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# The Perplexing Life of Erno Rubik



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"We turn the Cube and it twists us." --Rubik

Eleven years after his inspiration, here was the first great tangible reward. Erno Rubik was moving out of his father's house and renovating one for himself and his family. But he didn't smile once during the tour he gave me on a grey morning in Budapest. Maybe any good citizen of the Hungarian People's Republic, walking through the spacious old stucco building, would have been disconcerted by the bourgeois touches the workmen were adding: a three-car garage (with a Mercedes-Benz already parked inside), a glass- enclosed porch with a pleasant view of the front garden, a remodeled kitchen, an entirely new upper floor for the two children, an office for Rubik, a sauna and swimming pool in the basement--not a bad imitation of a villa in the decadent West. Except for one feature.

"Where's the dining room?" I asked.

"I eliminated that. We'll eat right there," Rubik said, pointing to a corner of the kitchen.

"Do you plan to have many people over to dinner?"

Rubik puffed on a Marlboro 100, gazed out at the walled yard in back, and frowned. "I hope not."

In Budapest there are two schools of thought about Rubik. One is that the Cube has turned him into a taciturn, suspicious, friendless man--and, really, who could blame him? One moment he's a professor of design who makes \$150 a month and has never been outside the Iron Curtain; the next he's the richest and most famous man in Hungary, beset by money-grubbing communists and capitalists alike. The toy he built in his room in his mother's apartment has perplexed maybe 500 million people. Socialist millionaire, tormentor of one-eighth of humanity--it would be a strain on anyone.

The other school of thought is that Rubik was a taciturn, suspicious loner long before he invented the Cube. Maybe one would have to be this sort to invent the Cube.

Rubik himself, naturally, prefers not to discuss either theory.

Each morning I stopped by his design studio I found him smoking and looking as if it had been a rough night. His hair was disheveled, his eyes were half closed, his head slumped. My questions only seemed to make him more

uncomfortable. "It's very hard to say the truth," he admitted. "Usually we are saying only part of the truth." He didn't mind explaining how he built and then learned to solve the Cube-- there the truth was easy enough to say. The real puzzle was what happened afterward.

Any modern marketer could have told him why the Cube would fail. It was put out by socialist bureaucrats who didn't know how to sell it in the first place, and who then made a grand mess of things when it became popular anyway. The Cube's excruciating complexity (it has one correct alignment and 43 quintillion\* wrong ones) violated that basic tenet of modern capitalism: no one ever goes broke underestimating the intelligence of the public. It also violated the toy industry's standards: it didn't talk, whistle, cry, shoot, change clothes, appear in a movie, or require batteries.

Yet it became the fastest-selling toy in the world and probably the most popular puzzle in history. It amused five-year-olds and inspired mathematicians. It was blamed for divorces. There were imitations, songs, and a plastic hammer called the Cube Smasher ("to beat it into 43 quintillion pieces"). Saturday Night Live did a commercial for Rubik's Grenade (whose colors had to be aligned in ten seconds or else). At one point, books about the Cube (there've been more than a hundred, in at least a dozen languages) simultaneously occupied the Nos. 1, 2, and 4 spots on the New York Times paperback best-seller lists. Until recently you could find the Cube on Saturday morning television (on a cartoon show called Rubik the Amazing Cube). Even today, with the craze over, it's still used in college math classes dealing with group theory.

And it currently has the title role in a controversial play in Budapest that uses Rubik's invention as a paradigm for the failure of socialist economies to innovate.

I never could stand the thing myself--I gave up after ten minutes--but if I had to pick one artifact of this century that will still be produced, unaltered, 2,000 years from now, I'd bet on the Cube. It's not only a timeless puzzle, but also a marvelous object to hold. I can't imagine how anyone could improve the design. The way those 26 little blocks of plastic are held together is as beautifully clever as the puzzle itself. The ancient Greeks considered the cube one of the special Platonic solids because its sides are identical. (There are only four other regular polyhedra, with 4, 8, 12, and 20 sides.) I wonder if some day puzzle makers will refer to especially elegant creations as Rubikian puzzles.

Of course, there may never be another puzzle like the Cube, which is perhaps one more reason why Rubik, who's 41 and still designing toys, seems unhappy these days.

