

# **Pi MAL DAUMEN**

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When I saw Moni Kosinsky for the first time, I took her for a secretary or maybe a cafeteria worker who'd lost her way. I wondered how someone could get so hopelessly lost: the cafeteria was a ten minute walk from here. The first calculus class had started fifteen minutes ago, and Moni stood in the open doorway as it screeched horribly, drawing the attention of the entire lecture hall. She had on a red faux-leather skirt and a low-cut leopard-print top. Hanging from her shoulder was an overstuffed blue Ikea tote bag.

Professor Zschau paused midsentence, his hand, holding a piece of chalk, hanging in the air.

"Sorry," Moni shout-whispered, noisily making her way along the aisle with her tote. She stopped in front of me. "Is that spot taken, sweetie? Can you move over one?"

I blushed and nodded.

I didn't give her the slightest chance.

At the beginning of the semester, classes were still full; people had to sit on the radiators and on the floor. Half the professors had East European names. They were feared because they'd mastered university-level material in the ninth grade at their specialized schools, and they had little patience for the snail's pace of German education.

"Wait a few weeks," the dean, Professor Orlov, had said at orientation. "Then we'll be amongst ourselves again. After the first week, half of you will be gone. After another week, only twenty percent will be left. After the first exam you'll all be crying, except the two or three of you who truly belong here."

I knew I'd be one of the few who made it. I scanned the room and, based on first impressions, tried to guess who would be here for the long haul. There were a few older students, with stressed-out looks on their faces and streaks of gray hair, who were trying to become math teachers. They were unpleasantly surprised that in the first semester they had to attend the same classes as real mathematicians. Nothing was of less interest to them than their future teaching field. They just wanted steady jobs and peace and quiet.

I knew from Mr. Brown that they'd be the first to complain about having to do too many assignments and about the difficulty of the exams. They'd immediately tell their instructors about their young kids, bemoan their day jobs that barely fed their families, and after the first week would try to transfer to the German or Education department. They struck me as con artists: as far as I was concerned, only people who took mathematics seriously should have been allowed to study the subject.

Moni sat down next to me after she put her Ikea tote down in the aisle. A colorful rubber boot and several stalks of leeks peeked out of the bag. I couldn't tell how old she was. Her bulging figure reminded me of our housekeeper, Frau Berger; her yellow hair reminded me of American pin-up posters from the sixties like the ones in our billiard salon.

As I furtively looked Moni over, she pulled out a pen and began to take notes. She wrote slowly, concentrating, in big, round letters. Nobody would ever be able to keep up at that speed. Mathematicians wrote in tiny script, quick and illegible. I'd been practicing since the fifth grade.

She'd distracted me so much in the opening moments that I'd briefly forgotten to pay attention to the lecture. And when I looked

toward the front of the classroom, one of the two chalkboards was already full and was being moved behind the other.

“Don’t worry, sweetie,” said Moni when she noticed my panic. “You can copy mine.”

It was unusual for strange people to continue to speak to me after initial contact. My first reaction was typically so exhausting that most people no longer felt it necessary. Nearly all exceptions to this rule proved to be freaks. So Moni’s repeated need to address me set off alarm bells.

I needed to shake her as quickly as possible. She was totally clueless about everything. She had a folded, handwritten class schedule with her, which looked at first glance to be written on a copy of the previous year's course catalogue. She hadn’t the slightest idea where the cafeteria or the library were, or how you signed up for the mandatory tutorials. I wondered how she had even managed to enroll. Judging by the model of smartphone she had, she must have been older than I thought.

“Fifty-three,” she said, even though I hadn’t asked. “I’m fifty-three. Don’t look so shocked. And you? You look fourteen.”

It wasn’t the first time I’d heard that. “I’ll be seventeen soon.”

“Oh, mercy me. What are you doing here at that age?”

“Started school early and skipped a grade.”

“Wow,” she said. “How could your parents let you move to the big, bad city?”

“They had no choice.”

“You’re super smart, eh?”

“Yeah,” I said.

Something in Moni’s green eyes seemed to suggest a mix of sadness and sympathy. “In that case, stay close to me. Because I’m not so smart. My father always said that if you averaged the IQs of his two children you’d end up with a person of normal intelligence.”

I’d never heard of anyone willingly describing themselves as stupid. Astonished (and probably unconsciously compelled by my family’s charitable engagement), I offered to show Moni the cafeteria, the library, and the campus’s digital system.

“Where would I be without you,” she said.

What a waste of taxpayer money, I thought, as I led her to an electronic kiosk where she could get a campus card and load it. “With this you can take public transport, prove you’re a student, and pay at the cafeteria.”

She carried the card gingerly in the palm of her hand, like a butterfly, until we reached the coffee machine. “It’s on me, sweetie. What’ll you have? A glass of milk?”

I waved her offer aside. “You don’t need to treat me.”

“Allow me. As a thank you. Without you, I’d be lost.”

Because she was right, I let her pay for my chamomile tea. Then she pushed another button on the machine and carried her cappuccino on a tray to a table by a window. I sat down across from her and took stock of the situation: up to now I hadn’t met a single normal person here.

