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## A New Golden Age

“It’s like music,” I repeated. Lady Vickers looked at me uncomprehendingly. Pale British features beneath wavy red hair, a long nose with a ripple in it.

“You can’t hear mathematics,” she stated. “It’s just squiggles in some great dusty book.” Everyone else around the small table was eating. White soup again.

I laid down my spoon. “Look at it this way. When I read a math paper it’s no different than a musician reading a score. In each case the pleasure comes from the play of patterns, the harmonies and contrasts.” The meat platter was going around the table now, and I speared a cutlet.

I salted it heavily and bit into the hot, greasy meat with pleasure. The food was second-rate, but it was free. The prospect of unemployment had done wonders for my appetite.

Mies van Koop joined the conversation. He had sparse curly hair and no chin. His head was like a large, thoughtful carrot with the point tucked into his tight collar. “It’s a sound analogy, Fletch. But the musician can *play* his score, play it so that even a legislator . . .” he smiled and nodded donnishly to Lady Vickers. “Even a legislator can hear how beautiful Beethoven is.”

“That’s just what I was going to say,” she added, wagging her finger at me. “I’m sure my husband has done lovely work, but the only way he knows how to show a person one of his beastly theorems is to make her swot through pages and pages of teeming little symbols.”

Mies and I exchanged a look. Lord Vickers was a crank, an ec-

centric amateur whose work was devoid of serious mathematical interest. But it was thanks to him that Lady Vickers had bothered to come to our little conference. She was the only member of the Europarliament who had.

"Vat you think our chances are?" Rozzick asked her in the sudden silence, his mouth full of unchewed cauliflower.

"Dismal. Unless you can find some way of making your research appeal to the working man, you'll be cut out of next year's budget entirely. They need all the mathematics money for that new computer in Geneva, you know."

"We know," I said gloomily. "That's why we're holding this meeting. But it seems a little late for public relations. If only we hadn't let the government take over all the research funds."

"There's no point blaming the government," Lady Vickers said tartly. "People are simply tired of paying you mathematicians to make them feel stupid."

"Zo build the machine," Rozzick said with an emphatic bob of his bald little head.

"That's right," Mies said, "Build a machine that will play mathematics like music. Why not?"

Lady Vickers clapped her hands in delight and turned to me, "You mean you know how?"

Before I could say anything, Mies kicked me under the table. Hard. I got the message. "Well, we don't have quite all the bugs worked out . . ."

"But that's just too marvelous!" Lady Vickers gushed, pulling out a little appointment book. "Let's see . . . the vote on the math appropriation is June 4 . . . which gives us six weeks. Why don't you get your machine ready and bring it to Foxmire towards the end of May? The session is being held in London, you know, and I could bring the whole committee out to *feel* the beauty of mathematics."

I was having trouble moving my mouth. "Is planty time," Rozzick put in, his eyes twinkling.

Just then Watson caught the thread of the conversation. In the journals he was a famous mathematician . . . practically a grand old man. In conversation he was the callowest of eighteen-year-olds. "Who are you trying to kid, Fletcher?" He shook his head, and dandruff showered down on the narrow shoulders of his black suit.

"There's no way . . ." He broke off with a yelp of pain. Mies was keeping busy.

"If you're going to make that train, we'd better get going," I said to Lady Vickers with a worried glance at my watch.

"My dear me, yes," she agreed, rising with me. "We'll expect you and your machine on May 23 then?" I nodded, steering her across the room. Watson had stuck his head under the table to see what was the matter. Something was preventing him from getting it back out.

When I got back from the train station, an excited knot of people had formed around Watson, Rozzick, and Mies. Watson spotted me first, and in his shrill cracking voice called out, "Our pimp is here."

I smiled ingratiatingly and joined the group. "Watson thinks it's immoral to make mathematics a sensual experience," Mies explained. "The rest of us feel that greater exposure can only help our case."

"Where is machine?" Rozzick asked, grinning like a Tartar jack-o'-lantern.

"You know as well as I do that there is none. All I did was remark to Lady Vickers . . ."

"One must employ the direct stimulation of the brain," LaHaye put in. He was a delicate old Frenchman with a shock of luminous white hair.

I shook my head. "In the long run, maybe. But I can't quite see myself sticking needles in the committee's brainstems five weeks from now. I'm afraid the impulses are going to have to come in through normal . . ."