"In its arranged state it suggests calm, peace, a sense of order, security . . . in sharp contrast to all that the working object means once it is brought to life, to motion. There is something terrifying in its calm state, like a wild beast at rest, a tiger in repose, its power lurking."

--Rubik

This animal was first glimpsed in the spring of 1974. There was no reason it couldn't have been built centuries earlier, nor was there any reason for Rubik to stack some blocks of wood and attach them to one another with elastic strings.

He started twisting one layer of blocks at a time, and soon came the dramatic result. The wild beast--more precisely, the elastic band--snapped.

Why, at the age of 29, was he playing with blocks? Why did he keep playing with them even after the elastic broke?

Rubik has tried to come up with an answer. He's given hundreds of interviews, made speeches, even written a 279-page manuscript in English called "Rubik on Rubik" (which he has allowed me to quote). It's unpublished--Rubik says he hasn't had time to make the revisions requested by his American publisher, and he has some doubts whether the public really wants to read his autobiography anyway. (I tried to assure him that such qualms no longer trouble any celebrity or publisher in America.) Rubik's memoirs aren't unlike the Cube: highly abstract, often tedious, yet in their own way engaging and revealing. I had a hard time believing Rubik when he told me he couldn't think of any colleagues or acquaintances who knew him well. ("It's very, very hard to find me as a person," he warned.) But it seemed more believable after reading about his unhappy days as an art student ("I was somewhat out of place among my classmates; I could not be as bohemian as they were"), about his hobbies (solo kayaking on the Danube, solving chess puzzles), and about Renni, the stray Irish setter that became "the best friend I ever had."

Rubik was born in the air-raid shelter of a Budapest hospital during World War II. His mother was a published poet, his father a renowned aircraft engineer who started a company to build gliders. When Rubik was in college they divorced. ("The waves surged high but they did not reach me," he wrote of that event.) Rubik describes himself as an above-average, unenthusiastic pupil all the way through his college classes in sculpture.

After graduating he went back to learn architecture at a small college called the Academy of Applied Arts and Design. He remained there as a professor, teaching interior design and generally keeping to himself.

A colleague remembers him as

"a bit sour."

Many of the early stories about the Cube related that it was built to teach Rubik's students how to "deal with three-dimensional objects." I never understood what this meant, much less how the Cube could teach it. The mystery was cleared up after I arrived in Budapest. At the Academy they chuckled at the thought of using the Cube in class, and Ru bik dismissed the idea. Yes, he had shown the Cube to his students, but he hadn't built it for them. He built it because he was a designer who likes playing with geometric shapes. His room in his mother's two-bedroom apartment was already filled with various cardboard and wooden figures the spring day he attached the elastic strings to the wooden blocks. Although his real interest was the structural problem--how could the blocks move independently without falling apart?--he couldn't help noticing the way they rearranged themselves as he twisted. By the time the elastic broke he was hooked. But he needed something else to hold the blocks together.

The solution was a brilliantly simple bit of engineering: have the blocks hold themselves together. Rubik painstakingly cut and sanded the little blocks (known today as "cubies"), assembled them, marked each side of the Cube with adhesive paper of a different color, and started twisting.

"It was wonderful," he wrote, "to see how, after only a few turns, the colors became mixed, apparently in random fashion. It was tremendously satisfying to watch this color parade. Like after a nice walk when you have seen many lovely sights you decide to go home, after a while I decided it was time to go home, let us put the cubes back in order. And it was at that moment that I came face to face with the Big Challenge: What is the way home?"

Half a billion people can imagine--and relish--what hapened next.

He twisted and twisted, and the colors only got more scrambled. It was like "staring at a piece of writing written in a secret code. But for me, it was a code I myself had invented! Yet I could not read it. This was such an extraordinary situation that I simply could not accept it."

Rubik was in even worse shape than his disciples. He didn't know if the problem could be solved. Perhaps there was only one sure way to get back to the start: by exactly retracing every step he had taken. Rubik couldn't hope to do that. Randomly twisting the Cube would eventually produce the ordered state, but he suspected that the laws of probability were against this occurring in his lifetime. (It has since been calculated that if every person on earth randomly twisted a Cube once every second, about once every three centuries one Cube would return to its original state.)

