THE SONG OF THE SWAN

Arthur D'Alembert

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Song of the Swan

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Cover Photo : Bubble Nebulae NGC 7635

by T. Bonev, K. Jockers, and T. Credner

of MPI fuer Aeronomie, Pik Terskol Observatory

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To my Father.

I also want to thank Mr. Steven Hoffmann for the revision work. Special thanks to Christine Thomas for her excellent checking and correction work, her suggestions, and patience with the job, to Beverly Powers and Marg Gilks for fine tuning of manuscript and also to Horacio A. Legal for his kindly words.

Much of the astronomical plot was inspired by the Scientific American articles, "The Great Supernova of 1987," by Stan Woosley and Tom Weaver, and "How Supernova Explodes," by Hans Bethe and Gerald Brown.

This work is purely fictional. Any resemblance to real people or incidents is coincidence.

Arthur D'Alembert

PREFACE

Where does science end? Where does fiction begin? The answers point toward the pleasant book of Arthur D'Alembert. The Song of the Swan is a novel that is based on scientific terms and explores, in a very objective way, the possibility of existence of an alien life, presenting an unknown new facet. The author combines astronomy, physics, mathematics, computer sciences, biology and other similar areas showing than mankind is much more integrated in the universe that most of us would like to realize.

The Song of the Swan is more than a captivating science fiction book, it is the collection of realistic facts that could be happening right now, behind our backs...

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Horacio is an electrical engineer & computer consultant in Paraguay

I have enjoyed reading The Song of the Swan and look forward to many other books by Arthur D'Alembert. His style of mixing fact with science fiction to weave a believable tale is fantastic. I have enjoyed working with Arthur as an editor and hope to help with future projects as well. The Song of the Swan is a must read for anyone who enjoys the possibility of life outside our universe.

Beverly Powers

THE DEATH OF A STAR

Even at three light-days distance, the scene was almost supernatural.

Sanduleak, an eleven million-year-old star, had evolved into a blue supergiant, shining with the power of a hundred thousand suns inside the Tarantula Nebulae.

Flaming tongues burst on its surface like luminous serpents reaching out hundreds of thousands of kilometers into space. Everything was tiny, minuscule—a nothing next to the star. She was the absolute queen of the nebulae in Magellan Cloud.

Sanduleak was a different star. With eighteen times the mass of our own sun and a diameter that could fill the entire orbit of the Earth, she had consumed all her nuclear fuel quickly. Stars like her live a short time, but compensate for their short life span by living intensely, brilliantly, like mythological beings. Their brightness is so powerful that they obscure any other object within a radius of countless light-years. They are creators of life, nuclear ovens where vital elements are cooked and the absolute essence of life is detailed. Sanduleak was a cosmic mother, ready to explode and spread the seeds of her womb.

In successive layers, she had manufactured denser and denser chemical elements, beginning with helium, carbon and oxygen and building up to the heaviest, nickel and iron.

There is no other process for creating the chemical elements in the universe. Only stars like Sanduleak have the supreme privilege to do this. Only she and her countless sisters already gone are delegated by nature to perform this task in their cores. They alone have the necessary abilities to compress and break the hard hydrogen atoms, melt them down, and force them to transform into different atoms, heavier and denser.

While burning fuel, the star was able to balance the weight, which insisted on compressing her more and more. She was like a hydrogen bomb in constant explosion, consuming a million times more energy than our sun, and transforming the lightest elements into heavier ones through this process.

All new matter formed released unimaginable amounts of expansive heat. The energy from this heat allowed Sanduleak to survive a little longer, evening out her volume and balancing the terrible smashing pressure of her own weight.

Each time, a shorter pause. Each time, a shorter respiration, almost a hiccup, making her whole mass shake. The star was agonizing. Her forces, exhausted by the constant effort, were reaching their end. Also reaching its end was an extraordinary story. Still, another no less amazing story would begin quickly, marked by cataclysmic events.

Sanduleak wouldn't disappear in silence. Rather, she would go out in the same grandiose style in which she lived her short and luminous existence. Her death would be something much more fantastic than any other event that had occurred in thousands of years in the entire galaxy.

She had taken ten million years to consume the hydrogen and transform it into helium, a million years to consume the helium and transform it into carbon and oxygen, twelve years for neon, and just one week for

silicon. With each transitional phase, a spasmodic tremor traveled through her body. First she swelled, then contracted; then everything started all over again. For nickel and iron, it would take just a few hours. After that, there would be nothing left to manufacture. Without the vital heat, she would cool, and while cooling, she would contract, and while contracting...