“I can’t believe it.” Moni licked milk foam from her spoon. “I’m just sitting here drinking a cappuccino at the university cafeteria. How does that sound?”

“Absurd,” I said helpfully. But then I thought: What’s going on here? After all, I wasn’t here to make friends. I wanted to finish my degree in less than the standard amount of time – five semesters was supposed to be enough.<sup>1</sup> For my master’s I wanted to go somewhere else in Europe, and for my doctorate to the U.S.

Mr. Brown had told me that math was a team sport. That I should find a study group, work on the weekly problem sets together, talk everything out. Nobody could survive on their own. But I was convinced he was mistaken about that. I’d managed to get through everything on my own for ages, and I’d gotten the farthest. Would the brilliant Andrew Wiles have been able to solve Fermat’s Last Theorem if he had shared his partial results with others? Could the brilliant autodidact Srinivasa Ramanujan even spell the word *teamwork*?

“In analysis and linear algebra we have to turn in our weekly assignments as part of a two-person team,” I said. This requirement had worried me since I’d first heard about it during orientation. I’d raised my hand to ask whether I could do mine alone.

“Dare to meet other people,” Dean Orlov had answered.

“You can’t force me to.”

He’d grinned like the villain in a James Bond movie. “Only if you wish to pass.”

So I said to Moni, “We can be a team.”

I didn’t bother to ask if she already had another partner. It was clear that nobody wanted anything to do with her.

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<sup>1</sup> Though even the standard amount of time was considered nearly impossible: fifty to seventy percent of students failed exams.

She brushed a lock of blond hair out of her face. “I don’t want to hold you back. You should find somebody good at it instead.”

“I’m good at it,” I said.

“I don’t know how much time I’m even going to have to study. My daughter has three children, and Keanu is teething at the moment.”

“Your guinea pig?” I asked.

“My grandson.” She smiled. “He’s the youngest. Püppi barely sleeps, and I’m always helping her. Püppi is my daughter. Keanu, the grandson.”

“I can solve the equations by myself if need be,” I said quickly, before she could think to show me any photos. “Don’t worry about it. I’ll just put your name on the paper to fulfil the requirement of working in a team. You’ll get credit without having to do anything.”

“I don’t want to take advantage of you.”

“I prefer to work on my own anyway.”

“As soon as I have time, I’ll make it up to you,” she promised, as if she hadn’t understood me. And as if she’d last more than two weeks here. “Deal? I’ll give you my number.”

That’s how Moni Kosinsky became the first contact I added to my phone at university. After several minutes of fiddling about, she also managed to add me to her contacts.

“Oscar,” I said, after she’d typed in the number and looked at me quizzically.

“Got a last name?”

“Oscar Maria Wilhelm, Count von Ebersdorff.” I spelled it out.

“Yikes,” said Moni. “I hope it’s ok that I haven’t curtsied to you.”

## WEDNESDAY TIMES WEDNESDAY

I'd started to prepare myself to study math all the way back in primary school. Mr. Brown had warned me that there was nothing taught in school that I'd need at university. Not one-times-one, not binomial expansions, not the p-q formula, also called the midnight formula by dull friends of rote memorization.<sup>2</sup> Everything you needed, you'd have to learn from scratch, Mr. Brown had said. You'd have to be prepared to reformat your brain. Studying university level math with school level knowledge would be like trying to excavate a lake with a toy sand shovel. You came to the realization that you'd been lied to about the right tools for the entirety of your school years, and you'd want to burn your school down.

So I'd been forewarned. And yet, I still had my toy sand shovel with me, along with my programmable calculator, set square, compass, and my collection of formulas. Couldn't hurt. Not to mention that I'd retained everything I'd ever learned in math class, in advanced math, at the summer academy, as well as in the course of all my own studying. I suspected that would make me an exception. It would emerge that I was still greatly overestimating the public education system.

After one week I'd still not spoken to anyone from my course of study. Moni didn't count, I considered her a nonentity. I'd raised my hand twice, when Professor Zschau had asked extremely easy comprehension questions about the contents of a lecture. Two other hands had gone up along with mine.

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<sup>2</sup> Because you supposedly should be able to do them in your sleep



Some days Moni was nowhere to be seen. Soon I wondered if I'd only imagined her. Good that I hadn't yet told my parents anything about her.

Moni was back again during the second week of the course. "You're pale. What did I miss, sweetie?"

"Nothing," I said, surprised once again at her chaotic appearance. I had, as promised, written her name on the week's worksheet when I turned it in, but hadn't counted on her showing up again.

"Initially I sat down next to the wrong person," she whispered. "Besides you, there are two others with blue hair."

"One of them has a greenish tinge and the other has sort of pink ends," I said, offended. "Maybe you should get your eyes tested."

Moni's bag started to vibrate. She fished her phone out and put it to her ear. "Püppi? What's up, sweetie?"

Several people giggled.

Professor Newman entered the room. Even though it had been a cool October, he had on shorts and sandals without socks. From his left earlobe dangled a long chain that looked as if a little kid had made it out of paperclips.