Rubik had only an intuition that there must be a method. He started out by aligning the eight corner cubies correctly, and he discovered certain sequences of moves for rearranging just a few cubies at a time. One sequence of four twists, for instance, would temporarily scramble the cube, exchange the positions of three cubies, and then restore the rest of the Cube to its previous state. Other sequences took twelve twists--with chaotic results if he lost track of what he was doing halfway through. But Rubik persevered in his room for more than a month and emerged in the summer to show his mother a pristine Cube.

"I remember how proudly I demonstrated [it] to her when I found the solution of the problem, and how happy she was in the hope that from then on I would not work so hard on it."

The puzzle was so intriguing, Rubik thought, that somebody somewhere must have already invented it--but then wouldn't he have heard of it? Intriguing puzzles tend to endure. Today you can still find little plastic versions of the 15 Puzzle, which was created in the late 1870s and became history's greatest puzzle craze (until the Cube). It consists of 15 consecutively numbered, flat squares that can be slid around inside a square frame. Its creator, Sam Loyd, an American, offered a \$1,000 prize to anyone who could switch the positions of the 14 and 15 without affecting the order of the other squares. This was impossible to do, as Loyd knew, but soon thousands of people around the world swore they'd done it--and then stayed up all night trying to reconstruct how. In some ways it was a two-dimensional version of the Cube, and Rubik, who played with the 15 Puzzle as a boy, acknowledges that it may have helped inspire the Cube.

By an odd coincidence, at least two other people were independently inspired at about the same time. A year after Ru bik had applied for his Hungarian patent, Terutoshi Ishige, an ironworks owner, applied for a Japanese patent for a cube held together by the same sort of mechanism (although shaped slightly differently). An American, Larry Nichols, actually patented his cube before Ru bik, but it was rejected by all the toy companies he went to (including Ideal Toy Corporation, which later bought the rights to Rubik's Cube). Some purists belittle Nichols's model, which was held together with magnets, and insist that the real genius in Rubik's is in the mechanism holding it together. In 1984 a federal judge ruled that the distribution of the Cube in America did infringe Nichols's patent, but made no decision on his claim for \$60 million in damages. The case is being appealed.

Rubik, unaware of any other cube, applied for his patent in January 1975 and left his invention with a small toymaking cooperative in Budapest. The patent was finally approved in early 1977. Nine months passed before the cooperative agreed to begin production, and the first Cubes appeared at the end of 1977. By this time Rubik was married to a former classmate from the Academy ("a quiet and stubborn girl," he called her; he turned down my request to see her) and living on the upper two floors of his father's house. Not long after the Cubes reached the

shops, Rubik took his new baby daughter to a playground in Budapest and saw two of them in action.

"The first belonged (I am sure only temporarily) to an eight-year-old street urchin, barefooted, shirt torn, covered in bruises, broken and chewed nails, badly in need of a good wash--a small Oliver Twisting," he wrote. "The second emerged from the elegant handbag of a still youthful mother in her thirties who must have just emerged from the beauty salon. She was sitting on a bench and cast only an occasional glance at her baby in the pram, so thoroughly was she immersed in the Cube. It was astounding to catch on the faces of these diametrically opposite people-- the very same expression."

It would be uplifting to report that the world soon joined the urchin and the young matron in beating a path to Rubik's door, but that was not to be. The cube seemed destined for a sedate life within Hungary until Tibor Laczi arrived. Then the Cube became a capitalist's dream that finally ruined its socialist manufacturer.

"Do you think, Laczi, that you could sell 30,000 pieces?"

"Rubik, if it were only 30,000, I wouldn't touch it."

--A meeting of minds in 1978

The way Laczi tells it, he knew the Cube's potential the moment he twisted it in a Hungarian cafe in November 1978. Laczi, a Hungarian emigre living in Vienna, had stopped at the small-town cafe while driving to Budapest on a routine sales trip for an Austrian computer company. His waiter had a Cube but wasn't sure how it worked. Laczi, a mathematics buff, bought it from him for about \$1.

The next day Laczi visited the state trading company, Konsumex, and asked for permission to sell the Cube in the West. "They laughed at me," Laczi recalls. "They said the Cube was finished. They had ordered 10,000 from the manufacturer and then canceled half the order. They had already displayed it at international toy fairs and nobody was interested. I asked them tactfully how they displayed it. They said it was on a shelf with hundreds of other toys. Was it taken out of its box? They didn't know. How many people working at the booth could demonstrate how to solve the puzzle? None of them--it was not their responsibility."

