirmed by the satellite data as well.”

Engines, air signal system sensors, satellite connection, a magnetic compass, and now the Entebbe dispatcher cannot see them on the radar. Alara focused on the interactive panel. The words were blurred because of the jolting, and the woman had to strain her eyes to see something. The onboard computer kept shuffling the instructions on the control card, with only one item at the top of the list remaining the same: *LAND ASAP*.

Alara angrily pushed the panel aside.

“Restart the engines,” she ordered Erdem. “Do not stop until at least one works. I’ll try to get us out of here.”

The aircraft jolted so harshly that the words coming out of her mouth sounded as if ground in a shredder.

“It’s hard to breathe,” Erdem croaked.

Alara looked at him over — the co-pilot was pale and panting, his face flushed with sweat — and then she realized that she also had to make more effort to get oxygen into her lungs. There was no warning of depressurization, nor did she experience ear congestion or headaches that would accompany the pressure drop, but she did not have time to think about it.

“Face masks!” She flipped the switch to the left of the main display.

Two massive oxygen masks descended from special niches above the chairs.

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<sup>17</sup> 1 knot = 1 nautical mile per hour = 1,852 km / h.

<sup>18</sup> Kisangani is a city in the northeast of the Democratic Republic of the Congo, three hundred kilometers west of Lake Edward. As of 2141, has been abandoned.



It was only when the cold oxygen, tickling, poured down the throat, her narrowed field of vision widened and Alara Tayfur realized how badly she was influenced by the shortness of breath.

“We are accelerating!” Erdem pointed at the display.

“Nonsense. The sensors froze. Forget about it.”

“But we are gaining... gaining altitude!”

Alara leaned over to the monitors. The altitude marks on the altimeter were moving down, which meant that the plane was taking off. How was that possible with no engine thrust at all?

“This is madness... and this...”

And that was exactly what was bothering her all the time. Alara has been flying since she was seventeen. She went all the way from thin-wing gliders and tiny four-seater turboprop aircraft to jet giants like the Airbus A650. Unlike Erdem, she knew how to fly, not just knew how to operate a plane. And just now Alara realized that she was not feeling what she should have to in a one-hundred-and-twenty-ton plane with its engines failed. The turbines were dead, but at the same time, something was holding their Airbus up in the air.

The next moment the automatic stall warning system turned on, “*Stall! Stall! Stall!*”

The onboard computer tilted the control stick forward, lowering its nose and forcing the aircraft to gain speed. The warning about the stall stopped, but in a second the speaker gave out a terribly calm mechanical voice, “*Overspeed. Slow down..! Overspeed. Slow down..!*”

For the first time since the system reported the engine number one failure, Alara was stunned. She had never heard these messages either in the air or in the simulator, one right after the other. No aircraft can move at excessive speed and lose the airstream at the same time. These are mutually exclusive phenomena.

“Slow down!” Erdem shouted. If they continue to accelerate, the fuselage will fall apart from overloads.

The computer raised the spoilers to slow down. The plane started shaking even harder.

“No!” Alara blocked the signal with a few clicks, the spoilers went down. “Something is wrong!”

“We need to go down!” Shouted the co-pilot. “Get us out of the clouds!”

Alara pursed her lips. Despite the grave cold in the cabin, drops of sweat tingled the skin above his eyes. First, they needed to understand where they were. She pressed the transmitter button, “Kampala-approach, you still don’t see us?”

“R... eat... p... ea...s...”

“Kampala-approach, it’s TK forty-three, can you hear me?”

“...”

“Kampala-approach?”

In response — the hiss of radio interference.

“Fuck!”

Oxygen masks had built-in microphones, and Alara could hear the echo of Erdem’s heavy breathing. This prevented her from concentrating.

“Restart the engines,” she ordered.

Then she took a deep breath and pushed the control stick forward. The aircraft shivered, leaned the nose, and began to go down.

At one point, the computer gave out a speeding warning signal again, and Alara allowed it to lift the spoilers but did not stop landing.

In a quarter of a minute, Erdem’s wheezing broke the silence in the headphones, “The engines are dead... There’s nothing I can do...”

“Dispatcher,” Alara squeezed out through her clenched teeth.

Erdem nodded.

“Kampala-approach, mayday, mayday, mayday... this is TK forty-three...”

There was no answer.

“Try Alexandria.”