"Püppi, dear, I'm at work," Moni whispered next to me. "I can't talk right now. The prof— uh, the boss just came in. I'll call you later." She made a kissing sound into the mic, buried her phone in her bag, and turned back to the blackboard. "Isn't he freezing?" she mumbled.

Most likely this was some particularly sneaky form of social benefits fraud. She crept into the lecture hall and pretended she was actually working. Maybe she just needed a place to warm up. I didn't

need to understand everything, it was after all not a math problem. Math, on the other hand, I needed to understand, or I wouldn't be myself. And now, for instance, when I looked back at the blackboard I didn't understand a thing. It made me angry.

It wasn't anything to do with me. The course – Mathematics in Context – was a nonsensical mix of geometry, group theory, and historical anecdotes. It didn't have any real beginning or any recognizable structure. I hated this kind of thing.

I squinted at Moni. She was listening to the professor with her mouth open. I looked back at the blackboard. Newman was just asking what the product of Wednesday times Wednesday was. Moni raised her hand. "Tuesday," she said.

The laughter went silent when the professor nodded.

I looked at Moni's notes. She had sketched out a multiplication table based on the days of the week. What was happening? In what crazy world had I landed? Moni elbowed me. "Check it out. You can make a number field out of anything and then calculate with it. It's like magic."

I felt ill.

"I have to go to the bathroom," I said. When Moni noisily stood up with all her belongings to let me out, mumbling apologies, the attention of the entire lecture hall seemed to reach for me like tentacles. This wasn't the attention I'd hoped for and spent my whole life preparing for. I stumbled out of the room.

In the foyer were a few tables and chairs, a coffee vending machine, and something that looked like a pharmacist's cabinet, with lockers for the

tutors. This was where we were to turn in our weekly assignments, as if the internet had never been invented. Fortunately the area was empty just then. Later in the day there were often pale figures sitting here, sometimes with hoods pulled down over their faces, sometimes with their sweatshirts on backwards. They had their fingers in their hair, staring at pieces of paper, and occasionally they were pecking at the keyboard of a laptop.

I leaned against the wall and let myself slide down. My heart was in my mouth, and air refused to enter my lungs.

The door opened again with a squeak. I kept my eyes on the floor, where somebody had flicked a cigarette butt. Next to it a dust bunny quivered in the draft. Didn't they clean this place? How was I supposed to study here?

“What's up? Stomach ache?”

Instead of oxygen, I now had Moni's perfume assaulting my olfactory system. I shook my head to extricate myself from the invisible lilac bush and to dodge Moni's hand. I wasn't a poodle, after all, that anyone could pet.

“Get up, sweetie. Sit on one of the chairs.”

Somehow she managed to help me up without even really touching me. She leaned over me and with a quick motion felt my forehead.

“I'm okay.” I pushed her aside with my elbow.

“Did you have any breakfast today?”

I shrugged. Even our nanny hadn't been this meddlesome.

Moni click-clacked away in her shoes, rustling and jingling. The coffee vending machine whirred and soon I smelled low-quality coffee,

felt the rim of a disposable cup on my lips. I took a big sip, which was simultaneously bland and bitter. Moni pulled out a large lunchbox which contained a salami sandwich, animal crackers, a handful of grapes and apple slices.

“I’m vegan,” I said, gagging on the salami being shove into my mouth.

“That’s why you’re white as a ghost,” said Moni. “Exactly the same as my Justin.”

“Who’s Justin again?”

“My oldest. Grandchild, that is. Wait, I’ll show you a picture.”

I closed my eyes.

“Okay,” said Moni. “Another time.”

My jaw was operating on its own, chewing everything she shoved into my mouth. Still engulfed in the invisible lilac bush, I gulped down the salami and bread, the animal crackers, and two slices of apple. Suddenly I could breathe again. My ribcage loosened, I savored some deep breaths. Then, defying the deadly risk of tachycardia, I tipped back the rest of the coffee and glanced at the lunchbox, which had a peeling Spiderman image on it.

“Sorry, I ate your lunch.” Then I understood. “It’s not yours. It’s for your Kevin.”

“Quentin,” Moni corrected. “The middle child. For after school. He won’t eat at the school cafeteria. Don’t worry about it, I’ll get him a chocolate croissant. He loves them.”

For a moment I thought about offering her money. After all, I’d been taught not to take food from poor people—at least not beyond a

polite bite—no matter how low my blood sugar was. Maybe now, because she'd have to spend extra money, she wouldn't be able to buy cigarettes. Which is why I at least resisted eating the grapes, even though they looked very tempting.

"It's just too much, sweetie," said Moni. "The city is brutal. You can't understand anything in class. You don't know anybody. Every problem set takes seven hours, and there are three per week. The weather is crap. Classes start at eight in the morning. How can anyone manage to prepare anything decent to eat given all of that."

"I'm sorry it's so tough for you," I croaked.

"I'm doing great," said Moni. "I meant you."

We returned to the lecture hall. I showed Moni the corrected linear algebra assignment that I had gotten back the day before, at the tutorial. I'd received full credit; they were just simple beginner's problems.

