

The Tolman Trick

The Wolf River emerges from the Black Forest and winds across the snow-covered land. Its water is so cold it is syrupy, a snowball gets carried several yards before it melts. Chunks of ice floating downstream curve gracefully around bends. Fluid particles move along smoothly, their velocities varying between orderly bounds. But then they encounter an obstacle, and their streamlines begin to break down. The river carries on, even though mathematically, a solution to its flow equations cannot be found.

Which was nonsense, of course, as his mentor György would have said: "Nature always provides a solution, it's we mathematicians who are not smart enough to validate her." Tolman scrubbed the steam off the cab window to get a better look at the river. There was a stub of snow projecting from the bank into the water, probably the remnant of an old stone bridge. He was tempted to ask the driver to stop so that he could take a closer look, watch the water hit the corner of the stone and loop around in its complex patterns. Patterns that engineers had recognized, even calculated for decades, but which the mathematical theory had not been able to substantiate. Not, that is, until two years ago, until the publication of his landmark paper on fluid flow around a corner.

Tolman marveled at how dramatically the paper had changed his standing in the pecking order. For years, he had clawed and scratched with everyone else in the barnyards of academia for scraps of recognition. Suddenly, he was judged worthy of a seat at the table. Suddenly, he could reach out and nosh from the platters of conference invitations and panel appointments he had only been able to smell before. Attendees at conferences sought him out, instead of walking away when they did not recognize the name on his badge. Overnight, he had become a star, surrounded

by a personal solar system of students and junior researchers. Already, some papers had started referring to his argument as “The Tolman Trick” because of the cunning way it bypassed all the difficulties that arose in trying to resolve the corner. (Personally, Tolman would have preferred that his colleagues use the more respectable “Theorem,” though he had to admit that “Trick” did sound catchier.) György himself, so notorious for his inability to praise the work of his former students, declared himself surprised to hear the result had been proved in his own lifetime. He died a month later.

“It’s very beautiful, no? Always soothing to watch water flow.”

Dixon. On the seat next to him. Tolman made a gesture with his head, halfway between a nod and a no. Soothing was the last word that should come to mind. Streamlines and velocities and Navier-Stokes equations —*that’s* what one should be seeing in water flow. That’s what should be flooding the mind of any young person in the field who wanted to do something, become someone, Tolman felt like admonishing Dixon.

They had run into each other on the railway platform at Hausach. Tolman had been pleased to have been recognized by Dixon, from the University of Arbutus, even though they had never met before. He looked at his fellow passenger now, perched on the edge of his seat like an expectant schoolboy, his feet barely reaching the mat, a thick leather satchel clutched in his lap. Tolman felt an avuncular twinge and remembered his own days as a fresh assistant professor, almost twenty-two years ago.

“Did you know that my advisor was György?” Tolman told Dixon, shifting his large soft body in his seat. “Back when he was still taking Ph.D. students, before he became such a recluse. He used to throw all sorts of impossible problems at us, without mentioning that mathematicians through the ages had tried and failed to solve them.” Tolman chuckled. “I remember when we first heard of the problem of flow past a corner. Bramer was a student of György as well, and we both thought it would be an evening’s work— we were in our twenties and so naïve then. We ended up racing through grad school trying to see who would crack it first. Look how long it took, though, to finally. . .”

Tolman stopped and ran a hand over his remaining hair to check that it was in place, the way György used to do with his own. How to convey to this aspiring young colleague all the effort, all the sacrifice, that good mathematics demanded? The exhausting rivalry that had escalated over

the years between Bramer and himself over trying to be the first to prove the result? He searched for some sage advice to bestow on Dixon, but was overcome by the poignancy of his own accomplishment.

“There was something I wanted to ask you about your proof,” Dixon undid the strap of his satchel and extracted a sheaf of papers.

“Not a mistake, I hope,” Tolman said jovially. He decided he liked this Dixon—the quiet personality, the studiousness he projected as he regarded life from behind his thick black-rimmed glasses. Tolman himself had been equally serious at that age—it had been a way of concealing the terrible shyness he felt. He contemplated asking Dixon if he too was shy—would that be too personal a question?

“Actually,” Dixon said, and Tolman looked at him, amazed. He couldn’t possibly think there was an error.

“Actually, it’s Theorem 2.3. I keep thinking there’s something wrong with it.”

How absurd. The little runt. Didn’t he know the exacting review process that *Acta Fluida* employed? Didn’t he know the result had been endorsed by György himself? Tolman felt the skin on the back of his neck begin to itch.

“Perhaps we could go over. . . ?” Dixon stopped, a look of alarm beginning to spread over his face.