Laczi got permission to visit Rubik. "When Rubik first walked into the room I felt like giving him some money," he says. "He looked like a beggar. He was terribly dressed, and he had a cheap Hungarian cigarette hanging out of his mouth. But I knew I had a genius on my hands. I told him we could sell millions."

Rubik taught him how to demonstrate the Cube, which Laczi proceeded to do at the Nuremberg toy fair several months later. He didn't have a booth--he just strolled around gathering crowds like a carnival barker, and he intrigued a well connected British toy expert named Tom Kremer.

Says Laczi, "Kremer took one of my Cubes and said to me, 'Both of us are now holding in our hands a wonder of the world.' " Later that year Kremer helped arrange the breakthrough: an order for a million Cubes from Ideal Toy.

The puzzle, called the Magic Cube (Buvuos Kocka) in Hungary, was renamed Rubik's Cube, not to honor Rubik--although it was this change that made him famous--but to compensate for a troublesome oversight. Neither Rubik nor the Hungarian manufacturer had bothered to patent the Cube in foreign countries, and now it was too late to apply. (Many countries require that foreign patent applications be made within a year of the original application.) Unable to protect the Cube's design, Ideal Toy wanted at least a name that could be copyrighted. This meant going West to promote his Cube, and Rubik started in Vienna with Laczi.

"It was his first trip to the West, and he didn't ask me to take him anywhere after the press conference," Laczi says. "Most Hungarians that come here want to look at shops or buy jewelry or visit a bar or a striptease. Rubik went back to his hotel. He was always that way, even after the money started. He never liked to be away from his family for long or spend money on himself. The only thing he did was start smoking better cigarettes. There was no drinking, no women--he just went back to his hotel room to read. He was always in another world. I really do like Rubik, but I can't imagine having a real friendship with him. He doesn't enjoy talking."

This last trait wasn't especially suited to promotion tours. Glad-handing toy executives and giving interviews made Rubik miserable. He would try to explain why the Cube appealed to an innate human fascination with order and chaos, and all the reporter wanted to know was how long it took him to solve it (two or three minutes) and whether it was really true that the man reputed to be the Iron Curtain's first legitimate self-made millionaire still couldn't get a telephone (it was). Or they would ask, "What does it feel like to be famous?" and Rubik would want to answer "What does it feel like not to be famous?"

In 1980 the craze took off, and soon devotees--Cubic Rubes, someone called them-- formed clubs to study solutions and build "racing cubes" by lubricating the innards. At the world championship in Budapest in June 1982, a 16-year-old Vietnamese high school student from Los Angeles won by unscrambling a Cube in 22.95 seconds. Rubik's original method, aligning the corners first, was one standard approach; another technique was to align the top layer, then clear up the other sides one at a time. These solutions required 80 to 120 twists.

Mathematicians vied to find the shortest method of unscrambling, which became known as God's algorithm. There's

speculation that an all-knowing being could restore any Cube in 22 moves, but the shortest method discovered so far requires 52. It was found by a British mathematician named Morwen B. Thistlewaite. With this method the Cube doesn't appear to become steadily more ordered-- it seems to remain scrambled until the last few moves, when the colors mysteriously all slide into place. Thistlewaite developed it with the aid of a computer and the rules of group theory.

Group theory is an area of abstract mathematics, developed in the nineteenth century, that the Cube transformed into a tangible reality. A group is a collection of related elements on which certain mathematical operations are performed. Consider a symmetrical, six-pointed snowflake. Any rotation that leaves the snowflake in an apparently unchanged position (multiples of 60 degrees) forms a member of the group. The 43 quintillion arrangements of the Cube can also be thought of as a group: twist any arrangement of the Cube and you get another element of the group.

For physicists, the Cube has special significance. Solomon Golomb of the University of Southern California uses it as a model to illustrate the properties of the elementary particles: a clockwise rotation of a corner cubie represents a quark; a counterclockwise rotation, an antiquark. The configuration of the corner cubies leads either to a baryon, consisting of three quarks, or a meson, a quark-antiquark pair.