Moni looked back and forth between me and the sheet of paper.

"What are those arrows?"

"Vectors."

"Never heard of it," said Moni.

"You learn it in high school."

"Not me," said Moni.

"In the Middle Ages people didn't even learn fractions in school,"

I said sympathetically.

"Is there someplace I could learn that?" Moni asked with distress.

"Fractions?" I asked.

"No, smarty-pants. The arrows."

“In the lecture notes,” I said. “And in textbooks. You can check them out with your student ID or download them for free.”

“Download them for free?” She looked at me as if I were Santa Claus with a full bag of Zometool kits.<sup>3</sup> “You can just download any book?”

“Maybe not any book. But the important ones, anyway.”

She was speechless. In order to snap her out of her happy reverie, I quickly explained how I’d solved the problems. Which wasn’t my style, really. Even as a primary school student I hated when I was forced to teach something to other people. *Oscar, if you’re bored, help the other students. Try to explain your work in a way that others can understand.* I wasn’t a teacher. My explanations never helped anyone. If the people were stupid, there was nothing I could do about it. How could you explain things that were so obvious?

“Got it,” said Moni when I was finished.

“What?” I asked skeptically.

“All of it,” she said.

“You sure?”

“You explain things well,” she said.

Of course these were basic principles that even a child could understand. Adding vectors, subtracting, scalar product, vector product. In fact, the entire worksheet was embarrassingly easy.

“It won’t be this easy going forward,” I warned.

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<sup>3</sup> Unpaid advertisement

Moni raised her hand apologetically and reached into her bag, which was vibrating again.

“Püppi?” she said. “Oh, no. Don’t cry, sweetie. I’m on my way.”

She pressed her phone to her chest.

“What now?” I asked.

“Quentin threw up at school.”

“Yuck,” I said.

Moni hurriedly tossed her notes into her bag.

“You can’t just leave,” I said. “The next class is about to start. I can’t personally explain everything to you every time.”

“This week I’ll try the assignment myself,” she said. “You don’t always have to bail my ass out.” And then she click-clacked away in her heels.

## GERMANY’S MOST FAMOUS MATHEMATICIAN

When during the day I ingested too little protein, I would dream at night of Gauß. A Gauß who complained that ever since we’d done away with the German mark we no longer had an image of him and his normal distribution curve printed on our bills and nobody paid with those nice, old ten-mark notes anymore. In my dreams he had a high-pitched, almost girlish voice, he giggled and was very full of himself. He always told the well-worn anecdote about an elementary teacher who’d told him to figure out the sum of all the numbers from one to a hundred in order to keep him

busy for a while. “I just put together pairs of numbers and multiplied 101 times fifty,” Gauß giggled with tiresome self-satisfaction. “I was basically done in one minute. Büttner just stood there looking like an idiot. Ever since, it’s been known as the Gauß Summation.”

“What’s so brilliant about it?” I asked him. “How else would you calculate it?”

“But I was only nine years old!” Gauß crowed.

“I’d figured that out at seven,” I countered, and Gauß, of all people, accused me of a poor upbringing and lack of modesty. In my dream I was too well raised to point out that these days his then so brilliant insights were well within the capabilities of any high school student of even middling intelligence. Humanity had evolved. These days a genius had to execute at a higher level than a hundred years ago.

Outside it was pouring. I drank two cups of tea and put on my rain gear. Thought about the day ahead of me, the cafeteria food, took off my outerwear again and made myself a piece of toast with margarine and currant jam, which had been given to me as a housewarming gift by the janitor, Frau Horn. It was a seven minute walk to the math department. From my balcony I had a good view of the stream of people rushing from the U-Bahn toward the university in the morning and back in the afternoon. In the rain-soaked bushes in the yard, little birds hopped around and picked at red berries.

Early morning analysis class kicked off with a quiz. We had ten minutes to solve a problem. Anyone who didn’t get at least halfway through the solution wouldn’t be permitted to sit for the final exam, regardless of their grades on the weekly take-home assignments.



I hated time pressure. In school I'd had an accommodation that got me extra time, which gave me such peace of mind that I usually was the first to turn in my work anyway. Timed challenges I only managed to get through with the help of pills that had to be meted out precisely or I'd fall asleep partway through. Only after Mr. Brown started to accompany me did I eventually put any stock in his opinion that one wrong answer wasn't the end of the earth. I'd have given anything to have seen his slightly stooped figure next to the coffee vending machine just now.

I'd just taken half a tablet and wasn't sure if it was enough. A glance into the lecture hall revealed I wasn't the only one feeling this way. In just the second week of class, most of the students looked totally spent. They were sitting there with anxious faces and pens already set out alongside sheets of paper, tapping their fingers, and staring at the board in anticipation of the problem.

Oh well, Moni, I said to myself. It was here that my charitableness toward widows and orphans hit its limit. We could pretend that she was really working on the weekly take-home assignments. But when it came to any kind of test, everyone had to get through that on their own. Some people couldn't even manage to get to the test site on time.