Tolman forced his jaw to loosen, his cheek muscles to relax. This was exactly the reaction Dr. Winton had warned against, to prevent the eruption on his neck. It had been a perfectly reasonable request. Why had he become so upset? “Roland, you’re a mathematician,” he heard Dr. Winton say. “It’s not as if you’re trading companies or landing planes. It’s not as if playing with numbers can lead to so much strain.” He reminded himself that he was now a senior person in the field. Wasn’t it his duty to soothe away the doubts of his junior colleagues? What better way to spend the time in the cab than to give a short, calming lecture on his own work?

“Certainly,” Tolman said.

By the time they reached Oberwolfach, though, Tolman was ready to pick Dixon up by the scruff of his neck and give him a good shaking. Could the man really be that obtuse? Part of a mathematician’s training was to refuse to take any statement at face value, to be skeptical of every line in a proof. But Dixon seemed incapable of accepting anything as true, asking the same questions repeatedly with such mulish persistence that

Tolman wished he could hasten him along with a stick. Sensing Tolman's displeasure, perhaps, Dixon began to freeze up, and, interpreting this as a further digging in of heels, Tolman felt his agitation turn to cold grinning fury.

"I hope you have a wonderful conference," Tolman said through clenched teeth, and Dixon collected his luggage and fled up the Institute steps.

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The Mathematics Institute at Oberwolfach was a low-slung concrete building defined by sharp vertical and horizontal planes, built on a hill about a half mile from town. In its original incarnation, it had been housed in an old hunting lodge, with the purpose of providing technical support for floundering Nazi forces near the end of the war. But for the past several decades, it had enjoyed the reputation of being a leading international center for mathematics. The building overlooked a valley in the Black Forest with a view so breathtaking that it was said that visitors staring at the panorama long enough would feel the solution to any mathematical problem waft in like a breeze off the pine-covered slopes outside.

Tolman drew back the long orange drapes and looked outside his balcony door. The sky was gray and overcast, not a good day to catch breezes. Inside, the room was spotless, but more Spartan than he remembered—a wooden desk and chair in one corner, an unplugged floor lamp, and a low single bed without a headboard, but with a small table attached to it. A mathematician didn't need much, he remembered György saying—a desk, a pen, and a writing pad—the less clutter, the better.

Sometimes Tolman fantasized that he was an ophthalmologist or a surgeon, with sleek, expensive equipment to play with and a progression of glamorous resort conventions to attend. Usually, though, he was happy with the calling he had followed, and today he was not dissatisfied with the room he found himself in. He went over and examined the large metal knob regulating the heating pipe. The gradations clicked smoothly under his fingertips as he rotated it. He turned it this way and that, fascinated with its oiled precision, which to him epitomized all the efficiency and exactness of Germany.

Tolman lay down on the bed to test the mattress and realized how jetlagged he was from the cramped overnight transatlantic trip. He was about to close his eyes, when he remembered Theorem 2.3. He supposed he ought to look at it, to make sure there was nothing to substantiate

Dixon's suspicions. The thought of his own behavior in the taxi filled him with shame. He would search Dixon out at the conference and apologize to him. Perhaps even tonight, though it was probably too soon to sit together, lest Tolman feel like cuffing him again. He turned towards the balcony and watching the sky darken outside, fell asleep.

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It was the staff that assigned people to the dining room tables, changing the seating pattern at every meal to force the mathematicians to mix. At dinner, Tolman found himself seated at a table with neither Bramer, who hadn't arrived yet, nor Dixon, and mentally calculated the probability that he would miss them on all five days. With ten meals and eight tables, forty-eight attendees and an unbiased staff, it worked out to $(42 \times 41) / (47 \times 46)$ raised to the power 10, which he quickly gave up trying to simplify in his head. He was a mathematician, not a calculator.

"Sort of like musical chairs," he said, commenting on the seating to the person next to him, whom Tolman had never met. The man had a large, round head, with an incredibly red face, partly covered by a handkerchief he held over his mouth and nose. He chuckled from behind his handkerchief, so emphatically that Tolman wondered if the reference had been understood.

"I'm Roland Tolman," Tolman said, extending his hand, and the man sneezed twice into his handkerchief.

"Lazarotsky. Like in the book," the man said, using his free hand to shake with Tolman.

"The book?" Tolman repeated, wondering for an instant if he meant the Bible, if there could have been a character named Lazarotsky in it.

"The book on boundary conditions for elliptic operators," Lazarotsky said grimly, his face flushed in insult, "translated from the Russian."