“Alexandria-control, mayday, mayday, mayday... this is TK forty-three, we have an emergency... Alexandria-control, this is TK forty-three, confirm?” His cracked voice was drowning in the hiss, and Erdem couldn’t believe anyone would hear them.

Suddenly the clouds in front turned reddish.

“Are we getting out?” Erdem said.

Alara didn’t answer — her bloodless lips clenched into a scar-like, barely visible line — but she stopped pushing the joystick that hard. The plane began to level off.

When the plane emerged from the clouds, Alara could not help shouting, “*Siktir*<sup>19</sup>! Have you ever seen that?!”

The clouds were not just loose and ragged, they looked as if a rage-stricken deity had shredded them with thousands of clawed paws. The whirlwinds collided and intertwined. Conical swirls with shabby edges first swelled and then closed, as if trying to crush everything that got inside them. The crimson-lit featherbed covered the sky as far as the eye could see, and its surface — ominous, heavy with moisture — roared, boiling. From time to time, lead prominences emerged from the darkest areas, and the wind rushed at them, shattering and driving them back. Some pieces still came off and, trembling, flew past the plane. Rushed at an unimaginable speed.

Erdem whispered, “We really have six hundred knots, or... I don’t know...”

Alara leaned over and peered out the side window. The dim light surrounded the edge of the wing with trembling waves, reminiscent of St. Elmo’s fire. At the bottom lay another layer of clouds, thinner and smoother, through the gaps in which they could discern the lifeless land of gray-black color. The unusual appearance of that land brought her to her senses.

“Where are the mountains?”

She turned and stared at the monitor. The computer was displaying a map, but there was no communication with the satellite, so the program could not determine their location. Alara switched the navigator to scan mode. Instead of a colorful altitude map around the plane, a black-and-white relief grid appeared — the ground under the liner. The pilots stared at the intertwining of twisted waterways.

“Where are we?” Erdem asked.

“I don’t understand, Imatong Mountains...” The glass of the oxygen mask was frozen, and Alara wiped it with her forearm. “They should have been on the left and a little ahead of us. Where are they?”

She ran her bluish fingers over the display, zooming in. The navigator added previously invisible areas. A flat plain laid ahead. Something similar to a mountain range - a heterogeneous terrain with height differences — appeared in the northwest, behind the plane.

“Here! Behind.”

“It’s not Imatong,” the co-pilot shook his head. “We couldn’t get past them.”

“Mountains are behind! We need to turn around.”

“Wait, but the sun...”

“What about it?” Alara glared at him.

“It is behind us, in the west.” He pointed with his thumb behind his back. “So, we were moving in the right direction all the time.”

“If we were moving correctly, Lake Victoria should be to the right of us. We got too far!”

Erdem frowned. They couldn’t. Too little time has passed. After turning east, the distance to the mountains at the border with South Sudan was almost five hundred kilometers. How could they get to them? Without thrust, the liner would appear on the ground long before the first spurs. And Alara didn’t seem to understand that.

“Listen, Alara...”

“Shut up and restart the engines.” She had a hang-up about the mountains and did not want to hear anything. “And get in touch with someone finally.”

Alara thought that the sun should have already set, but was afraid of the misty depths this would lead to, and pushed it out of her consciousness.

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<sup>19</sup> Fuck!

“Tell them we are returning to Kampala... tell we are going down, and... and let them give us directions.”

Erdem pressed the transmitter button but did not say a word. Through the gaps in the clouds to the south, he discerned an unfamiliar rocky desert illuminated by a deceptive pink light.

“God, why is it so cold?” Alara was breathing hard. At first, she decided that the cylinder ran out of oxygen, then realized that the moisture from her breath froze on the walls of the oxygen hose and almost completely blocked the flow.

Alara shook the mask. It didn't help much. She looked at the display. -89 °C overboard. The headwind was one hundred and sixty knots. It was simply impossible. Thoughts in the oxygen-deprived brain flickered like light bulbs that were about to go out. She pulled off the mask, realized that there was even less oxygen in the cockpit, and hastily pulled it back. But why? They were already low enough and should have been able, despite depressurization, to breathe without restraint. But this cold... and wind... and... There was something else. Alara stared at the snippets of clouds flickering over the liner. Fast. Too fast. And what if the air sensors did not lie? The oncoming wind of this strength would be enough to keep the aircraft with no engine thrust in the air. But if this is the case, if they are really holding on the oncoming airflow, then when trying to turn around, the wind will hit them to the side and... This is the end. It will throw them out of the sky.