Moni showed up at the last minute, with a dripping umbrella and smeared mascara. She had on something bulky, heavy, and also dripping. As she dropped into her seat, I was shocked to suddenly realize the bundle in her arms was looking at me with two dark eyes.

She had a child with her. A real-life child, with a red nose and its thumb in its mouth. A child she immediately began to wipe off with some tissues.

I moved over a seat, with my notebook open and a pen by the ready.

“Stay here, there’s enough space for us,” Moni whispered.

Glances – some inquisitive, some betraying *schadenfreude* – were directed at the child. In some of the glances I recognized my own sense of panic. Though a few people smiled sympathetically. For the most part those were the older people, who’d already begun to talk in tutorials about *level playing fields* and *family-friendly policies* and to haggle over deadlines.

If you allowed them, they’d all bring their children, grandchildren, or nephews next time, I thought. Not to mention dogs, hamsters, and turtles.

I took a quick glance at the front of the hall, where Professor Zschau and some younger person, probably his assistant, were wrestling with the technology. The child next to me sneezed. Moni rummaged around for a clean tissue. A tiny human foot fumbled toward my pen like a thick-legged spider.

“And, go,” said Zschau. “The clock’s running.”

A giant timer had been projected onto the board. I could almost hear it ticking in my ear. I read through the problem. It had nothing to do with what had been covered in class. It was just three linear equations using different notation. Two of them defined the same line, which was immediately obvious and provided the answer.

“Huh?” said somebody behind me. “I don’t get it.”

It threw me back to my schooldays. The simplicity of the problem was insulting. I started to write as Moni reached down beneath her seat

for a pen that had fallen. I'd finished my answer with eight minutes left. Just to be sure, I wrote out a second variation of my proof formulated a different way. Still five minutes left.

"Huh?" blurted another voice. "What I am supposed to do with this?"

"It's all there," said the assistant.

If not for the child next to me, I'd have been bored now. I looked at his runny little nose and gagged. I scrawled my name on my paper and stood up. In order to let me out, Moni would also had to stand up, together with all her baggage. She emerged from beneath her seat, where she was still looking for the missing pen.

"Here." I gave her mine, handed my paper to the assistant, and left the lecture hall.

I sat down next to the coffee vending machine and began to google some webpage where I could complain. I didn't see myself being able to study when there was somebody next to me slobbering, sucking their thumb, and threatening to grab my pen. But the university didn't seem to have a forum to question policies that were too family friendly.

The lecture hall door squeaked and Moni emerged along with a screaming child, bag, and dripping umbrella. My hands reflexively moved to cover my ears. Moni's voice bore its way through anyway.

"I was thrown out. The little one's too loud. Some people complained."

"Seriously?" I should have thought of that.

"Yeah, they couldn't concentrate. Said they'd fail the test because of me."

Even though I basically shared their outrage, I felt more compelled to stick to the truth. “Anyone who can’t solve that problem should dropout immediately and not blame Kevin.”

Moni hugged the child.

“He’s sick,” she said. “But I didn’t want to miss the test. They’ll get tougher as the semester goes on.” She felt the child’s forehead and pulled out a bottle.

I moved my chair away. I didn’t want to get infected. I didn’t like the enthusiastic way the child was pointing at my head, either.

“Oscar has nice hair, right?” said Moni tenderly. “We’re going home.”

“Hope he feels better, and get home safe.” I shifted my chair a bit further from them.

“In a moment. Not quite yet. We’ll just have a quick breather.”

She put the child down on the floor. It managed to get to its feet and staggered toward the nearest wastepaper basket. Instead of intervening, Moni leaned back and closed her eyes. Her face was covered in a thick layer of powder, and her red mouth was reminiscent of a geisha. I’d never seen anyone so tired before.

The child fished a crumpled piece of paper out of the wastepaper basket and headed toward the adjoining corridor, babbling away. He ran into a set of legs and plopped down on his diaper-wrapped bottom.

I glanced over for a moment and quickly sat bolt upright. I’d known this moment would come one day. But I’d expected to wait much longer – months or even years, if that’s what it took. I would never have dreamed that it could happen so quickly.

The man who'd just come around the corner took an exaggerated step around the child and stopped directly in front of me. He looked around inquisitively, as if trying to remember where he was going.

His hair, as I'd long known from photos, was pulled back in a ponytail. He had on cowboy boots, which were mentioned in every article about him. There'd been quite a number of pieces about him when he'd won the Fields Medal. Before him only one German had ever won that honor. No journalists had been capable of describing his area of study in anything approaching the right way. Because it was about dimensions, they always reached for comparisons in the realm of science fiction that had nothing to do with the actual research. Even though the Nth dimension was just as real as the fact that most of us had two thumbs.

I'd pictured his face younger. When he won the prize he'd been thirty-five years and ten months old. All of the photos of him online seemed to be from that time. News about him had grown quiet afterwards. I'd read that he'd spent ten years researching in the U.S. and Australia. Only last year had he returned to Germany, to the same university where he'd attended his first lectures while still a schoolboy. Seconds after reading that news I knew where I'd attend university.