Her core was now an immense ball of pure iron the size of the Earth, surrounded by lighter and lighter elements in successive layers, a gaseous sphere with a temperature of a million degrees. Surrounding the iron was silicon, then oxygen, carbon, and finally, very far away on the surface, fifty million kilometers away from the center, the little that remained of helium and original hydrogen.

The star's gravitational pull compressed her center with such force that just a cubic centimeter of matter weighed one hundred tons. The iron atoms were so deformed that they were only a fraction of their original size.

Sanduleak was so far away that her light took one hundred and sixty thousand years to reach earth. The light would hardly be visible to our planet, and even if it were, there would be nobody to appreciate it. While Sanduleak was a blue dot in the sky, fighting against her fate, mankind was just beginning to crawl and still had no time for worrying about gods and stars. Primitive man still sought food by surrounding mastodons in dangerous hunting rituals. It was far more important to survive at any cost.

Closer to the star, something moved.

The small dot moved slowly, three light-days away from the star. It displayed no urgency in arriving at its destination. It navigated like a swan in a calm pond, floating on its own inertia.

It was so insignificant next to that scene of such magnitude that it seemed like a grain of dust floating in the air, imperceptible, a mote floating on a sunny day.

But it was extraordinarily big by human scale. The pattern of light and shadow in its structure foretold something different. The curves and edges in its silhouette made it seem like a strange insect flying around the intense light of Sanduleak. It had a specific destination: the giant planet three light-days away from the star. That was to be its port, its protection in the face of the terrible heat emanating from the star. It had come to attend the star's death and the birth of a new era.

Even three light-days away, the heat roasted and melted everything nearby. Very strong protection was necessary, so as not to be incinerated instantly, yet the strange insect seemed not to care about that infernal heat.

In the star's nucleus, every atom was now like a tiny spring supporting the weight of the whole external mass, each at the limit of its endurance. The external electronic layer of each atom was under such pressure that the matter occupied only a fraction of its normal size. In that state, any thermal imbalance in the Sanduleak core could lead to an unimaginable catastrophe. It was just a matter of time, a matter of waiting for an end as inevitable as a game played with marked cards—a game that had a certain hour to begin and a certain hour to finish.

Then it happened.

The small point accelerated its approach to a fantastic speed, as if noticing that it was too late. The warning arrived in the form of neutrinos, small particles without mass that escaped from the star like mice abandoning a sinking ship. The neutrinos passed through the insect as if they didn't exist. They passed through whole planets as if they didn't exist, almost unnoticeably, so weak was

their interaction with matter. The “warning” arrived without warning.

Then, in a fraction of a second, the star's nucleus tumbled. The implosion was so profound that the star turned into a gaseous sphere, merely a hundred kilometers in diameter, but with the mass of several suns and the density of millions of tons per cubic centimeter. Every atom of the star was compressed instantly, like a squeezed sponge, until all the empty space was gone. The electronic layer of every atom, which had heroically resisted for eleven million years, was finally defeated by a patient and colossal gravitational force.

Only the internal energy of every atomic nucleus, a thousand times more powerful than the electromagnetic force, postponed the final collapse. The last rampart of the matter resisted the stellar blow firmly.

Like minuscule Titans, the atomic nuclei held against the fall. And the entire mass that had collapsed to the center in a fraction of a second, until becoming a hundredth of its original size, exploded outward like the chiming of a sidereal bell. The star bucked like a wild colt trying to rid itself of its cruel destiny.

Trillions of tons of hot, dense gas leaped into space, almost at the speed of light. The tumbling of such a mass, and its immediate expulsion outward, was like dropping a stone into a calm pond. In the fourth-dimensional fabric of the universe, a gravitational wave was formed, accompanying the expansive wave of radiation—an invisible wave that deformed time and space in an imperceptible way while expanding.

The shock wave swept through everything like a hot, infuriated wind, with a speed of thousands of kilometers per second. Planets, moons, asteroids—everything within its reach—were transformed into a gaseous cloud. Everything was vaporized instantly. At that moment, the star was the most brilliant object in the universe, more

brilliant than the whole galaxy, more brilliant than a trillion suns. It was, without a doubt, the most extraordinary spectacle that anybody would ever observe—if they could get close enough. It was the death of the star and the birth of a supernova.

