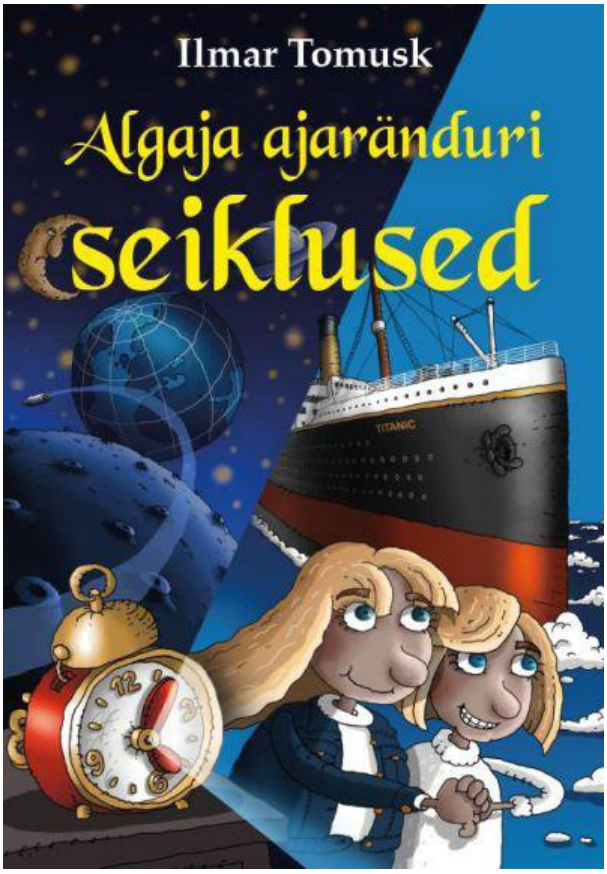

The Adventures of a Novice Time Traveler
Text by Ilmar Tomusk
Illustrations by Hillar Mets
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Age: 10+
#time travelling #physics #school #history
#key events #friendship #adventure

Eighth-graders Anette and Mariliis consider themselves to be the only normal people in the world. Their classmates are the worst, studying is the most dreadful thing ever, and the most detestable subject is physics.

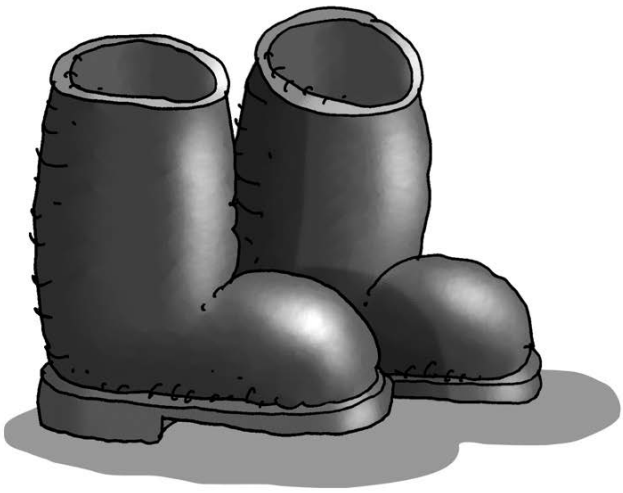
However, on a bleak November evening, an accident unfolds before the eyes of these very girls, turning their world upside down. They become travellers unhindered by time or space, gaining the power to alter the past, which in turn changes the present and the future.

History has repeatedly shown that what was considered fantasy yesterday might already be science today.

The book is part of the *Time travellers series* of five books. each book focusing on a few important key events of the World history.

"The great advantage of Ilmar Tomusk's books is the author's effort to explain, through engaging examples and explanations, the physical laws that truly govern our lives in this universe. After reading the first part of the series, I felt that my previously almost non-existent knowledge of physics had significantly improved."

- Oskar Helde, Children's Literature blogger



Eesti Lastekirjanduse Keskus
Estonian Children's Literature Centre

Reading sample

[pp. 7–32]

Chapter One

"The Herring has gone bananas again!" Anette whispered to her deskmate. Mariliis nodded, understanding exactly what her friend meant by the brilliant comment.

Neither Anette nor Mariliis, who had been inseparable since first grade, were the brightest crayons in the box, so to say. They could figure out what their teacher was trying to say in history and geography if they really cared to, as those subjects didn't demand lots of mental gymnastics, but physics simply wasn't meant for their brains. Maybe they'd have understood if they tried, but neither believed it was worth the effort.