The sound of the heels of his cowboy boots had roused Moni from her momentary nap. She opened her eyes and looked around for the child. Then she saw the man.

"Oh," she said. "Hello, Daniel."

The man looked at her. She stood up and straightened out her clothes. And what on earth was plastered on her face now: it wasn't her own smile, she must have stolen it somewhere. Silence hung in the air.

Then for the first time I heard the voice of Daniel Johannsen, Germany's most famous living mathematician, in person.

"Hi there," he said. "Is there a room 102 around here somewhere?"

"On the first floor," I said.

"Of course! Thanks." His eyes were still glued to Moni's face. Then he lifted his hand to wave goodbye and disappeared back into the corridor where he'd just come from.

"Whose baby is this?" came an echoing voice from that direction. "Is somebody going to look after him?"

Moni staggered around the corner and returned with the baby. Even the layer of powder couldn't hide the fact that she was blushing.

"You know Daniel Johannsen?" I asked.

"Who doesn't," said Moni. "See you later, sweetie, I promised Püppi I'd stop by the pediatrician."

Obviously I could have studied at any university in Germany. Though that said more about the academic landscape than my abilities. There was no minimum requirement to study math, which was why during the first week you'd see people sitting in class who needed their fingers to count. Math departments took every applicant and opted to stage a bloodbath during the first few weeks instead of gauging the idiots' adequacy in advance.

Naturally I could also have attended any of the world's most renowned universities. But I had a reason to be right here.

As soon as my Google alert had informed me of Daniel Johanssen's return to Germany, I had resolved to do my undergraduate thesis under his tutelage.

I'd had to wait a long time for the chance. Eighteen years had passed since he'd received the Fields Medal. The first coverage of the award preceded my birth. Once my parents had allowed me to research online, most of the articles had already disappeared from publicly accessible internet archives. The sporadic hits led to error messages. My mother drove me to publishing companies and had coffee with editors as I made copies of articles and profiles that often bogged down in irrelevant details: Daniel Johanssen's favorite books and whisky brands, his fitness regime. His international research seemed strictly secret, so much so that I searched for clues about its contents.

Johanssen's appointment as a professor in Germany had garnered only minor mentions in national press outlets, if at all. Which was fine with me: I'd always been a devotee of rarified knowledge.

I'd planned out my studies precisely. For me it wasn't about getting good grades on assignments and passing exams. That went without saying.

I had another goal.

I wanted to take care of the basic requirements as quickly as possible. I needed a solid foundation in analysis, linear algebra, number theory, combinatorics, and topology. And wanted it fast, before Daniel Johanssen hit on the idea to move to New Zealand and I'd have to follow him across so many time zones. As soon as I'd satisfied the degree requirements, I wanted to finally begin to fully devote myself to Daniel

Johannsen's research. I wanted to speak to him as fast as possible and ask him for a topic for my undergraduate thesis, ideally some building block in his own work that he would leave to me, forever conjoining our names. Maybe I'd even have a chance to propose some of my own concepts.

I envisioned Johannsen's name listed as my faculty advisor on the cover of my first academic paper.

Of course, it hadn't escaped me while studying his website that although he seemed fond of being photographed "pondering mathematics," he hadn't advised a single undergraduate in recent years.

But I was accustomed to being an exception.

## TWENTY-THREE BIRTHDAYS

Moni had an agreeable though rare trait: she accepted my intellectual superiority without so much as a hint of doubt. I'd already begun to offer her lifestyle advice to add more structure and efficiency – like, for instance, establishing a daily routine. For the most part she wasn't in a situation that allowed her to put the advice into practice. But she greeted it with the requisite admiration.

"If somebody had told me that one day I'd be graded by someone who could be my grandchild," she mumbled as Raphael, the assistant who led our tutorial, labored at the chalkboard. "Yet another person who's so young and brilliant. I don't know whether I should feel like a little kid or like I'm totally senile."



“The difference is just a question of perspective.”

The fact that Moni would lump me in with Raphael stung.

Looking after her cost me energy that was impossible to replace.

Moni was always hungry, for instance, and constantly talked about it.

Once I was talking about the common sources of error in proofs by induction and she was instead talking about the fact that the cafeteria had pancakes and rice pudding on the menu. This derailed my train of thought and caused me to be more hungry than usual, too. Moni unpacked her Tupperware container and held it out to me. Quality snacks were one of her surprising assets.

At some point I stopped noticing the lilac scent. Which must have meant that I was growing accustomed to it.

I only entered the humid, bustling cafeteria, with its lines in front of the food counters, out of politeness and respect for Moni’s age, her hunger, and her obviously limited means. I always had a chamomile tea and kept my sleeve over my nose in order to survive the stay, while next to me Moni ate quickly, talked even more quickly, and then put her leftover moussaka or lasagna in a Tupperware container she’d brought and which I’d already emptied. Her monologues spanned a broad spectrum of topics that began with her bafflement at quirks of the university system (“Why does class start at quarter past eight when it says eight in the course catalogue?”) and always ended up back at the coursework. Once Moni spent an entire lunch break in disbelief over the fact that she had finally grasped the essence of zero after Professor Newman had spent the course of an entire lecture proving that zero

equaled zero. “It’s a neutral element in addition, isn’t that crazy, sweetie?”