"Absolute Film," Rozzick said suddenly. "Hans Richter and Oskar Fischinger invented in the 1920s. Abstract patterns on screen, repeating and differentiating. Is in Warszawa archives accessible?"

"Derisory!" LaHaye protested. "If we make of mathematics an exhibit, it should not be a tawdry *son et lumière*. Don't worry about needles, Dr. Fletcher. There are new field methods." He molded strange shapes in the air around his snowy head.

"He's right," Watson nodded. "The essential thing about mathematics is that it gives esthetic pleasure without coming through the senses. They've already got food and television for their eyes and ears, their gobbling mouths and grubbing hands. If we're going to

give them mathematics, let's sock it to them right in the old gray matter!"

Mies had taken out his pen and a pad of paper. "What type of manifold should we use as the parameter space?"

We couldn't have done it if we'd been anywhere else but the Center. Even with their staff and laboratories it took us a month of twenty-hour days to get our first working math player built. It looked like one of those domey old hair dryers growing out of a file cabinet with dials. We called it a Moddler.

No one was very interested in being the first to get his brain mathed or modified or coddled or whatever. The others had done most of the actual work, so I had to volunteer.

Watson, LaHaye, Rozzick, and Mies were all there when I snugged the Moddler's helmet down over my ears. I squeezed the switch on and let the electrical vortex fields swirl into my head.

We'd put together two tapes, one on Book I of Euclid's *Elements*, and the other on iterated ultrapowers of measurable cardinals. The idea was that the first tape would show people how to understand things they'd vaguely heard of . . . congruent triangles, parallel lines, and the Pythagorean theorem. The second tape was supposed to show the power and beauty of flat-out pure mathematics. It was like we had two excursions: a leisurely drive around a famous ruin, and a jolting blast down a drag strip out on the edge of town.

We'd put the first tape together in a sort of patchwork fashion, using direct brain recordings as well as artificially punched-in thought patterns. Rozzick had done most of this one. It was all visualized geometry: glowing triangles, blooming circles, and the like. Sort of an internalized Absolute Film.

The final proof was lovely, but for me the most striking part was a series of food images which Rozzick had accidentally let slip into the proof that a triangle's area is one-half base times height.

"Since when are triangles covered with anchovy paste?" I asked Rozzick as Mies switched tapes.

"Is your vision clear?" LaHaye wanted to know. I looked around, blinking. Everything felt fine. I still had an afterglow of pleasure from the complex play of angles in Euclid's culminating proof that the square of the hypotenuse is equal to the sum of the squares on the two sides.



Then they switched on the second tape. Watson was the only one of us who had really mastered the Kunen paper on which this tape was based. But he'd refused to have his brain patterns taped. Instead he'd constructed the whole thing as an artificial design in our parameter space.

The tape played in my head without words or pictures. There was a measurable cardinal. Suddenly I knew its properties in the same unspoken way that I knew my own body. I did something to the cardinal and it transformed itself, changing the concepts clustered around it. This happened over and over. With a feeling of light-headedness, I felt myself moving outside of this endless self-transformation . . . comprehending it from the outside. I picked out a certain subconstellation of the whole process and swathed it in its logical hull. Suddenly I understood a theorem I had always wondered about.

When the tape ended I begged my colleagues for an hour of privacy. I had to think about iterated ultrapowers some more. I rushed to the library and got out Kunen's paper. But the lucidity was gone. I started to stumble over the notation, the subscripts and superscripts; I was stumped by the gappy proofs; I kept forgetting the definitions. Already the actual content of the main theorem eluded me. I realized then that the Moddler was a success. You could *enjoy* mathematics—even the mathematics you couldn't normally *understand*.

We all got a little drunk that night. Somewhere towards midnight I found myself walking along the edge of the woods with Mies. He was humming softly, beating time with gentle nods of his head.

We stopped while I lit my thirtieth cigarette of the day. In the match's flare I thought I caught something odd in Mies's expression. "What is it?" I asked, exhaling smoke.

"The music . . ." he began. "The music most people listen to is not good."

I didn't see what he was getting at, and started my usual defense of rock music.

"Muzak," Mies interrupted. "Isn't that what you call it . . . what they play in airports?"

"Yeah. Easy listening."

"Do you really expect that the official taste in mathematics will

be any better? If everyone were to sit under the Moddler . . . what kind of mathematics would they ask for?"

I shrank from his suggestion. "Don't worry, Mies. There are objective standards of mathematical truth. No one will undermine them. We're headed for a new golden age."