Fortunately, the food arrived just then, wheeled out on carts by the sturdy kitchen women in their blue uniforms.

"Have some soup," Tolman said, ladling out a bowl of thick dumpling soup for Lazarotsky, "it'll be good for your cold." Lazarotsky accepted the bowl with a grunt and did not look again at Tolman.

The main course was endive-wrapped sausage baked in cream and covered with a cheese sauce. Tolman suspected this was not the best antidote to jetlag, but the rumbling emptiness in his stomach made him eat enthusiastically. He even helped himself to one of the three extra sausages that

had been apportioned per table. His Finnish colleague Hynoven, whom he had not seen for a while, bought him a beer, and then two more, which helped ease the food down. Tolman felt the combination of beer and cream rise to his head.

Anna, the Canadian woman sitting on the other side of Tolman, was not a mathematician. She was there with her husband whom she introduced as Michel Dresser, an algebraic topologist on a three-month visit unrelated to the conference. Tolman was close enough to smell Anna's perfume even through the meaty vapors rising from the platters on the table. Perhaps it was the angle at which he sat, but everything about her face seemed strangely elongated—her chin, her nose, her lips which seemed to project out to a point as if she was puckering them for a kiss. Even the wisps of her eyebrows arched so high that they seemed ready to lift off from her forehead. She looked like a refined, very elegant collie.

She was also, Tolman decided, the most beautiful woman at the conference. Marie Joly from Belgium could be a contender if she ever bothered about her appearance, the three or four graduate students around were all too young, and the Popescu sisters, who had caused such a stir twelve years ago when they had arrived from Bucharest in their shiny black dresses and luxurious matching furs, seemed to grow tragically more dowdy and book-bound with every conference.

"And what do you work on, Mr. Tolman?" Anna asked with a light French accent, pronouncing the "tol" as "tool."

"My wife's hobby is to collect the names of different fields of mathematics," her husband said.

"It's fluid dynamics. Applied mathematics. Not as abstract as your husband's."

"Which means he's doing things people might actually pay for," her husband interjected.

Tolman blushed. "I'm afraid I only prove things—useless things like the existence of solutions that engineers already take for granted. Besides, it isn't as if algebraic topology is not useful. . ."

Dresser cut him off. "Really, Dr. Tolman. Shouldn't you leave it to me to take up the defense? As the only pure mathematician around, I insist on this prerogative."

He said it as a joke, but Tolman did not miss the sharpness beneath the surface, like a hidden layer of ice crackling underfoot.

"And how do you spend your days, Mrs. Dresser?" Hynoven asked.

"She's an artist," her husband replied again. "She makes quilts."

"I even have a loom here, believe it or not, to weave cloth," Anna said, apparently unmindful of her husband answering for her. "You should all come and see it some day. It's in this huge open space with a skylight, right outside our room on the top floor."

A vision of Anna alone in a sunlit tower, working on her loom like the heroine of some fairy-tale came to Tolman. He did not know much about quilts (or art in general, for that matter) but felt a need to find out more about Anna. "What kind of quilts?" he asked.

"Little ones, with all sorts of scenes on them. Snow, mountains, trees. I sew them together to make bigger ones. But the biggest I've ever made would still only cover half a single bed."

"Pure quilting, in other words, as opposed to *applied*. Runs in the family," her husband said, and the lines of Anna's eyebrows deepened, bringing an irresistible sadness to her face.

Why could she not have been married to him instead? Tolman was sure he could learn to be proud of a wife who made quilts. They would live in a room next to the loom and decorate the walls with her work. He tried to imagine where her husband could have found her, how the two might have met. Except for a brief relationship with a fellow student during graduate school, Tolman had been single all his adult life. The probability that he would ever marry, he knew, was decaying with time. There were so few women in mathematics, and he did not really feel comfortable with people outside his profession. He had once subscribed to a dating service, but had felt ungainly and tongue-tied on the dates they had sent him on. The last woman, a realtor, had pressed him to talk about his work. She had listened attentively as he poured his heart out about existence and uniqueness and turbulence. At the end of the evening she pecked him lightly on the cheek. "In case you're ever ready to buy," she had whispered, squeezing a card into his palm.

The dessert carts were rolled out, and the server, a large woman with red cheeks like those of a doll, placed hearty servings of apple strudel in front of each of them. At first, Tolman decided he would not touch his strudel, but then he thought he would have just a little to appease his stomach, which had begun rumbling again. He ate half of what was on his plate, then half of what was left, and half of what was left again. He re-

membered his father showing him with a piece of cake. “See, Roland? See how I can take a half again and again, and still never run out of cake?”