Fear piled up in her stomach. The palm that gripped the control stick was covered with a thick layer of sweat. Alara didn't know what to do. The mountain range in the west was receding.

“I'm coming back,” she finally croaked, “we're making a right turn.”

Then pulled the control stick forward and to the right. Signals from the cockpit came to the electric ailerons on the edges of the wings and the rudder in the tail. The liner leaned over and began to turn around.

The cabin was gradually flooded with a reddish glow. Erdem Menderes, stretching his neck, looked to the west, where the glow was coming from, and suddenly screamed, “Alara, no!” He pointed to something outside the window. “It's not the sun!”

“What?”

Out of the corner of her eye, she managed to snatch out a hot disk tucked between the clouds streaked with black spots, more like a wrinkled orange vacuole. Then a giant baseball bat seemed to hit the liner. Oxygen masks flew off their faces, the shock wave swept through the fuselage, and something with a shrill metal grind broke in the cargo hold. The liner almost turned upside down, dozens of icons flashed red on the display, and a voice warning came pouring from the speakers, “*Stall! Stall! Stall! Stall! Stall!*”

The plane hung, balancing on the edge of the wing, and then continued to collapse. Finally, with the unemotional recitative of the onboard computer, which did not tire of announcing the entry into the crash mode, rushed to meet the black earth.

*Amundsen-Scott Antarctic Station, South Pole  
September 21, 2141*

The discussion of the abnormal neutrino flow did not subside all the day.

Dr. Young walked electrified like a cloud. Dr. Barrett left the video conference room only to go to the restroom and argued with Dr. Springfield, Dr. Tsujihara, and a dozen other scholars about how to proceed. Jayleen and Katia tried to make sense out of gigabytes of data from neutrino telescopes.

Closer to New Zealand evening time, the enthusiasm subsided. But the first day, when the fiercest disputes took place, ended in nothing. Not only did the scientists disagree on what could have caused the outbreak, but they also did not agree on how to name it. The only thing that was accomplished that day was contacting the leaders of the *Caltech Gravitational Wave Detector*, the *Pellegrini Gamma-ray Observatory*, and the X-ray Telescope Complex at *Deep Space Habitat*, but none of the observatories recorded anything extraordinary.

The *Ice Cube* was also silent after the flow.

A quarter to midnight, Thelma Barrett and Stellan Young went to bed. Jayleen also went to her room, but could not sleep. Different thoughts swirled in her head, finding no way out. She was lying with her eyes wide open for a while, then returned to the data center and continued to copy the data from the detector.

Jayleen found a simplified 3D model of the Earth on the Internet, uploaded it to a graphic editor, and then spent four hours concentrating, like a surgeon performing open-heart surgery, adding lines along which neutrinos collided with the detector. Not only from the *Ice Cube* but also from other observatories.

At 4:47 a.m., the sun rose, but Jayleen didn't notice it. She finished work shortly after five a.m. and then wandered restlessly through the empty corridors of the station for a quarter of an hour. Jayleen found something and desperately wanted to share it. She approached Thelma Barrett's door several times but did not dare to knock.

Eventually, realizing that she was unlikely to cross paths with anyone before breakfast, Jayleen returned to her room but did not want to sleep. She went to the bathroom and stood under the hot shower until her chest and shoulders turned red and the skin on the fingers wrinkled. Brushing her teeth and combing her hair, Jayleen stared at her own reflection in the mirror. Faded eyes, bitten lips, and a vein in his forehead, that seemed to be ready to rupture. Apparently, it's necessary to take a nap. At least try. And as soon as she thought about it, the door slammed in the hallway. Jayleen ran out of the bathroom and leaned her ear against the door just in time to hear the shuffling of footsteps. She waited for the steps to recede and looked out. Dr. Barrett limped to the end of the corridor and turned to the stairs leading to the second floor. Jayleen quickly got dressed, picked up the tablet, and left the room.

The clock showed five to six a.m. At that time, the station cafeteria was not yet working, and the dining room was empty, but for early birds or for those who like to have a bite in the middle of the night, there was a refrigerator with snacks and a microwave right behind the food counter.