By 1982 the craze was over and the toy's Hungarian manufacturer was going bust--quite a feat when you consider that probably more than 100 million Cubes were sold worldwide. But that was precisely the problem: a centrally planned economy isn't accustomed to dealing with consumer crazes. A Budapest writer, Mezei Andras, has written a book and a play called *The Hungarian Cube* chronicling the debacle. It started when the officials at the small manufacturing cooperative, Politechnika, insisted on trying to expand their operations to meet the burgeoning demand instead of farming out work to other factories.

"The company took a loan from the government," Andras told me, "but they had to wait nine or ten months for it to be approved by all the proper committees. Then it took them six months to order and receive the manufacturing equipment they needed. By that time the craze was finished, so the company had a large debt and no popular product, and the state had to save it from going bankrupt."

In the meantime, factories in the Far East had been churning out pirated versions-- which accounted for half of the estimated 100 million sold-- and Ideal Toy had been forced to turn to other manufacturers for its Cubes. At one point the Hungarians were so desperate that they bought a million Cubes from Hong Kong and tried to pass them off as made in Hungary. This proved especially embarrassing when the shipment was returned because 800,000 Cubes were defective.

"Everyone made money on the Cube except the Hungarians," Andras said, "but it was still a good lesson for us. It has taught people that our way of centrally directing the economy has to change. We can be socialists and still have a market-oriented economy."

Today Hungary has a growing number of private businesses and the freest economy in the Eastern bloc ("goulash communism," the commentators call it)--not directly because of the Cube, of course, but Rubik has certainly become the country's equivalent of a Horatio Alger hero. I heard plenty of sniping in Budapest against the local nouveau riche (such as black marketeers or operators of the newly fashionable hamburger stands), but I didn't hear anyone begrudge Rubik his fortune. People seemed proud of him and said he deserved his share of the Cube's proceeds, which was reported to be about five per cent. I was told by knowledgeable sources that he has made \$3 million or \$4 million, more than anyone else in Hungary has earned (legally, that is), and enough to send lots of Hungarian inventors in the direction of Tibor Laczi.

"I get several letters from them a day," says Laczi, who lives in a lavish house in Vienna, wears a diamond ring, and markets inventions full time. "I think the Eastern bloc has many more inventors than the West. In the West people have to work, but in the East they get their salary no matter what, so they can sit in their offices and think all day. Everybody has connections, so they can always get a sample made for free somewhere. They all want to be like Rubik, and today it is easier for them. There are more export firms now, and the officials are better. If anyone puts up an obstacle, the inventor can make a loud complaint, 'Let's remember Rubik's Cube.'"

Of course, certain philosophical East-West differences remain. Laczi tells of going to the premiere of *The Hungarian Cube*. "At the end of the play they introduced me and brought me on stage next to the actor who plays me. Afterwards a crowd of people came to me and asked for my autograph and thanked me for all that I done for the Hungarian state. I said to them, 'But I didn't do it for the state. I did it for myself.'"

"What does a socialist millionaire do with his money?"

When this question was put to Rubik several years ago by *Life and Literature*, an intellectual weekly in Budapest, he devoted a good deal of time-- most of the interview, in fact-- to not answering it. It wasn't just the ideological issue that bothered him (although he did insist that successes like his wouldn't "corrupt socialist ethics" or lead to "lavish spending"). He sounded genuinely troubled by the money and what came with it: "For me it is another quiz, a new puzzle, and it is not so easy to find the proper solution," he said, and lamented, "Success has taken away from me the time necessary for looking inside, together with silence and peace."



In our meetings last fall he seemed as worried as ever. "Mistrustful" was the word his acquaintances kept using. "He's afraid that people will take advantage of him," said Laczi. "You know, in this play about the Cube, the rest of us all gave permission to use our real names. But Rubik wanted his changed. He suggested they name the inventor Bubik. He was finally convinced it would sound silly, and his name was used. But it tells you something."

Rubik, who obviously does not need to work--\$3 million goes a long way in Budapest-- told me he would return to his teaching job when his present one-year sabbatical ends. "I want to try to keep my life the same," Rubik said, although he seems reconciled to a few changes. He now has a telephone in his apartment (but doesn't know when he'll get one for his house). After years of urging from Laczi, he has moved up from his dilapidated Polski Fiat to the Mercedes and a Volkswagen Golf (the same cars that Laczi has). His clothing is slightly upgraded but no more formal--turtleneck, corduroys, high-top white sneakers.