To be fair, the problem wasn't physics itself, which was nasty, miserable, hard, stupid, boring, horrid, pointless, repugnant, depressing… Anette and Mariliis could no doubt have come up with even more words to describe the terrible subject, but those were enough.

The main problem was their physics teacher himself, whom the girls thought was a despicable old dude. And that's exactly why they called him the Herring.

When Mr. Leho Anderson walked into room 8B for the first time last autumn, Anette could tell right off the bat that he wasn't entirely normal. Their homeroom teacher had told them that a young man would be teaching physics. Every girl in class 8B was excited, Anette and Mariliis most of all, because they'd only had female teachers up till that point. They'd hoped to get a tall, athletic young man who'd stare so deeply into their eyes when he stood next to the chalkboard that their knees would go weak. Alas, the specimen who entered the classroom when the bell rang was, in the girls' opinion, a total catastrophe.

"Look at the tie he's wearing," Anette moaned, rolling her eyes. "Green and paisley patterned. How gross! He could at least wear one with skulls or scorpions."

Mariliis honed in on his figure.

"He's like a turkey," she said. "If you take away his legs and replace his arms with wings, then he'd fit right in on a turkey farm. This guy's so dumb."

It was hard to tell why the girls thought Mr. Anderson looked dumb, as they themselves weren't exactly supermodels. More like the opposite: Anette and Mariliis were both rather plump young women whose figures revealed they had no problems with their appetites. They'd even been excused from gym class because a doctor that Mariliis's mom knew wrote the school a letter claiming they had asthma and were forbidden from physical exertion. The reality was that neither suffered from the slightest hint of any illness: they were simply overweight. It was also why they got winded if they walked at a faster pace. It had nothing to do with asthma.

Mr. Anderson wasn't the handsome prince of anyone's dreams either, to be completely honest, but comparing him to a turkey was an obvious exaggeration. He was your run-of-the-mill man in his thirties, slightly balding, of average height, and indeed a little brawny. Yet, it also hadn't crossed his mind to even try to impress anyone with his looks or body. He simply didn't care about such details.

Back when he was studying to be a teacher, Mr. Anderson had spent his free time lifting weights and pumping iron, which gave him broad shoulders and a bulky torso. Even then, he'd known that a strong body makes a sturdy mind. Despite his seemingly round physique, he was tough through and through and would occasionally, when no one else was around, grab one of the bars bolted to the gymnasium wall and do a few quick pull-ups as he passed. Getting his chin over the bar twenty times in a row was a piece of cake for Mr. Anderson. None of the school's PE teachers could do such a trick themselves, as they simply were too busy to work out. Mr. Anderson always said you needed to make time.

If he'd wanted to impress anyone with his strength and abilities, then he could've "accidentally" stopped by the gym just as the upper-grade girls were showing up for class. But he didn't. Other things mattered much more and one of them was, without a doubt, physics. Though Mr. Anderson was required to teach the phenomenon known as grade-school physics to earn a living, he kept the majority of his knowledge a jealously guarded secret.

When Mariliis and Anette saw their new physics teacher for the very first time, they decided he had to be found a suitable nickname. It needed to be as nasty as

possible because if you put together two extremely nasty things like physics and a dumb-looking teacher, then an ordinary nickname just wouldn't do.

The girls took turns suggesting the most revolting words they could think of. Turd, hog, lard, blubber, egg, and turkey were some that could be written down if need be, but there were also a few that shouldn't even be whispered aloud in polite company. When Mariliis finally brought herself to pronounce the word "herring" with a shudder, the grossest thing she could possibly imagine, Anette's eyes sparkled.

"You're a genius!" she gasped. "From this day on, we're going to call that man the Herring."

"Yeah!" Mariliis agreed. "I don't care if his ID says Anderson, Peterson, or even Karlsson. To me, he's just nasty old Herring."

The girls were so proud of what they'd accomplished that their first physics lesson passed in a flash, and afterward they couldn't recall a single syllable of what the Herring told the class. But now it was November, and the Herring planned to quiz the students on their reading assignments. He'd had the silly habit of assigning them since the very beginning of the school year, and almost everyone in class was used to it. Before answering, however, came roll call.

"Alright," Mr. Anderson began. "I see we still have twenty-eight students registered in class 8B, but today, there are…" he quickly scanned the room. "…twenty-seven present. Who's missing?"

"Anton Villik," Madis called out from the back of the room. Anton was Madis's deskmate.