Ironically, the same star that destroyed all in its path also created the seeds of life.

All the elements manufactured in its nucleus, from carbon to silicon, iron to oxygen, were spread in a bubble of hot radiation. Someday, condensed and transformed into planets and solar systems, in another generation of stars, these same elements would form life.

Many other elements denser than iron were formed during the one-hundredth of a second that the initial explosion lasted. Only under such extreme conditions of temperature and pressure as occurred during the stellar explosion could radioactive elements like uranium be created. The supernova manufactured and spread these elements like a careful mother—cosmic seeds, so to speak. Thorium, osmium, lead, argon and platinum, copper and gold, silver and iridium flew away in clouds of gas.

The small point was vaporized like everything else when the explosive bubble arrived three days later. As quietly as it had arrived, it went away, this time as gaseous metal; its metallic atoms mixed with the star's metal. A little before being reached, it tried to move quickly to the planet, but it was too late. It disappeared like an insect in the web of a gigantic spider.

The newborn supernova would reign majestically for some days, until the explosion finally lost its force. Then it would transform into a minuscule point surrounded by gaseous matter and radiation, a little point rotating at astounding speed.

One hundred and sixty thousand years later, on February 23, 1987, the radiation arrived on Earth, causing enormous agitation in the scientific community. It was the first time that modern man, the technological man of the atomic era, could look so closely at a supernova, could measure it, register it, and develop new theories about it.

At 7:35 in the morning on February 23, the Kamiokande Neutrinos Detector in Japan and the IMB detector near Cleveland in the U.S.A. verified abnormal activity in the flow of neutrinos coming from space.

Built in deep underground salt mines, these engines verified the interaction of these massless phantom particles against ordinary matter. When a supernova is about to explode, a fantastic amount of neutrinos is launched outwards. These departing neutrinos cool the nucleus of the star just a little bit, precipitating the explosion.

None of the people operating the detectors knew the real cause of the increased neutrino activity. It wasn't until that night that they were informed of a new supernova in the Magellan Cloud.

Luck helped, and the Supernova 1987-A was detected almost at the moment of its birth. It received this name because it was the first discovered supernova in that year. Without a doubt, it was the most spectacular supernova to have occurred in the last few centuries. Thousands of hours of signals emitted by the star were analyzed and recorded, to be studied later. Several satellites currently orbiting the Earth to study cosmic radiation were all pointed in the direction of 1987-A as soon as it was discovered.

Fourteen hours after the discovery, the team controlling the International Ultraviolet Explorer, or IUV, satellite succeeded in changing the direction of its antennas and pointed them at 1987-A.

Orbiting in the darkness forty thousand kilometers above Earth, IUV was the silent witness of a tragedy. Quietly and patiently, it stored the information it gathered for the future.

Along with the star's data, a small moan permeated its magnetic memory. A scream, stifled by the roar of the explosion and further weakened by time and distance, reached us.

PRIMES AND PSEUDO-PRIMES

One night in August of 1992, Susan Kimmerly Horowitz decided to analyze some radio-emission records that had been collected three days after the explosion of 1987-A. Five years had passed since the event, and Susan's study of the supernova was one of many that still needed to be done.

She planned to take her small daughter to the dance festival at school, close to the laboratory in Pasadena, as soon as she finished analyzing the tapes.

Susan had always been an unusual woman. She didn't possess any special beauty; however, her well-shaped body still caught the eyes of many colleagues when they gathered outside to chat and pass the time during coffee breaks. She was divorced and planning to marry again in a few weeks. Secure and pragmatic to the extreme, she had always put her feelings second. What made Susan different was her love of mysteries, of questions without answers, of seeing organized structures where nobody saw them, the profound relationships among unthinkable things. She eventually found her paradise in the cold and silent world of mathematics.

Here she found her unfathomable mysteries, her questions without answers and her fractal structures, relationships among objects existing only in the mind, physical realities that were well-elaborated copies of purely mental concepts; she found everything where nobody else saw anything.

Her cold and analytical mind won Susan a prominent position in the team entrusted to study and classify data about new stars and supernovas.

She also nurtured a hidden, almost secret fondness for some mathematical areas without any practical application. The pure beauty of those mysterious relationships between numbers always attracted her like a magnet. Many times, she declined a party night at the university in favor of a good book about the mathematician Pierre Fermat, spending a pleasant night enjoying the demonstration of a theorem. This secret love would have an unexpected development.