He was concentrating on dividing the last few crumbs left on his when he saw Anna with her sad eyebrows staring at him. “Goodnight Dr. Tolman,” she said. “I don’t know if we will sit together again, but do come up some time and see the quilts.”

Later, when some more of the people had left, he caught sight of Dixon and waved to him across the tables in between. By the time Tolman could negotiate his way over to him, Dixon had disappeared from the room. Instead, Tolman joined a table of colleagues gossiping about a husband and wife, both mathematicians, who had worked as a team and who had just divorced. “It was all the papers they wrote together—they never could agree on the notation. Philippa told me how at the end he started using R to denote the *complex* plane, just to taunt her.” Tolman laughed with everyone else and had another beer, so that by the time he got back to his room, the orange curtains were blurring with the white walls. Theorem 2.3 was not even a memory as he fell fully dressed into bed, and into sleep.

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At 3:45 am, he was wide awake. He forced himself out of bed. He had learnt long ago in graduate school not to let sleep rule him—to regard such early awakenings as gifts, using them to get an edge over other students (particularly Bramer) while they slept. Today, though, he was still a little drunk. In his throat, he felt the bite of acid reflux.

He threw open the curtains and was greeted by the blackness outside. Then the outlines of the mountains emerged, like spirits revealing themselves out of the air. He went and played with the knob controlling the heat, again enjoying the smooth way it rotated, like the dial of a well-lubricated lock. Then he sat down at the desk and opened his paper from *Acta Fluida*. “On the existence of solutions for Navier-Stokes flow in the presence of obstacles with Lipschitz boundaries.”

He began scouring it line by line, poking every lemma, prodding every proof, seeing if any step was loose, would give. “Think of a dentist examining your mouth with a pick,” he heard György say. “Assume there is a cavity lurking under every innocent surface.”

At 5:00 am, he got up to play with the heating knob again. He swallowed some antacid and wished they had coffee in the room, then sat down once more to examine the paper.

Soon after, he started getting a sense of what might be wrong. It was the crucial second step, at the heart of his trick, where he mathematically stretched out the obstacle and its surrounding region to make the corner disappear—the step that always reminded him of drawing a picture on a piece of balloon skin and pulling it into a different shape. He had used a lemma from one of György's first papers, but could that really be applied when the interface was not smooth? Excited by the scent of error, even though it might be his own, he pulled out the György paper and found his attention drawn at once to the continuity assumption. Would it hold in his case? It was a very subtle point, one easy to miss. Could Dixon really have stumbled onto this?

By the time the day emerged from behind the mountains, Tolman had managed to pierce a hole into his theorem and let all the air out of his trick. He felt himself sliding into depression, and clutched at the fading strands of exhilaration he had experienced in the hunt for the mistake. All was not lost, he told himself, he would find a way to repair the proof. Even though Dixon had a hunch there was something amiss, it was unlikely he would be able to pinpoint it. There would be no need to advertise the mistake—Tolman would publish the correction in the guise of a more general proof, and simply stop referring to the original paper. He'd heard that even György had bodies like that buried in his earlier work.

It was almost 8:00 am by now, so he went down to the dining room for breakfast. Even before he entered, the back of his neck started to itch. It was the voice, of course—the abrasive edge, the underlying steel, that the tone, no matter how smooth, could not conceal. There he sat at the far table, surrounded by eggs, bacon and graduate students, and Tolman noted with satisfaction that since their last meeting a year ago, Bramer seemed to have put on at least as much weight and lost as much hair as he had.

Seeing him, Bramer rose and strode over to where he stood, a look of such delight on his face that for an instant, Tolman wondered if he had not misjudged him. Then he remembered to look at the eyes, and saw again the light that danced like mercury in the irises, the pupils that never stood still.

"Welcome," Bramer said, as if he had personally arranged the conference for Tolman, as if Tolman was the guest of honor they had all been waiting for. Wrapping a hand around his shoulder, Bramer led him to the breakfast buffet. "Let's see what we can get you, whether anything looks

fresh today.” Picking up a pair of tongs, Bramer began rummaging in dissatisfaction through the bacon.

As Tolman ate the toast and boiled egg that had finally met with Bramer’s approval, he looked around the room. The tables were all filled now—there was Hyvonen, and Crofton and Eisner—all people he waved at, all people he would have enjoyed breakfasting with. What was he doing stuck in this circle of Bramer’s graduate students? Was this a subtle way of belittling him, or was Bramer up to something more sinister—a plot, perhaps, to isolate him? He would not stand for it, Tolman told himself, he would get up and go to another table. But just as he was about to excuse himself, Bramer turned around and smiled at him, and Tolman found himself remaining where he was, and silently chewing the food his colleague had chosen for him.