"Again!" their teacher sighed. "So, what's the problem causing our dear Anton to be absent today? I can see on the e-school system that he was present this morning."

"Home reasons," Madis answered.

"What?" Mr. Anderson barked angrily. "What 'home reasons' can he have for attending the first four lessons of the day and then simply disappearing?"

"Simple. Anton got tired and went home to sleep because you're not allowed to sleep at school," Madis explained. "That's his home reason."

"And he's got stress, too," Gerli chimed in.

"Of course," their teacher said sarcastically. "How on earth didn't I think of that myself? He being stressed makes sense because you all needed to learn the structure of the solar system by today. Stress comes for every upstanding schoolboy when he knows his teacher might quiz him on something terribly difficult. Like whether the Earth is round or it's flat and balancing on the backs of three elephants."

"I told you—he's a total idiot," Anette whispered to Mariliis. "Why's he going on about elephants? There are no elephants that big. They'd have to be something much bigger, whales or dinosaurs or something."

"Makes total sense," Mariliis agreed.

"And you two," Mr. Anderson said, addressing Anette and Mariliis. "Do you have stress as well?"

"What do you mean?" Mariliis asked, batting her long, dark eyelashes.

"I mean literally," he calmly replied. "I simply cannot understand why you two are still here when Anton has stress and 'home reasons'."

The girls were confused.

"Does you mean we can leave?" Anette asked.

The teacher gave them a pitying look, turned, walked back to the front of the classroom, sat down in his chair, and released a long sigh.

"Lord have mercy—that was sarcasm," he said despairingly.

"I told you! He's religious to boot!" Anette hissed in a whisper. "Heaven help us!"

Mr. Anderson shot the girls a glare. Anette's comment had reached his ears.

"I'm not religious," he said, adding, "Not yet at least. But I imagine that if I intend to live to see spring and keep my wits intact as well, then I'm going to have to appeal to a higher power. For never in my life have I laid eyes on such highbrow intellectuals as you, if you'll excuse the turn of phrase."

He let his arms dangle at his sides and closed his eyes as if he were deathly exhausted and wanted to take a nap. Although his eyelids shut for only a second, probably not even two, it was enough for him to then jump right back to his feet as if reborn. It was like he'd somehow vacationed on a sunny Greek island in that fleeting instant.

"Okay," he continued energetically, "where did we leave off?"

"The solar system," Kert said.

"Well, and Anton, too," Mr. Anderson recalled. "But no matter. He's never going to need physics, anyway. You know what? I'm not even going to mark him down as absent. You just let him know that he doesn't have to be afraid of me. Tell him he can come to class without worrying. I don't intend to quiz him ever again."

"How do you know he's never going to need physics?" Anette asked.

"I just have a hunch," Mr. Anderson replied with a grin. "But you," he continued, looking at Anette, "aren't getting off that easily. Please come to the front of the classroom."

Chapter Two

"I don't want to," Anette whined, trying to worm her way out of answering. "I don't feel good."

"Tell me honestly, if you'd please: did you fail to study again?" Mr. Anderson asked.

"No," she snorted. "I studied like crazy yesterday. I just don't want to come to the front of the classroom. I don't feel comfortable there. It makes me anxious, and my asthma flares up super fast."

"I see," Mr. Anderson said, seeming to relent. "If asthma's the problem, then so be it. In that case, you'll all give your answers in writing."

Mr. Anderson pulled a stack of ruled loose-leaf paper from his desk drawer and started handing sheets out. The classroom buzzed with whispers.

"We weren't told there was going to be a test on this!" the students groaned. "You're not allowed to give tests without telling us beforehand. It's against the school handbook."

"I'm glad that you're so familiar with the school handbook," Mr. Anderson said, "but there are other rules besides that one. Such as you're not allowed to be absent without an excuse, and when something is assigned, you're required to learn it. What's more, not every written assignment is a test. This, for example, is a pop quiz. Teachers are allowed to give pop quizzes on every reading assignment. It's 100% in line with the handbook. Alas, as you've conveyed to me with your behavior, you don't wish to answer verbally. Therefore, the only choice we're left with is a written examination of your knowledge."

Only then did everyone realize the real cause of the crisis: Anette, the class whiner, who refused to answer verbally.

"Cut it out, Anette!" Kert howled. "You're the reason we've got to take a pop quiz. Just go up there and quit being so fussy."

Anette shot Kert a nasty glare. Everyone in class 8B knew that when Anette was angry, her looks could kill a horse. Or any other animal, for that matter.