She was always driven to silence when somebody asked her, "This is very beautiful, but what is it good for?" She didn't know, but the answer would come in the form of an expanding wave that took one hundred and sixty thousand years to reach Earth.

This August night, Susan had decided to study the tapes that had been classified between sixty and eighty-two hours after the beginning of the explosion, recorded from signals captured by the IUV satellite between the 25th and 28th of February, 1987. Carefully, she opened the containers with the tapes and inserted them into the tape player.

Softly and quietly, the spools began to rotate, copying tons of information to the processing and classification systems. The numbers ran quickly on the computer screen, and Susan, experienced in astrophysics, noted the interesting data carefully. Her interpretation of the graphs that appeared would help reveal the secrets of the great explosion of 1987-A.

It was then that she saw the number 561 on the screen, mixed in with many other numbers. It passed quickly, appearing at the bottom and scrolling to the top of the screen and then disappearing in a few seconds. It was enough to light a tiny light in Susan's mind, a light

illuminating the past, her college days, days spent in the library reading about mathematical history. That number had a singular magic for her. It reminded her of pleasant moments, moments better than those spent with her old boyfriend. She remembered the mathematician Pierre Fermat, who had died three hundred years ago. She remembered the last theorem, the little theorem, and the unfathomable mysteries contained in the magic of numbers.

After some seconds, another number on the machine's luminous screen caught her attention. It was the number 1105.

"That's strange. Another pseudo-prime," Susan thought. The data she was analyzing should have been in the range from zero to one hundred, the numbers being simple sequences of on-off signals in the computer's memory.

"I need to make a filter first, and discard the numbers that don't interest me," she told herself, and immediately began to develop a small program that would filter all the anomalous numbers. "If the number 1729 appears," she thought as she worked, "I'll fall off the chair!"

Susan programmed the computer so that it would print a list of all the unwanted numbers on an old printer. She went to grab a cup of coffee from the vending machine while the program ran.

The old printer was snarling when she returned, getting her attention. Unworried, she passed by it to take a look at what had been printed, mere curiosity after all, since they were numbers that would be thrown away. "No one has any use for this work, it's just 'sidereal trash'," she thought.

Then she choked on the coffee and began to cough. Drops of coffee fell on the shiny floor and dirtied her new stockings.

There on the print-out was the number . . . *1729*.

"Is this a joke?" she murmured nervously. "What was the next number—2300? No, 2465..."

Buzz. Once again, the printer got her attention. Then Susan placed her hands on her head and looked wide-eyed at the printer. She blinked and looked again. Her mouth wanted to say something, but couldn't. She was only able to move her index finger and point at the sheet of paper leaving the machine, her lips opening and closing like a fish in a fishbowl. The number 2465 was there, as if placed by the hand of God.

She sat down slowly in the chair. She placed her hands on the table and looked at her colored fingernails for a long time while she tried to understand. "Why do these things always happen to me?" she thought, and a chill traveled down her spine. "What have I done wrong in my life?"

The printer demanded her attention once more, but she didn't want to look. She waited and waited, sitting quietly, trying to understand. Now she was afraid. Her heart beat quickly and she felt a little dizzy.

After half an hour, several numbers had been printed. Susan built up her courage, grabbed a small calculator, and began to look at the report, making some calculations.

"Easy, girl, easy," she repeated to herself while her heartbeat accelerated. "Nothing is happening. Tomorrow you will wake up with a brilliant explanation for all of this."

She grabbed the telephone and called the home of her team boss in Pasadena.

"Hello, Dave, please excuse me," she said when he answered. She tried to make her voice sound as normal as possible. "I know this is not a good time to be calling

you, but do you know, by chance, if anybody worked with the tapes classified J-46 to J-47?"

"The tapes for 1987-A?" Dave asked. "I don't think so. All the tapes are exactly as they were recorded at the time. Nobody has worked with them in the last five years. Not that I know of, anyway. Are you still at the office? I think you're working too much, Susan."

"Okay, do you know if the satellite's telemetric or instrumental data is transmitted to Earth at these frequencies?"

When Susan ignored the playful comments, Dave knew there was big trouble. "Yes, there is telemetric data," he replied, "transmitted in the range of 2249 Megahertz, I think at twenty-thousand bits per second."

"Okay, Dave, thanks for the help." She tried to sound natural.