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The day passed by in a haze. It was too early in the conference to slip out unnoticed, so Tolman sat in the overheated room, unable to shut out the speakers’ voices.

He tried to apologize to Dixon between lectures, but the latter darted away at his every approach with the skittishness of a deer. All day long Bramer insisted on acting the old lost friend, sitting next to him wherever he went, and Tolman had to be careful not to write anything about Theorem 2.3 on his notepad, lest it be noticed. Most exhausting were the comments on the lectures that Bramer kept whispering like a gossipy schoolgirl into Tolman’s ear. “He’s been giving the same talk for two years.” “What a ridiculously broad assumption to make—why not just assume the entire theorem?” “Cunha proved this years ago—looks like the French are just rediscovering it.” Little nips and jabs at every speaker, offered as implicit evidence of trust and friendship, which only served to remind Tolman of the unease he had felt around Bramer ever since graduate school.

That evening, when Tolman found himself seated right next to Bramer at dinner (the probability being 1 out of 23.5), he realized how easy it must have been to slip in beforehand and move place cards around. Bramer started waxing nostalgic about their student days, dredging up anecdotes about György and Galena and all the other professors. “Remember Bartle?” Bramer said. “Remember how we all skipped his Thursday class and went to the Craig Street Inn to have a beer?”

“And the next week, Bartle himself came with us,” Tolman said, joining in despite himself.

By the time dessert rolled around, Tolman had consumed the same number of beers as the night before, and realized that he had been much too harsh on Bramer, who was, after all, his friend. He looked around for Anna, wanting to point her out to Bramer, but didn’t see her. He had tried going upstairs to the top floor after the day’s talks, but had not found the lobby with the skylight she had spoken of. “She’s really beautiful,” Tolman said. “Though she looks so sad. Who knows what she sees in her husband?”

“I met someone interesting at the conference as well,” Bramer said, pouring more coffee into their cups. “Just before dinner. From the University of Arbutus—his name is Dickens or something—do you know him?”

Tolman felt his head suddenly clear. It couldn’t be, he thought. Even Bramer couldn’t work that fast.

“Dixon. That’s what it is. Dixon. He says he shared a cab with you on the way here.”

So this was it. The friendliness and goodwill that Bramer had been lavishing on him all day—it had been a ruse to get his guard down. Tolman braced himself for the kill.

“He seemed intelligent enough, until he suddenly started making the most preposterous claim. About the obstacle paper you wrote. Such a beautiful, beautiful paper, I must say—people ask me to this day how far I came along in proving the result myself - and of course I tell them it doesn’t matter any more, Tolman beat me to it. But this Dixon character —for some reason, he’s convinced himself he’s found a mistake—Theorem 2.3 I think he claims.”

“Yes, he made some such remark to me as well.” Tolman tried not to let his voice waver. “In the cab. He was hardly coherent.”

“Completely absurd—and I told him that, of course. In fact, I even offered to go over the proof with him—I’m meeting him tomorrow. Who even knows where this obscure University of Arbutus is—never heard of it. All these people coming to conferences these days—I wonder what idiots in university administration are funding their trips.”

Bramer began to rant against his own higher-ups, and Tolman tuned him out. There was no time to lose, he realized, bringing the cup to his lips and sipping the coffee Bramer had poured. He had to get to his room at once and fix the proof before his old rival did.

By Wednesday, Tolman was in a panic. Nothing had worked. Pages of useless equations lay strewn over the room, like the droppings of some unroped mathematical truth. His eyes hurt and his body ached from sitting at the desk in his room all day Tuesday. He had gone downstairs only for meals, and seen Bramer and Dixon busy scribbling on paper napkins each time. All night, he had lain awake in bed, churning mathematical arguments in his head, until at 4:00 a.m. an exhausted sleep had overtaken him. This morning, he had awakened with a sore throat and runny nose. Viruses took a week to incubate, he had reassured himself— it couldn't be Lazarotsky passing on his cold in revenge.

He almost didn't go for the traditional Wednesday afternoon hike, but then decided the walk would clear his head. The last time he had attended a conference at Oberwolfach, their mathematician guide had dragged them over mountains and through valleys in search of authentic Black Forest cake, a search that had turned into a seven-hour ordeal when they had not been able to find their way back. This time the organizer had less ambitious plans—he simply led the way along the river towards town, where there was a small fair going on. The mathematicians followed along obediently, several of them in sturdy hiking boots packed specially for this afternoon.