"Quit leering," he continued, unintimidated. "We don't plan on suffering because of your stupidity."

"What was it those musketeers said?" Mr. Anderson interrupted. "Something along the lines of 'one for all and all for one'?"

"This isn't fair!" Kert protested. "If she's supposed to answer, then she should be the one to answer. Make her write it alone. We don't have to do her work for her."

Anette stared angrily at her fingernails and pretended not to hear. Her other classmates quickly joined in demanding that the fussy girl go up to answer.

Anette certainly wasn't the most popular girl in class. She and Mariliis tended to keep to themselves, and the reason was very simple. They believed everybody else was too dumb to talk to. It was why they also never took part in class events or went on field trips with the others. It was all to contrast with their dumb classmates.

This stood out most in the way they dressed. Neither Anette nor Mariliis wore any color other than black: dark black stockings, short black skirts, and black shirts. They tied

black scarves around their necks and even dyed their hair raven black. Nobody could even remember what their true hair color was! Both wore a little silver earring in their left ear and a little silver nose ring in their left nostril, which was meant to show that they belonged to a higher social rank than everyone else.

Whereas an outsider might get the impression that Anette and Mariliis were outcasts and none of their classmates

wanted anything to do with them, the reality was that everyone in 8B was an outcast except for Mariliis and Anette.

After it became obvious that the whole class was going to have to do a written assignment because of Anette, everyone was justifiably angry and began to fight for their rights.

Mr. Anderson spent a minute watching the scene unfold with great interest before finally speaking.

"There really is a much easier way to resolve this. Anette need only come up to the front of the classroom, answer questions about the solar system, and everything'll be a-okay."

It appeared that Mr. Anderson had some kind of a plan for Anette, because if it'd had been any other student, he would have simply shrugged and picked the next person.

"An-swer, A-net-te! An-swer, A-net-te!" Kert chanted, and soon the whole class joined in. Anette finally stood up and trudged to the front of the classroom. She was furious.

"Wonderful," Mr. Anderson praised. "So, the solar system. What can you tell us about it?"

"The solar system is a system with the Sun in it," Anette said, blurting out every bit of solar-system-related knowledge she'd ever committed to memory over the short span of her lifetime.

"You're absolutely right. Now, please draw a model of it on the blackboard."

Anette picked up a piece of chalk from the shelf at the bottom of the blackboard, drew a big circle, and added lines coming out of it that she thought could represent rays of sunlight.

"Am I correct in assuming this cactus-like object is the Sun?" Mr. Anderson asked.

"Yes," Anette replied.

"But I asked you to draw the solar system."

Anette picked up the chalk again and, in big block letters, wrote one word next to her prickly balloon: SYSTEM.

"That's the solar system," she declared.

Mr. Anderson frowned.

"Don't you think something is missing?" he asked.

She shook her head.

"The Sun's right there, the 'solar' part, and the system is, too. I can't draw it any better. I'm no Michaelangelo or Banksy, you know. I don't know how to do all kinds of stupid artwork."

The whole class gaped at the show. Everyone except Mariliis was glad that Anette was being given yet another chance to show off her ignorance.

"Would you explain the role that the Sun plays in this system of yours?" Mr. Anderson asked.

"In summer, we need the Sun to sunbathe," Anette said. "You can actually start sunbathing in May, but you shouldn't go overboard because otherwise you might get sunburned."

Anette had a knack for answering questions like those: if you don't know anything about what you're asked, then at least talk about what you do know. And Anette knew everything about sunbathing.

"What an interesting thought," Mr. Anderson said. "So, in your interpretation, the Sun's primary role is to help us all get tanned."

The whole class erupted in laughter.

"Let's keep following this line of reasoning. Can you explain what the Sun does in winter?" Mr. Anderson asked, looking outside to hide his face. The situation was so ridiculous that he could barely suppress his own laughter.

"The Sun only shines in winter to make it lighter. Otherwise, it'd be really dark all season long."

Mr. Anderson's expression turned serious again and he sighed deeply.

"Well, alright. I suppose that's about all we're going to get," he said in resignation. "Perhaps someone can help Anette. Let's say this spiky ball here is the Sun, which is positioned in the center of our solar system. My question is: what's missing?"

"The planets," almost every student replied.

"Correct. Planets, but not only. What else?"

"The Moon," Mariliis suggested.

"Fantastic. The Moon is also part of our solar system. And if we capitalize the word moon, then which one are we talking about?"

"The moon that's in the sky," Mariliis answered.

"You're absolutely right," Mr.