Jayleen froze in the doorway. Thelma made herself coffee, sat down at the table, and stared out of the window, sluggishly chewing on a sandwich. Jayleen coughed to reveal her presence. The old woman did not react. Jayleen approached her and began, "May I..."

The dining room windows overlooked the Quiet Sector. There was nothing behind them but piles of snow and ice. Thelma looked as if everything she cared about at that moment were the gloomy shadows that lay between them.

"What do you want?" She didn't even turn her head.

"I..."

"May you what? Sit down? Take a chair? Do you want to offer me more coffee?" Her face was gray like a person's out of breath. "I don't read people's minds, Ms. Honkala."

"I want to talk to you."

Thelma dug a fingernail into a piece of ham stuck between her teeth.

"Well, talk."

"Can I sit down?"

She started sinking into a chair, but Thelma replied sharply, "No."

Jayleen stood up as if burnt.

"I am joking. Sit down."

"I want to talk about what happened yesterday." Jayleen perched on the edge of a chair.

"Go ahead." Thelma looked at her without interest.

"I made some calculations tonight... while everyone was asleep".

The doctor was silent, and Jayleen, glancing at her, realized that she didn't go to bed either.

"I spent the whole night trying to understand where the neutrinos came from."

"And you're not the only one."

"I wasn't much good at math at university..." She hesitated. "I mean algebra. With geometry, on the contrary, I was okay. That is, when I had the opportunity to imagine a solution to the problem, I easily coped with it. But if the problem is abstract... all these formulas... they meant nothing to me. For me, these squiggles... there was nothing behind them."

A viscous mist rose over the melted ice outside the window. Jayleen went on.

“And so, to better imagine the problem, I began to mark the directions neutrinos have arrived from on a three-dimensional model of the Earth. Signals came from certain parts of the starry sky. *Ice Cube* has recorded neutrinos from Ursa Major, Ursa Minor, and the Dragon constellation. Neutrinos recorded by *Antares* came from the Peacock constellation, by *Homestake* from the Serpent Bearer, and by *Kamiokanda* from the Virgo and Crow constellations. However, I did not encounter any neutrino that came precisely from one point. I chose the particles that came one after the other, looking for some correlations, but in vain. No consistency, neither temporal nor spatial. And then, looking at all these lines on the model of the Earth, I suddenly realized that such a scatter of directions can be easily explained.”

Dr. Barrett jerked at the word *easily*.

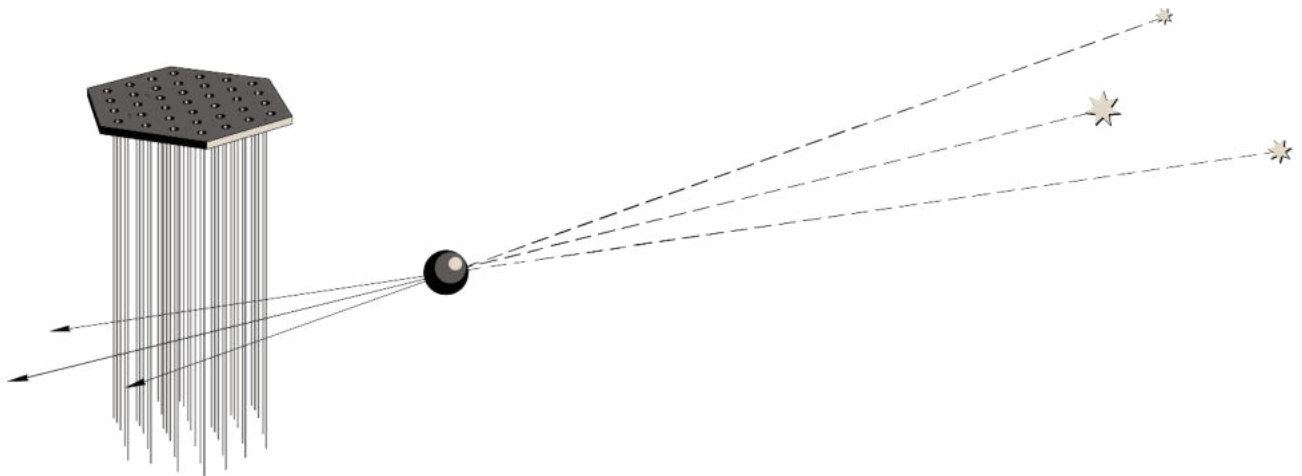
“How?”