Tolman walked silently near the back of the group, staring at the clean, cold water. They were coming up to the stub of snow he had seen from the cab; their path would take them only a few yards from it. He let the dawdling Popescu sisters, their furs bedraggled by the years, pass him. Then he walked over to the river bank.

It was, indeed, a bridge that had once stood there. All that survived now was a stone abutment built into the bank and a short piece of walkway that ended abruptly where the rest had fallen off. The snow crunched and packed under the smooth soles of his shoes as Tolman edged his way along the walkway and peered over the side. Below, the flow was an example of almost textbook perfection, one that he had drawn so often in class on the blackboard. Water swirled around the right-angled corner of the support, the froth curling into tiny eddies as it raced to join the river beyond.

Tolman got down on his knees, then stretched his body flat against the snow. He pulled his head up to the edge and gazed at the water.

When he was ten, his family had moved to a house next to a wooded area through which a stream ran. He would lie alone on the bank for hours on end and watch the twigs and leaves float by. Patterns would flow and fade like in a kaleidoscope, as they were doing now on the surface below.

How many equations, he wondered, were being solved at each instant to form these patterns? How many variables, how many parameters, how many pieces of data were involved? How many decades before mathematicians had the proficiency to prove theorems assimilating them all? The models he looked at were derived after many assumptions and all sorts of simplifications. Even those models were so inscrutable, so resistant to the pencil and paper manipulations of his tribe.

And who cared, anyway? What was the point of being a mathematician? Of spending years of his life trying to validate solutions that scientists took for granted, that engineers routinely approximated? The real world needed ships and dams and planes and rockets built. It demanded computer-generated approximations in seconds, color maps in two and three dimensions. It did not time its business to the musings of mathematicians any more.

Tolman felt the snow melt against the warmth of his legs and soak through the cloth. He wished György were here. György rallying him to get up and resume the fight. György reminding him of rockets that had crashed, oil platforms that had collapsed. Of all the catastrophes that could have been averted precisely if the world had paid attention to its mathematicians. György telling him how he was indispensable, how without mathematicians there would be no science or engineering or civilization, how Nature would reign, cruel and untamed and uncontested.

He was trying to remember György's green-blue eyes, his carefully combed strands of white hair, his Hungarian accent, when he heard footsteps and turned around. It was Bramer, stepping cautiously over the stones towards him.

"Oh, there you are," Bramer said, as if, while out on a casual stroll, he had come quite naturally across Tolman sprawled on the snow.

"I was trying to study the water under the bridge." Tolman made an awkward, unsuccessful attempt to get up. "It's hard to look at a river and not think of György."

Bramer offered a hand and helped pull Tolman to his feet.

"He'd have loved this spot, wouldn't he?" Bramer brushed some snow off Tolman's coat. "I remember the time he took me down to the Monongahela. We spent the whole afternoon looking at streamlines. His wife packed egg sandwiches for him, which he hated, and gave to me. I can't believe it's been two years. I still dial his number when I'm stuck on a proof, not remembering he's gone."

They stared silently at the bridge, at the water.

"A wonderful place for the obstacle problem, is it not?" Bramer said. "One could even use the trick."

Tolman noticed it at once, as he knew Bramer must have meant him to—the omission of his name in prefacing 'trick.' He shivered in his damp clothes and waited for what Bramer had come to say.

"Look at you, you're all wet. We better head back—I'd hate to see you catch a cold. We can have some coffee, talk a little. Maybe even discuss your obstacle paper."

Suddenly Tolman felt a violent need to sneeze. He pulled out his handkerchief from his front trouser pocket and buried his nose in its folds, but the dampness of the cloth only exacerbated his urge.

"It's the continuity assumption, isn't it?" Bramer was saying. "Dixon pinpointed it for me. It's such a useful theorem, too – it would be a shame to lose it. Perhaps we could all sit down together and look at our options."

Our options. The pronoun arrested the sneeze that was preparing to discharge through Tolman's nostrils, stopping him in mid-inhalation.

"He's smart, this Dixon guy. He feels we might be able to save it."

It was difficult to assimilate the full arrogance of Bramer's proposal quite at once. All Tolman's insight, all his years of research, and now Dixon and Bramer were to be his saviors? So that they could rename his result the Bramer-Dixon-Tolman Trick?

Then a more frightening thought occurred to him. What if he didn't join in, and they managed to correct the theorem before he did? He could hardly forbid them from working on it. What if it became known as the Bramer-Dixon Trick?

"I was thinking we could meet Dixon for breakfast tomorrow."