Anderson said. “But in what sky is the Moon located?”

“Just… the sky,” Mariliis said, confused. “The Moon’s in the sky and it goes around there.”

“Therefore, we’re referring to the Earth’s natural companion, which we call the Moon. But first, let’s go through the planets. Can anyone name them all? Let’s start with the one closest to the Sun.”

“Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune,” Kert listed.

“Now we’re getting somewhere!” Mr. Anderson exclaimed. He picked up the chalk and drew a row of egg-shaped objects next to Anette’s Sun, each of which was a different size and represented a different planet.

“We used to also include Pluto, but scientists now classify it as a dwarf planet and don’t believe it fits on the list of true planets. Back to moons, however. What do you reckon: is our Moon the only one in the solar system or are there more?”

“There are lots,” Kert replied. “Mars has two moons, Jupiter has sixteen, Saturn has more than sixty, Uranus has twenty-seven, and Neptune has thirteen.”

“It’s wonderful that we have at least one student who’s read things outside of our textbook. Good job, Kert! So, is that it, or is there anything else in our solar system?”

“There are comets, too,” Kert added. “And asteroids. Hundreds of thousands of them.”

“That is correct,” Mr. Anderson said. He turned to Anette. “You, young lady, may take your seat. I guess you didn’t study like crazy yesterday, after all?”

“Not that crazy,” she admitted. “I did read the section, I just couldn’t remember.”

“Which chapters did you read?” Mr. Anderson pressed.

“Um, the system one. Yeah,” Anette replied. “If you all keep teasing me all the time, then I’m going to lose any interest in learning. You’re the teacher! You should be encouraging me because that’s what you get paid for. Nobody pays me to learn!”

“Thank you for reminding me of the duties of my employment,” Mr. Anderson said. “Right now, I’m going to give you an “incomplete”. You can take it as pay for the work you did today. Your duty is to learn the section and answer questions when asked.”

Chapter Three

“We’re going to wrap up our discussion on the structure of the solar system for today and move on to a new topic,” Mr. Anderson continued. “But I promise we’ll return to it again. You, young ladies,” he said, addressing Mariliis and Anette directly, “will not get by in life without physics. I’ll think up a way to increase your motivation by our next lesson.”

He returned to his desk and glanced at his notes.

“Now, we’ll talk about how the solar system came to exist and its age. Our Sun formed a little over four and a half billion years ago. In human comparison, you could say it’s about forty years old… a lady in her prime, half of life lived and half still ahead.”

“Wait, why do you think the Sun is a lady?” Mariliis asked.

“Well, the Sun is the largest cosmic body in our solar system, and we tend to think of everything big as masculine. But it makes no difference, really. In some ancient beliefs, the Sun is female, and the Moon is male. In others, it’s the opposite. I simply called the Sun a lady because it glows, and glowing is more of a female trait.”

Mariliis and Anette, who both had long, jet black hair and dressed all in black, wrinkled their noses scornfully.

“That’s dumb,” they jeered.

“But we’re veering off-topic. Let’s return to the solar system,” Mr. Anderson said. “The solar system formed from a cloud of gas and dust that was drawn together by gravity. It became an extremely dense and extremely hot mass of matter that ultimately turned into our Sun, which is nothing but a cosmic nuclear reactor.

“A little bit of dust and gas was luckily left over, and that became our solar system’s other planetary bodies—the ones we discussed at the beginning of class. The Sun is enormous compared to the other planetary bodies and comprises 99.86 percent of the solar system’s total mass. That leaves just 0.14 percent, of which the giant planets Jupiter, Saturn, Uranus, and Neptune make up 99 percent. The Sun is 333,000 times heavier than Earth. Thanks to the Sun being so heavy and the planets being so light, the planets orbit the Sun.

“Therefore, you could say that the Sun’s job isn’t to let us sunbathe in summer,

but rather that its mass keeps us, meaning planet Earth and all the other planets and cosmic bodies, nice and steady in our orbits. What's more, Earth coincidentally, or not-so coincidentally, ended up just far enough from the Sun for life to form here."

"When did that happen?" Kert asked.

"Good question. The Earth formed at about the same time as the Sun, and the first very basic organisms like single-celled amoebas and microorganisms appeared soon after, or about 3.7 billion years ago. Given that the universe itself is about 13.7 billion years old, you could say that life sparked on Earth almost immediately after it formed."

The class was as quiet as dormice while listening to their physics teacher, as this part of the lecture had become fascinating.