“Assuming that the neutrino source was closer, not necessarily on Earth, but... I mean, much closer to us.”

Thelma rubbed the bags under her eyes with her fingers.

“We already discussed this yesterday with people definitely no dummier than you.”

With a stony expression on her face, Jayleen opened the tablet, put it on the table, and turned it over to Thelma.



“That’s what I’m trying to explain. We’re here,” she pointed to the detector on the left. “If the source is here,” the finger moved to a sphere closer to the center, “it will *only seem* that neutrinos come from different points. We habitually look for a source amidst remote objects, but that’s wrong, do you understand?”

It has been three decades since Thelma Barrett was last asked if she understood what she was being told. She looked at Jayleen as if she wanted to punch her.

“And what do you think this is the source?”

“You said it yesterday: something we have not encountered before.”

Thelma sighed. Fatigue was evident. She had no energy to argue.

“We have data on hundreds of thousands of collisions. By taking limited samples, one can find confirmation of anything.” She shoved the tablet away. “This is a false-positive result. When the selected data seem to confirm your hypothesis, but you chose them from such a large array that in fact, it does not indicate anything. The conversation is over.”

“No, it’s not over! I understood that this was a rather weak assumption, but I also knew that I could prove or dispose of it. I decided not to take into account that the neutrinos arrived chaotically, I just tried to average out the directions — all that I had. I started with two random neutrino events. Their vectors include a flat angle; I determined the bisector of this angle and marked it with a line on the diagram. Then I moved on to the next event and determined the bisector between its vector and the already marked line. And so on. I continued to determine bisectors between as many as possible...”

“I know what a bisector is, Ms. Honkala,” Thelma said in an icy tone.

“Fine.” Jayleen felt her time was running out. “I averaged the data for each observatory that recorded the collisions and got four lines along which neutrinos came to these detectors. And you know what?”

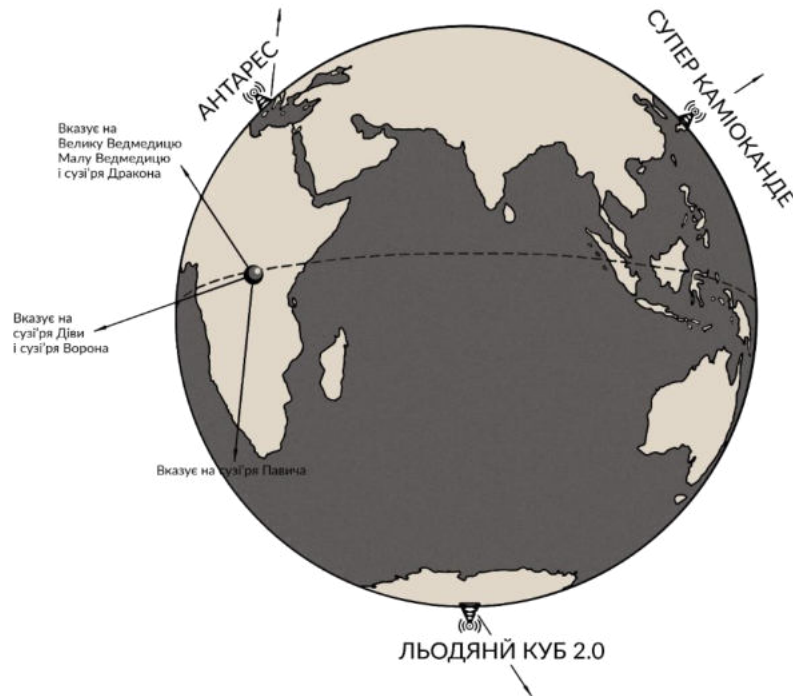
She fell silent, waiting for Thelma to ask ‘what?’, but the old woman was chewing on a sandwich not even looking at her. The idiotic pause lingered, and Jayleen, losing her temper, continued.

“Tell me, doctor, what is the probability that false-positive results from all four detectors will converge at one point?”

Up to this point, Thelma had looked like she was somewhere else, but after the last words, things changed. She looked at the assistant, and Jayleen thought no one had ever looked at her like that before.