"Why? Are the tapes really damaged?" Dave asked casually. He'd sensed her agitation but apparently decided to follow her lead.

"No, the data is just out of range," answered Susan.

"Can this wait until tomorrow?"

"Yes, you're right. See you tomorrow, Dave. And thank you."

That night, Susan thought a lot about the subject. To tell the truth, she was so concerned about it that she was hardly able to close her eyes. If the data was not instrumental, then she was facing a bad practical joke from somebody on the team. It would not be the first time something like this had happened, and that had led to dissension on other teams. Even so, she knew there were no pranksters on her team. She closed her eyes, imagining radio waves traveling one hundred and sixty thousand years through space until arriving at Earth, until arriving in her hands, by way of her old printer.

This was madness, but not fiction. It was a real and tangible madness. Could there have been some civilization next to the exploding star, somebody clamoring to the skies in the face of such a catastrophe?

She remembered Pompeii and Herculaneum, Roman cities destroyed by the Vesuvius volcano. She remembered the human bodies forever frozen in the ashes with fright imprinted on their faces, relics that soon disappeared into history, buried with the cities in the dust of forgetfulness. Could catastrophes of greater magnitude exist, where whole civilizations were destroyed in a few seconds by a stellar explosion?

And what if it was true? Would it be possible to recover that history? Before her sleepy eyes, the radio waves spread across stars, planets and constellations, traveling many light-years, sleeping many light-years, sleeping and dreaming.

The next morning, when Susan entered, Dave was waiting for her.

Dave James Erkoff was the typical successful chief scientist. He had majored in astrophysics, in one of the best universities in the country, with excellent grades. He possessed profound knowledge of scientific methodology but he considered himself, above anything else, a philosopher—a successful philosopher, to be honest. He was happily married, with a daughter. Fifty years old, he still felt young enough to swim one hour every day in the pool.

“Hello Susan. Good morning. So, what about last night's trouble?” he asked in a cheerful voice.

Susan was a little calmer than the night before. She had thought up some research strategies to try that should isolate the previous night’s mistake, or at least explain it satisfactorily.

"To be honest, Dave, it was nothing. I won't waste your time with this, but I would like to know if there are duplicates of these tapes anywhere else."

"I think Tokyo University has tapes because they captured the signals with their own antennas. I believe Sam recorded some backup copies here, but as for original tapes, only two sets exist: those in Tokyo and ours."

"How I can get them? Not the backup ones, but the originals from Tokyo."

"You can send a message by Internet to Dr. Takeu Ishido. He was the commissioner for the tapes."

"Okay. I should have some results for you by noon."

"That's fine," Dave told her. "Bring them to my office."

The file IUV8766-23 of tape J-46 arrived in less than an hour, thanks to the courtesy of Dr. Takeu, and a few minutes later, it was copied to Susan's computer. She went to her office and closed the door. Quickly, she began to execute the same program that she had run the previous night, using the new data sent by Takeu.

She decided not to look at the results until an hour later and waited, trying to read the newspaper, but her mind was busy with only one subject "What if the same data appears in this tape too?" she wondered. "Then it couldn't be a colleague on the team making a joke. There could only be one answer, for now." She mentally underlined the words 'for now.' "That means the data really did come from 1987-A."

When she looked at the printed results again, Susan removed the sheet from the printer and went to Dave's office. Her heart was beating quickly. She knew the monster was chasing her again, just like the previous night. Her lack of answers, the feeling that she was imprisoned by her own ignorance, annoyed her a lot, and asking for help was an ugly blow to her pride, but she knew she needed help urgently.

“Dave, I don't know what is happening here, can you help me?” Susan was unable to hide her nervousness. “I don't understand anything anymore!” she added in a low voice.

“Susan, you look pale, what’s wrong?” Dave asked. He leaned forward in his chair. “Is it the anomalous data you talked to me about?”

“Yes.” She handed him the sheet of paper. “These match with the ones I listed last night, and these came from the tape from Tokyo.”

Dave looked carefully at the paper and soon murmured, “Hmm! Seems to be some numbers in growing order, but I don't have any idea what they could be or what they could represent.”

“They’re pseudo-primes—Carmichael numbers, Dave,” Susan said. She stared at Dave helplessly, as if saying, “Can’t you see it?”

“What? Pseudo what?” Dave grimaced, shaking his head.

“Dave, grab a calculator.” Her voice was strong and nervous, almost imperative. Her grim face spoke of urgency.