Sometimes I waited outside.

When Moni wasn’t there, I left campus during the break to have a rooibos tea in a café on the nearby shopping street. Sometimes I bought myself a vegan croissant or raisin bun.

Hardly any first year students strayed into the café, as they were still busy exploring what the campus had to offer. This was a place where professors met up with other professors for coffee, or brought international guests or their semi-secret lovers. Maybe one day I’d sit here with Daniel Johannsen and discuss the progress of my undergraduate thesis. I hadn’t seen him in this café yet, but I had seen many others whose classes I took or whose faces I recognized from the university’s online faculty directory.

Professor Herbst, whose linear algebra class I was in, had a cappuccino here most afternoons. I’d seen him many times. His name had long been on my radar because Daniel Johannsen had cited him as his mentor in an interview. He’d taken private classes with Herbst when he was still a schoolchild.

I had a lot of questions for Professor Herbst.

He had a friendly, melancholy face with luminescent blue eyes and a barely noticeable East European accent. He’d opened his first lecture with the claim that linear algebra was nothing but a bunch of trivialities. His assignments were so easy that nearly everyone managed to get the required fifty percent and nobody had cried, even though it was already weeks into the semester. According to his faculty page Herbst

regularly served as advisor on undergraduate theses. Not that I had a plan B in the unlikely event that Daniel Johannsen were to refuse to serve as my advisor. But Professor Herbst was my plan C, D, and E.

I sat down next to Herbst on a bench by the window, the commotion of the street at my back, and waited for my drink as well as an opportunity to strike up a conversation. I was desperate to know what he, with his penchant for lack of complexity, could possibly have taught a genius.

Presented with this opportunity three times, I hadn't thought the time was right. The fourth time, Herbst turned to me.

"Isn't that one of your classmates?" He gestured toward the counter.

"I don't know any other first year students," I said, flattered that he recognized me after raising my hand just twice in his class.

"But you always sit together. And she's waving at you right now."

"Impossible." Even so, I glanced over. Operating the espresso machine was a woman in a dress so garish that I'd avoided looking at her in order to protect my retinas. It looked like a jungle had exploded onto the fabric: a jumbled mess of vines, monkeys, tigers. It almost made me dizzy.

"Do you see them, too?" I sputtered.

Herbst squinted and leaned his head to the side. "Impossible not to."

"What's she doing there?"

"What does it look like?" said Herbst. "I suspect it is related to the *Help Wanted* sign that's no longer in the window. Very sensible to take a

job close to the university. I'm just not sure how I can grade her papers without worrying she might poison my coffee if she doesn't like the result."

"No wonder she doesn't have time to study." Suddenly I was upset. "She's using her energy here while I do the weekly assignments for the both of us. I cheated for her. Her grades are going to benefit from my work. In your department, by the way! Doesn't it bother you?"

"It's fine," said Professor Herbst. "As long as you don't wave it in my face."

"She'll be allowed to sit for the exam and then she'll fail. It's not good."

"I guess we'll see about that," said Herbst.

"Would you hit on the idea of becoming a professional ballerina at her age and in her condition?" I asked.

"You don't think I'm capable of it," said Herbst. "I feel discriminated against."

For a moment I was horrified, but then I realized by the wrinkles around Herbst's eyes that he quite possibly hadn't been serious. He didn't seem serious about anything; not his teaching, probably not his research either. I didn't like it when sophisticated concepts were made easy for the general public to understand. Math wasn't literature, you couldn't sum it up in a sentence and pretend it still contained the essence.

"Is linear algebra really a bunch of trivialities?" I asked him.

"That's right," said Herbst. "If you understand linear independence then you understand everything else, too."

I had to think about that.

“Look at you,” said Moni’s voice, from just above my ear.  
“Wasting no time in making the right contacts. Your cappuccino,  
Professor. Your tea, sweetie. They’re on the house.”

She handed me a chamomile tea that I hadn’t even ordered.

I took the cup silently.

Herbst smiled at Moni. “I missed you in my class today. But you didn’t miss anything essential. Just read pages eleven to fourteen in the class notes.”

“The good thing is that everyone avoids us,” I said to Moni at our next joint visit to the cafeteria.

“We’re the only ones who didn’t go on the pub crawl the first week of the semester,” Mona sighed.

“There was a pub crawl?” I grimaced. “No wonder nobody here is showing much progress. And you must be really hungry.”

Moni had loaded her tray with goulash, noodles, a mound of things from the salad bar, and a huge slice of chocolate cake. I was carrying my cup, the teabag bobbing in the lukewarm water. She put her tray down at a table that was already taken. A man was sitting there shoveling a rice dish into his mouth with astonishing speed. He moved his plate aside. He looked like one of the homeless people who tried to warm up in university buildings on cold days.

“What are you doing?” I gripped my cup more tightly. “The table over there is free.”