LaHaye and I took the Moddler to Foxmire the next week. It was a big estate, with a hog wallow and three holes of golf between the gatehouse and the mansion. We found Lord Vickers at work on the terrace behind his house. He was thick-set and sported pop eyes set into a high forehead.

"Fletcher and LaHaye," he exclaimed. "I am honored. You arrive opportunely. Behold." He pulled a sheet of paper out of his special typewriter and handed it to me.

LaHaye was looking over my shoulder. There wasn't much to see. Vickers used his own special mathematical notation. "It would make a nice wallpaper," LaHaye chuckled, then added quickly, "Perhaps if you once explained the symbolism . . ."

Lord Vickers took the paper back with a hollow laugh. "You know very well that my symbols are all defined in my *Thematics and Metathematics* . . . a book whose acceptance you have tirelessly conspired against."

"Let's not open old wounds," I broke in. "Dr. LaHaye's remark was not seriously intended. But it illustrates a problem which every mathematician faces. The problem of communicating his work to nonspecialists, to mathematical illiterates." I went on to describe the Moddler while LaHaye left to supervise its installation in Lord Vickers' study.

"But this is fantastic," Vickers exclaimed, pacing back and forth excitedly. A large Yorkshire hog had ambled up to the edge of the terrace. I threw it an apple.

Suddenly Vickers was saying, "We must make a tape of *Thematics and Metathematics*, Dr. Fletcher." The request caught me off guard.

Vickers had printed his book privately, and had sent a copy to every mathematician in the world. I didn't know of anyone who had read it. The problem was that Vickers claimed he could do things like trisect angles with ruler and compass, give an internal consistency proof for mathematics, and so on. But we mathematicians have rigorous proofs that such things are impossible. So we

knew in advance that Vickers' work contained errors, as surely as if he had claimed to have proved that he was twenty meters tall. To master his eccentric notation just to find out his specific mistakes seemed no more worthwhile than looking for the leak in a sunken ship.

But Lord Vickers had money and he had influence. I was glad LaHaye wasn't there to hear me answer, "Of course. I'd be glad to put it on tape."

And, God help me, I did. We had four days before Lady Vickers would bring the Appropriations Committee out for our demonstration. I spent all my waking time in Vickers' study, smoking his cigarettes, and punching in *Thematics and Metathematics*.

It would be nice if I could say I discovered great truths in the book, but that's not the way it was. Vickers' work was garbage, full of logical errors and needless obfuscation. I refrained from trying to fix up his mistakes, and just programmed in the patterns as they came. LaHaye flipped when he found out what I was up to. "We have prepared a feast for the mind," he complained, "And you foul the table with this, this . . ."

"Think of it as a ripe Camembert," I sighed. "And serve it last. They'll just laugh it off."

Lady Vickers was radiant when she heard I'd taped *Thematics and Metathematics*. I suggested that it was perhaps too important a work to waste on the Appropriations Committee, but she wouldn't hear of passing it up.

Counting her, there were five people on the committee. LaHaye was the one who knew how to run the Moddler, so I took a walk while he ran each of the legislators through the three tapes.

It was a hot day. I spotted some of those hogs lying on the smooth hard earth under a huge beech tree, and I wandered over to look at them. The big fellow I'd given the apple was there, and he cocked a hopeful eye at me. I spread out my empty hands, then leaned over to scratch his ears. It was peaceful with the pigs, and after a while I lay down and rested my head on my friend's stomach. Through the fresh green beech leaves I could see the taut blue sky.

Lady Vickers called me in. The committee was sitting around the study working on a couple of bottles of amontillado. Lord Vickers

was at the sideboard, his back turned to me. LaHaye looked flushed and desperate.

"Well," I said.

"They didn't like the first tape . . ." LaHaye began.

"Dreary, dreary," Lady Vickers cried.

"We are not schoolchildren," another committee member put in.

I felt the floor sinking below me. "And the second tape?"

"I don't see how you can call that mathematics," Lady Vickers declaimed.

"There were no equations," someone complained.

"And it made me dizzy," another added.

"Here's to the new golden age of mathematics," Lord Vickers cried suddenly.

"To *Thematics and Metathematics*," his wife added, lifting her glass. There was a chorus of approving remarks.

"That was the real thing."

"Plenty of logic."

"And so many symbols!"

Lord Vickers was smiling at me from across the room. "There'll be a place for you at my new institute, Fletcher."

I took a glass of sherry.