He has donated \$200,000 to endow a foundation to help promising inventors in Hungary. He has also provided most of the money to establish a private cooperative, the Rubik Studio, which employs a dozen people and is planning to design such items as furniture and toys. Since the Cube, Rubik has produced several other toys--the most successful was Rubik's Snake, which could be twisted into shapes--and he told me that some day he wants to try his hand at designing computer games. He also spoke vaguely of attempting to develop a "general theory of structures."

He's readying a new toy for release sometime this year. It's a bit like a jigsaw puzzle, I heard elsewhere, but Rubik doesn't want to talk about the toy or its prospects.

"People always ask me if I will surpass the Cube," he says. "What can I answer? I did not plan to make the Cube. I did not plan the success. I wanted nothing else than to make the object as perfect as possible. Now, after the Cube, I still don't have any plans to make anything like it. I'm still the same person, thinking the same way, so it's possible I will invent something. But to want to repeat the Cube--that is not the way to live."

Rubik sometimes mentions the Golden Age of the Cube, by which he means the time before the craze, back when "it brought only delights to me." He has a lot of--well, interesting--explanations for those delights. He discusses the way the Cube can seem alive as it heats up in your hand, and the fact that each face of the Cube is made of three layers of three blocks. "For me, the number three seems to have a particular significance, relevant in some strange ways to the relation between man and nature. Take mother-child-father, heaven-earth-hell, creation-preservation-destruction, birth-life-death." Sometimes he talks about the Cube as an imitation of life itself--or even as an improvement on life.

"The problems of puzzles are very near the problems of life," he said at his studio one morning. "Our whole life is solving puzzles. If you are hungry, you have to find something to eat. But everyday problems are very mixed--they're not clear. A good puzzle, it's a fair thing. Nobody is lying. It's very clear, and the problem depends just on you. You can solve it independently. But to find happiness in life, you're not independent. That's the big difference."

I took out some toothpicks to show Rubik another kind of puzzle. It was from a book by Martin Gardner called *Aha! Insight*. Gardner, a great American puzzle expert (and *DISCOVER* contributor), had collected problems requiring a sudden inspiration--a refreshing alternative to the Cube, I thought. (Gardner, incidentally, never had the patience for the Cube either.) "Tell me what you think of this," I said. "How do you move two toothpicks and leave exactly four unit squares?"

"Move just two," Rubik repeated to himself, sitting up in his chair. He tried removing two from the table, which wasn't allowed--they had to stay in the diagram. Then he produced this formation, which was clever, but the four squares had to be the same size. He wanted to know if he could double up some of the toothpicks--also illegal, but I did admire the effort. This was the first sign of life I'd seen in three days. He nibbled at his fingernails and played with the toothpicks for five intense minutes.

"There is a trick," he said, exasperated.

But after another couple of minutes he relaxed. He showed me the answer:

"It's a nice puzzle," he said.

"This is called the *aha!* instinct. It's one quick--"

"A flash," he said.

"Yes," I replied. "It's very different from the Cube that way."

"Yes, but with the Cube there are many flashes, there are many *aha*'s."

I told him that the problem

I had with the Cube was that it took so much grunt work to remember all of the required maneuvers.

But Rubik wasn't listening. He was already rearranging the toothpicks to show one of his favorite puzzles. Then he grabbed Gardner's book and turned to its next puzzle, which is to rearrange the toothpicks below to form six unit squares:

"Make six unit squares," he muttered. "Make six . . . they must all be the same size?"

"Yes," I said, devoutly hoping to see him squirm here--a small revenge I could extract on behalf of the millions of Cube dropouts. I'd always had a theory that we were the intelligent ones. As Rubik stared at the toothpicks and muttered, it pleased me to reflect that I had solved this problem in only about ten minutes. What pleased me even more was my conviction that this particular aha!, this nimble leap of intellect, was beyond the reach of any mind that would slog through the Cube.

But he got it in less than a minute. Rubik suddenly realized that he could use the toothpicks to form squares in a three-dimensional structure.

"Ah, it's the Cube," he said, smiling and nodding to himself as he contemplated the toothpicks in his hands. He looked very much alone, and very happy.