“All right, all right, don't worry, girl.” He always called her ‘girl’ when they argued, and now he seemed to know Susan was not playing games.

“Now divide the first number on the sheet—561—by three, then by eleven and then by seventeen.”

“Yes, it can be divided evenly by these three numbers. I see,” he said, after doing some figures.

“Now subtract one from 561. You’re left with 560. Divide 560 by two, by ten and by sixteen, one calculation at a time.”

"Okay," Dave said, "560 can also be divided evenly by each of those." He looked up at Susan. "So?"

"Did you notice that two, ten, and sixteen are three, eleven, and seventeen minus one? And did you also notice that one was subtracted from 561?"

"I'm noticing now." Susan could tell by his voice that the curious scientist inside Dave had finally woke up.

Susan spoke quickly, garbling the words. She tried not to scream. "If you have a composed number, then you decompose it into its prime factors, then subtract one from the original number, and this new number can again be divided evenly by each and every one of them," stressed Susan, "its prime factors minus one, then you have a pseudo-prime number." The smile on Dave's face had disappeared. He adjusted his glasses carefully with a light touch of his hands. "Girl, some times you scare me. Let's see if you can explain this to me more slowly."

"Okay, take the second number. It's 1105, divisible by five, thirteen, and seventeen. Then subtract one, which leaves 1104. It is divisible by four, twelve, and sixteen. Now you have the second pseudo-prime."

"Are you saying that 561 is always the first pseudo-prime?" Dave's hands shook a little. Susan knew what that meant. When he was a little tense, he always needed to light a cigarette. He had already tried to stop smoking countless times without success.

"Yes, 1105 is the second, 1729 is the third...well, they're in order on the paper I gave you." Susan pointed at the paper on his desk.

Dave reclined in the chair, looked outside, and sighed deeply. He lit the first cigarette of the day with steadier hands. Then he asked her slowly and clearly, "Do you mean to say that all these numbers came from the 1987-A tape?"

“Yes, Dave.” She calmed down when she realized that he understood the extent of the problem.

“And it matched with the tape from Tokyo?”

Susan nodded.

“And you’re saying that all these numbers are such pseudo— I don't know what?”

“Yes.”

“Do you know of any natural process that could produce them? Some harmonic wave, some chemical element? Some satellite instrument? Some TV station—anything?” He spoke almost angrily. Susan could tell he felt as impotent as she.

“No. Nothing.”

They remained silent for a long time.

They looked through the window, at the ceiling, at their own hands—anywhere but at each other. Several minutes passed. Then they looked into each other's eyes, confused and fearful. But that lasted only briefly, a few seconds. They were very seasoned in objectivity and soon recovered. They knew that good scientists don't fear the truth; they face it with determination.

Dave spoke. He sounded momentarily defeated.

“Susan, it is evident there’s a mistake here, some terrible mistake, and we are going to find it. We are going to verify the tape again and again until we find where you or somebody else made a mistake.”

“Dave, I agree. The problem is, I don't know where to begin.”

““Well, did you verify the content of the other files on the tape?” Now Dave spoke as the leader he always was. He had taken control of the situation.

"Not yet. I only saw these results, and I came to speak with you."

"Okay, then list all the anomalous numbers in all the files of tapes for series J, and then do the same with the tapes of series F to I and K to T."

"Whew!" exclaimed Susan. "It will take a lot of work. I won't have the final results for three or four days." She felt calmer. After all, it seemed that Dave had an idea of how to solve the problem.

"Yes, do that for now, and I'll ask for a copy of all these tapes from Dr. Takeu and personally check them."

"Dave..."

"Yes?"

"What if the check shows that everything is okay?"

"It won't. You'll see it was a terrible coincidence."

"But let's suppose that…"

"Susan, we are scientists. We know when we are facing a mistake—a methodological mistake, a measurement mistake, or even a malicious hoax by someone—but we know that this is just a mistake, a coincidence. You can call it what you want. You will see." His voice sounded strong and firm, almost as if he was ordering Susan to stop dreaming nonsense.

Susan could tell that he thought everything was just foolishness, without importance. The facts would demonstrate it and would prove him right, as they always did.

"You will soon see a non-pseudo-prime number appearing and your theory will be ruined," he added.

"I would like to share your confidence in this subject Dave, but I've been calculating the probabilities of this happening by chance. You know I am very good at doing that, and the probabilities are against you."