For an instant, Tolman imagined grasping Bramer by the arm and swinging him into the river from where he stood. Watching his colleague float away through the ice chunks, flipping from side to side as he hit the

banks. What would be the appropriate boundary data when Bramer made contact with an edge?

Then Tolman felt ashamed. Bramer was who he was, and there was technically nothing dishonorable in what he had said. An uninformed observer might even characterize his overture as benign, rather than the raw attempt to hijack the theorem that Tolman recognized it as. There was nothing to do but politely decline the invitation, and hope that Dixon didn't by some crazy fluke stumble onto a corrected proof before he did. Tolman had, after all, been the person to come up with the original idea, so there was reason to believe he would be the one to correct it as well. This was not the moment to lose faith in himself.

"Perhaps some other time," Tolman started to say, but was overcome by a volley of sneezes.

By the time they got back, Tolman was feeling quite unwell. His head hurt, his nose ran, and the rash on his neck seemed to have moved to the inside of his throat. He thought he had a fever, but didn't know whom to contact at the Institute for a thermometer. At dinner, he forced himself to eat some of the pea and sausage soup, but the main course of stuffed cabbage sent him scuttling back to his room. For a moment, he actually contemplated making a stab at Theorem 2.3. But then he turned the knob on the heating pipe up and down a few times, adjusting the temperature, and with the soup roiling in his stomach, climbed into bed.

Around midnight, he checked his pulse. It was racing along at around a hundred and twenty. He tried gauging the temperature of his cheeks and forehead with the back of his hand, but everything felt equally hot. He got up and turned the heat down a notch. An hour later, he began shivering and had to turn the heat back up. Still later, he began to feel once more as if he was boiling and threw off all his covers. In his delirium he imagined that he was back at the Wolf River. In his hand was a shovel, and he was going to dig up the remains of the bridge to smooth out the flow. But there was no way to climb down to the level of the water. So he took off his shirt, then the rest of his clothes, and jumped in. The water felt cool and refreshing against his burning forehead, his sweltering skin.

There was a knocking on his door the next morning. Tolman ignored it. Hyvonen looked in at lunchtime and came back with some rolls and

butter for him. He stayed in bed all day, popping aspirin whenever his pulse rose above 120. Once, when he began thinking he was at the Wolf River again, he soaked some water on a handkerchief and laid it across his forehead.

Around four, he fell into a troubled sleep for an hour and dreamt of György. When he awoke, he thought György was disclosing the corrected obstacle proof to Bramer in a corner of the room. He called out to the shadows in protest, but there was no reply.

At six-thirty, he decided he had to eat a proper meal to keep up his strength. He forced some clothes over his aching body and went down to the dining room. Dinner was a blur. There was a potato and pork stew, flavored with curry powder for a reason he was unable to understand. He was startled to find a section of starfruit nestling radiantly between the slices of pork on his plate. He wondered if he was delirious again, and bit into the star-shaped piece. It squirted curry and pork fat in his mouth.

He was about to drag himself back upstairs when Holzman, one of the organizers, turned to him. "How is your theorem doing?" he asked, and the voices at the table died down. "Bramer said there might be a mistake somewhere."

Tolman felt the room lurch. "I'm working on it," he said. "Trying to," he added weakly.

"Your talk's tomorrow morning, isn't it?"

"I hope I'll be better by then." He waited for the conversation to pick up again, then fled.

Bramer came to his room at 9:00 pm, just as the fever, fueled perhaps by the curry or the starfruit, seemed to be surging back.

"Don't worry about tomorrow, don't worry about anything" he said. "I asked Holzman to let Dixon give a talk in your stead. He agreed, so now I want you to take complete rest."

Tolman began mumbling in protest, but Bramer shushed him. "We're still working on the proof. If nothing else, we'll at least be able to explain where the argument in your paper breaks down."

"Now remember. Rest," Bramer said, placing a hand on his forehead, and Tolman tried flailing out but his arms were too heavy to lift off the bed.

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The night was worse than the previous one. Once again Tolman found himself in the river, hurtling towards the bridge this time, surrounded by millions of fluid particles. The stone came up with tremendous speed, and his body bounced off the right-angled edge. He whirled through the water, spinning like the ball in a pinball machine, then was thrown into an eddy and went spiraling to the river bottom. Perhaps he drowned, because he suddenly experienced a remarkable buoyancy, and saw himself afloat on the river surface, his spread-eagled body being borne downstream.