"Can anyone tell me how far we are from the Sun?" Mr. Anderson asked.

"A million kilometers," Anette hesitantly proposed.

"One million kilometers is a certainly a very long distance on Earth but not very far in space. Actually, it's 150 million kilometers. The Moon is the closest body to Earth, orbiting at an average of 384,000 kilometers. It's also the only cosmic body that humans have been to, apart from our own planet.

"By the way, the Moon also formed at about the same time as the Earth. The most likely reason is that a planet about the size of Mars collided with our young Earth and knocked a chunk off. That alone wasn't enough material to form the Moon, however, as most of its matter comes from the planet that collided with Earth."

Mr. Anderson paused and asked if there were any questions. Anette raised her hand. "Yes?"

"Why is the Sun so bright but the Moon isn't?" she asked. "It'd be cool if we could tan at night, too."

"I see that the subject of tanning is near and dear to your heart," Mr. Anderson replied with a smirk. "Our Sun is a star. Like I said earlier, the Sun is like a gigantic nuclear reactor. The matter at its core is very dense and very hot, at a temperature of about 15 million degrees Celsius. You'll be learning what goes on inside of the Sun soon, but to explain it briefly, there are particles called photons that are released during the nuclear reactions that take place. We perceive those particles as light and warmth. They're to thank for the existence of life on Earth, as they deliver the Sun's energy. However, Earth's companion the Moon doesn't produce light itself. It may appear to, but actually that's the Sun sending its light to the Moon, which then reflects to Earth. Although the Moon may seem rather bright at night, moonlight is about a million times weaker than sunlight."

"How long does it take for light to travel from the Sun to Earth?" Martin asked.

"It takes tens, or even hundreds of thousands of years for photons that form in the Sun's core to reach its surface. Once they do and start moving in our direction, their rate of speed accelerates phenomenally and the light reaches Earth in a little over eight minutes," Mr. Anderson explained. "Therefore, the light that we see today was actually born dozens, or even hundreds of thousands of years ago, deep within the Sun."

"Why does it take so long?" Martin asked, perplexed. "I thought the speed of light was supposed to be crazy fast?"

"It is 'crazy fast'," Mr. Anderson replied, chuckling. "And that's very well put. In a vacuum, which is to say in empty space, light travels at a speed of 300,000 kilometers per second. But in the core of the Sun, where matter is extremely dense, photons' movement is obstructed. That's why instead of taking 2.3 seconds, it requires tens or hundreds of thousands of years to move from the core of the Sun to its surface, a distance of about 700,000 kilometers. But if nothing holds back light's movement, then it really does travel at the speed of light. A ray of sunlight could circle the globe seven and a half times in a single second, and it'd travel from Earth to the Moon in a little over a second as well.

"But that means that the Sun we're seeing right now isn't the same anymore at all," Kert said slowly.

"That's a very wise observation. Would you please explain to everyone else why you think that?" Mr. Anderson asked.

"If it takes light eight minutes to travel from the Sun to Earth, then we're actually seeing the Sun the way it was eight minutes ago, not how it is right now."

"You're exactly right," Mr. Anderson agreed. "You can't really tell with short

distances, but space itself is so immense that right now, we're seeing the light of some stars that were born just after the universe formed and no longer even exist anymore."

"How many stars are there in the universe, anyway?" Kert asked.

"That's a question no one can answer," Mr. Anderson replied. "Whereas centuries ago, people thought that our solar system was the one and only thing in the universe, scientists have since determined that there are about 400 billion stars in our galaxy alone, which is called the Milky Way. There could be between one- and two-hundred galaxies like our Milky Way in the part of space that scientists call the observable universe, and each one may contain several hundred billion stars. Therefore, there might exist so many stars that we don't even have a name for a number that great. It's easier to just say that there are infinite stars in the universe. And that's probably the most exact way to put it, too, because most modern astronomists believe that the universe itself is infinitely big."

"How big is infinitely big?" Anette asked.

"So big that it simply has no end," Mr. Anderson replied. "Let's imagine that humans are immortal and engineers have built a spaceship that can travel at the speed of light. Nothing can move faster than the speed of light because it's not allowed by the laws of physics, at least the ones that we learn in school. We could travel for ten, twenty, thirty, or even ninety billion years and still not reach the end of the universe. That's exactly how big 'infinitely big' is."

The students were completely silent. Even though the bell had rung minutes ago, no one hurried to leave the classroom. All that talk about the universe, stars, and light was so fascinating that they would have gladly continued the lesson.