“Sit down, sweetie.” Monika pushed a chair toward me. “We should interact with people more. And when I say *we*, I mean *you*. This is Tom. Tom, this is the young genius I told you about.”

“We know each other.”

I sat down, shocked. Tom had long hair that hung down into his plate of rice. It dawned on me that I had indeed seen him in our class. Most of the time he wore his hair in a bun.

“Nice to meet you,” I said politely. “I just realized I have an important meeting to get to.”

“Don’t be ridiculous.” Moni grabbed my sleeve, then let me go after I yanked angrily. “You don’t have anyone to work with on the group project. And Tom and I need another team member.”

My jaw dropped. “What project? What group? We’re not schoolchildren.”

“We already wrote your name in. Here’s the problem we have to solve.” Tom held his tablet toward my face.

*A party with  $N$  guests is in full swing, I read begrudgingly. How great must  $N$  be to make it more likely that two guests share the same birthday than that nobody shares a birthday?*

“This is stochastics,” I said. “What does it have to do with the course material?”

“Newman loves riddles,” said Tom. “I’d guess it has to be greater than a hundred and eighty people.”

Moni shook her head. “Fewer.”

“A lot fewer,” I snickered.

“Why?” Tom pushed his empty plate away and threw back his hair. “There are three hundred sixty-five days a year. Just divide it in two. What is there to laugh about?”

“Sorry.” But I couldn’t stop.

“I have to go to work.” Moni closed the Tupperware container that I had previously emptied and into which she had transferred her leftovers.

“At the café?” I was beginning to panic about being left alone with this guy.

“I wish. You two can keep talking about the assignment.” And off she teetered. Tom watched her go.

“Amazing woman,” he said.

“She has grandchildren.” Suddenly I was worried that he might have dishonorable intentions toward Moni. She was old, of course, but so was he.

“I know,” said Tom. “Children, grandchildren, husbands, the whole shebang. So, how great is  $N$ ? Shall we google it?”

I didn’t understand what he wanted from me. I had little enough to talk about with classmates my own age. I had no desire to complain about the grading or which professor gave impossible exam questions. Tuition costs were also not a topic for me. I didn’t want to ask anyone to take a picture of the chalkboard for me if I couldn’t make it to a lecture. I always showed up. I couldn’t blame the public transport system because I came to class on foot.

The conversation with Tom seemed so absurd to me, like trying to discuss a season of Supermind with a tree. But hopefully even a sycamore wouldn't have looked at this assignment and just divided by two.<sup>4</sup>

"Say hello to your family for me," I said to Tom, quickly placing my teacup in the dirty dishes cart and heading home.

In order to make the move as simple as possible, my parents had provided me an apartment in an old three-story villa, fully furnished. Home furnishings didn't interest me anyway, I just wanted someplace clean, with white walls. I had a kitchen where I found, as requested, a little pan (for tofu) and a pot (for peas and rice). In the closet were two sets of cream-colored, satin sheets.

I lay on my back and watched as the display on my phone lit up and projected dots of light on the high ceiling. The first thing Tom had done with my number was to add me, unasked, to the class group chat. After ten minutes I'd had more than enough of the cacophony and I unsubscribed.

But I couldn't figure a way out of the three-way chat with Tom and Moni other than to mute the notifications. Still, I had to read it once in a while, pulled against my will into the whirlpool of university nightlife. It was already one in the morning and a lively discussion was taking place. Tom didn't understand why his rough and ready rule (divide everything he saw by two) didn't lead to the answer this time. Moni, as evidenced by her complicated sketches, had tried various values for N. I

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<sup>4</sup> We know too little about the intelligence of plants.



had to give her credit; for an uneducated woman they were clever ideas, worked at diligently. She could keep banging away with that method forever. It was going nowhere, but it did at least disprove Tom's intellectually lazy speculation.

At some point I couldn't take it anymore.

*Hint: what is the complementary event?* I typed in the chat.

*Hey, somebody's awake.* (Tom)

*Did we wake you, sweetie?* (Moni)

*What the hell is a complementary event?* (Tom)

*Should I just tell you the answer?* I wrote.

Yes. (Tom)

No. (Moni)

*Why not?* (me)

*I want to figure it out myself.* (Moni)

*What's his name again? Oscar? Tell me separately. I have to leave home at seven tomorrow. Meaning today.* (Tom)

I had no desire to start a separate chat with Tom. I turned my phone over so the light wouldn't disturb me further. It was like watching a bad ping-pong match where one of the players kept losing the ball. You wanted to beat him with his own paddle.

I'd figured out the famous birthdate paradox in seventh grade.

It took me a while to hear the alarm the next morning, though normally I woke up on my own anyway. I reached for my phone. The chat was bursting with over two hundred messages. I scrolled through a flood of sketches and photos of handwritten calculations until finally the number twenty-three popped up. Moni had fought her way to the correct

answer around three in the morning, but needed almost another hour to explain it to Tom.

I pulled on my slippers and staggered to the bathroom. I had a bad feeling that up to now I'd overlooked an important aspect of mathematics.

[END OF SAMPLE]