When he awoke, sunlight was soaking through the balcony drapes, bathing the walls in an orange sheen. He looked at the bedside clock—it was a little past 10:30 am. Dixon, he realized, must be in the middle of his lecture right now. He wondered if he should throw off the covers and stagger through the snow to the conference room, burst into Dixon's talk and take the podium from him. What would he say, though? The transparencies he had brought along were teeming with references to the Tolman Trick. He imagined Bramer at the back of the room, standing up to repudiate him. The tale being told for years to come about Tolman going down in flames at Oberwolfach.

No, emotion was always the enemy of good mathematics, as György used to say. He would stop thinking of the problem for a while, let his mind float free to allow new ideas to drift in, come back and fight another day. It was his fear and nothing else that had so magnified the specter of Dixon having already corrected the proof. He had to keep reminding himself that it was much easier to find a mistake than to repair it.

Tolman sat up in bed. He still had a fever, he could tell, but his pulse was slower. He felt hungry so he put on his clothes. As he stepped outside the door he remembered that breakfast had ended more than an hour ago. A woman in a blue uniform looked up from besides a bucket on the floor. "Guten Tag," she wished Tolman, then went back to scrubbing the tiles vigorously with a brush.

Tolman made his way around the giant chessboard on the hallway floor. He walked past the bookshelves built into the walls, lined with the great classics on mathematics. Newton and Hilbert, Euclid and Descartes nestled reassuringly next to one another.

He came to a narrow wooden door between two of the bookshelves. He had not noticed it before and wondered if it was an exit reserved for the

staff. The blue-uniformed woman was oblivious to him, her body rocking back and forth as she attacked the floor with her brush. Tolman opened the door and squeezed through.

He stepped into a corridor and followed it to a vestibule from which a spiral of steps rose. Light shone down from the floor above. He mounted the stairs and stepped onto the polished floorboards of a large hallway. Sunshine poured in from the windows on either end, and blazed through a skylight on the far side.

Beneath the skylight what appeared to be clothes had been spread out on the floor, perhaps to dry in the sun. Tolman moved closer and saw that they were in fact quilts, some no larger than a table napkin, others the size of a child's cot. Scissors and bits of cloth lay strewn about, and a measuring tape basked uncoiled along a window sill. On a table by the wall was a loom, with threads of different colors plunging to spools on the floor.

Tolman bent down and examined the quilt closest to him. It was made up of individual patches, each about a foot square, arranged in three rows of two. Each patch had a miniature scene depicted on it—mountains of white snow, forests of pure green, clouds floating against backdrops of blue sky. He moved from quilt to quilt, and saw roads and rivers and villages and lakes, even cows grazing in a field. He picked up a patch from the table and felt it between his fingers—the cloth had a cottony feel to it. Sewn into the material was a blue ribbon of river, running unimpeded across a snow-white landscape.

Tolman ran his thumb across the curve of the river bank. He could not detect any kinks, the boundary between blue and white was smooth, graceful. He was examining the stitching on the back when he heard the turn of a doorknob. Anna appeared in the hallway and gasped when she saw him.

"Oh, Dr. Tolman. You startled me. I didn't know anyone was here." She stopped, noticing his feverish eyes, his unshaven face. "Are you all right?"

"Yes, don't worry, I'm okay. I'm really sorry. I didn't mean to intrude like this. I just saw the stairs and. . ."

"No, no, that's fine. I told you to come, remember? I'm glad you found it."

Tolman stood by the table and smiled awkwardly. Anna's face was long and expectant, waiting for him to speak. "It's very beautiful," he finally said.

“All of it. Your. . . art.” The word felt apt and full of possibility in his mouth. He had never made such a judgment, uttered such a pronouncement, paid such a compliment before.

“Thank you. Dr. Tolman.” Anna lowered her eyes to the square in his hand.

“I’m especially fascinated by this one,” he said, holding it up. “How serenely the river seems to run.” Tolman touched a fingertip to the blue. “Tell me, were you on the hike into town?”

Anna shook her head.

“There’s this point on the river where there used to be a bridge of some sort. Where the water makes its way around an old stone abutment.”

Tolman stopped. Anna was looking at him, her silence encouraging him to go on. Sunlight dappled her hair and slid down the slopes of her face. Her mouth extended towards him, her lipstick darkening its edges. The lines of her eyebrows reached high towards each other in anticipation. She was waiting, he knew, for an explanation, an elaboration.

How could he begin to comment on the chasm between her river and his own? To express to her the naïveté, the brilliance, the startling beauty of what she had sewn? “Where the water...” he began, then broke off again. The innocence in her eyes was something he couldn’t bear to remove. Behind it was a clarity he realized he would never possess.

“It’s beautiful, isn’t it? The river,” Anna said.