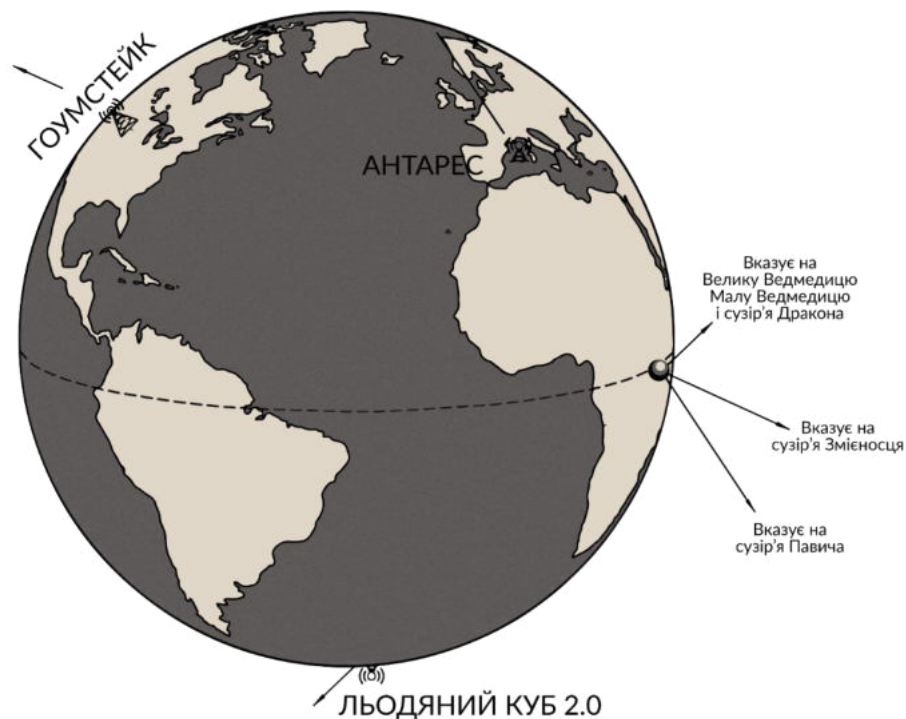
“If you are talking rubbish here...”

Thelma did not finish. Jayleen opened the Earth’s image and slipped the tablet back. Dotted lines from three detectors visible from this angle pierced the planet and converged at one point over Africa.



“All lines crossed at one point.”

Thelma Barrett must have been staring at her for twenty seconds. Not at the three-dimensional model on the screen, no, she was looking straight into Jayleen’s eyes. And only when she repeated, “Everyone. Every single one,” Thelma turned her gaze to the image.



Jailen turned the model: *Kamiokande* disappeared, but the detector appeared in *Homestake*.

“A point on Earth?” Thelma asked.

“Almost.”

“What does ‘almost’ even mean here?”

“Over Lake Edward. At a height of several kilometers above the surface. At the border between Uganda and the territory that was once the Democratic Republic of the Congo.” Realizing that she had managed to erase the arrogant expression from the doctor’s face, Jayleen beamed. “Something in the air above the lake *flashed*, scattering high-energy neutrinos.”

“But there... There was nothing. Over the past day, no one recorded anything extraordinary.”

“Not at all. A cargo plane crashed there yesterday.”

The old woman’s gaze was both humbled and embarrassed.

“And this disaster...” Thelma moved her lips, “coincides in time with the flash?”

“No,” Jayleen shook her head. “The plane crashed four hours later.”

Thelma was silent for a moment, then hemmed and stood up.

“We are preparing an article. Me, Tsudihara, Springfield. A few more parasites from CERN. Well, you are on the team now as well. Co-authoring.” She pointed at the tablet. “Describe everything you’ve just said.”

“Uh-huh.” Jayleen felt as if she was about to faint. “Yes. Okay. I’ll do everything.”

“I want a draft on my desk on Friday morning. Three paragraphs, no more.”

“Friday morning, three paragraphs.” Jayleen nodded. “Will be done.”

The old woman was at the exit from the dining room, but after taking a few steps, she stopped and turned to Jayleen.

“Don’t even think of mentioning the plane. Forget about it at all. We will draft the article to *Nature* or *Science*, and if you start yacking about the overlap of the flashes and the crash of that liner, I swear, your next articles will not go beyond the garbage sites like *disinfopedia.org* or *paranoiamagazine.com*. Are we on the same page with it?”

Jayleen stood up.

“I’ve heard you, Dr. Barrett.”

A good minute after Thelma left, she stood leaning her hands against the table, trying to figure out if Dr. Barrett had actually winked at her.