

# *Schrödinger's Cat*

by [Rudy Rucker](#)

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*“A cat is placed in a steel chamber, together with the following hellish contraption (which must be protected against direct interference by the cat): In a Geiger counter there is a tiny amount of radioactive substance, so tiny that maybe within an hour one of the atoms decays, but equally probably none of them decays. If an atom decays then the counter triggers and via a relay activates a little hammer which breaks a container of cyanide. If one has left this entire system for an hour, then one would say that the cat is still living if no atom has decayed. The first decay would have poisoned it. The wave-function of the entire system would express this by containing equal parts of the living and the dead cat.”*

--- Erwin Schrödinger, 1935

By rights, this should have been an important scientific paper ... not a thrilling wonder tale in some lurid, mass-produced edition. But I must cast my net as wide as possible. I am fishing for minds, minds with the delicacy of thought to appreciate the nature of Ion Stepanek's fate.

Such are the facts: with my assistance, Ion Stepanek was able to build a sort of time-machine. He used this machine to produce a yes-and-no situation, which he tried to observe. As a result, he has split into an uncollapsible mixed state. Due to coupling effects, I suffer his condition, though not yet to the same degree.

It is March 21, 1980, Heidelberg, West Germany. I am sitting in the office Stepanek shared with me, staring out at a white sky. The office is in the Physics Institute. Across the river, the great castle hovers over the misted town like a thought. Such are the facts.

I did my undergraduate work at Stanford, then took my Ph.D. in particle physics at Berkeley. My thesis project helped lead to the first experimental disproof of the Bell inequality. At one time this was a fairly sensational result, although now more and more people have accepted the ultimate validity of the wave-function world-view.

Schrödinger's thought-experiment is paradoxical because, according to quantum mechanics, until the observer opens the door, *the cat is not definitely dead or definitely alive*, but is rather 50 percent dead and 50 percent alive. The cat is in what is known as a *mixed state*.

Einstein responded to Schrödinger's paradox by asserting that this fifty-fifty business was just a measure of the observer's lack of knowledge, rather than being a true description of the actual state of the cat. But the experimental disproof of the Bell inequality has shown that Einstein was wrong. The unobserved world evolves into truly mixed states. There are no hidden parameters which make things stay definite.

It is thanks, in part, to my own research that this result was proved. But despite this high achievement, I was unable to obtain a good research or teaching post. I make enemies easily, and it may be that one of my letters of recommendation was, in effect, a black-ball.

I postponed the inevitable with a post-doc at Harvard. But after that I had to take a poorly paying job at a state college in Wankato, Minnesota.

Cut off from any real physics laboratory, I was forced to begin thinking more deeply about the experiments I had run at Harvard and at Berkeley. What is it Schrödinger says about his paradox?

*This prevents us from accepting a "blurred model" so naïvely as a picture of reality. By itself reality is not at all unclear or contradictory. There is a difference between a blurred or poorly-focused photograph and a picture of clouds or fog patches.*

I had a nervous breakdown during my fourth year at Wankato. It had to do with the television weather reports. Quantum mechanics implies that *until someone makes an observation*, the weather is indeterminate, in a mixed state. There is, in principle, no reason why it should not be sunny every day. Indeed, it is logically possible to argue that it rains only because people *believe it to be raining*.

Fact: in Wankato, Minnesota, there is precipitation 227 days of the year.

Before too long I thought I had determined the reason for this. All of the citizens of Wankato ... even the faculty members ... watch television weather reports every evening. These reports almost always predict rain or snow. It seemed obvious to me, in my isolation, that if the weather reports could be stopped, then it would not rain so often.

I tried, unsuccessfully, to gather signatures for a petition. I went to the TV station and

complained. Finally, I forced my way into the studio one evening and interrupted the weather report to state my case.

“Tomorrow it will be sunny!” I cried. “If only you will believe!”

The next day it was sunny. But I was out of a job, and in a mental institution. It was clear that I needed a rest. It had been folly to shift my fellows over so abruptly from one belief system to another. I had neglected the bridge, the mixed state.

That was in March, 1979. A year ago. They let me out after six weeks of treatment. As luck would have it, a letter from a German research foundation was waiting for me when I finally got back to my little furnished room. They had approved my application for a one-year grant, to be spent working with Ion Stepanek at the Physics Institute of the University of Heidelberg. My project title? “Mixed States as Bridges Between Parallel Universes.”

On a typical Heidelberg day it is misty. On the Neckar River the vapor hangs in networks, concentrated at the boundaries of atmospheric pressure cells. The old town is squeezed between the river and a steep mountainside. Some hundred meters up the mountain hangs the huge, ruined castle. In the mist it looks weightless, phantasmagoric.

I got there in early September, during semester break. I found a room outside of town, and on most days, I would ride the stuffy bus from my apartment to Bismarckplatz, the little city’s center.

Strange feelings always filled me on these bus rides. I never seemed to see the same face twice, and the strangeness of it put me at a remove from reality. Never had I tasted alienation in such a pure and unalloyed form.

Half convinced that I was invisible, I would stare greedily at the German women, at their thick blonde hair and their strong features. The women stared back with bold and clinical eyes. I gave my heart a thousand times, without ever saying a word. But I could never muster the courage to approach one of those tantalizing aliens. I am, after all, soft and funny-looking.

On a normal day I would get out at Bismarckplatz and walk over the bridge. Crossing the Neckar always took me a long time. In the middle of the bridge I would stop and watch the fifty-meter-long barges speeding by beneath me. The river is like a highway, with coal and wrecked cars being lugged upstream, and great beams of steel gliding downstream. There are the locks to see, and the hazy old town, and above it all, the great hallucinatory castle.

Other darker thoughts detained me on the bridge as well. Surely you have seen Edvard

Munch's painting, *The Cry*? Why do you think Munch chose to place this most anguished figure in modern art ... on a bridge? On a bridge one is neither here nor there; one is rootless ... and anything can happen. Did you know that in the 1800s the most commonly attempted method of suicide was none other than ... jumping off a bridge? Out there, in the wind, one need not choose this bank or that. There are other alternatives.

During my first two months in Heidelberg, the Institute was deserted. The sole secretary present showed me my desk in Ion Stepanek's large office. As I later learned, Stepanek was spending the semester break visiting relatives in Budapest. Both he and his wife, Klara, were Hungarian refugees.

The first time I met Stepanek, he caught me by surprise. I had spent those first lonely months at the Institute by going over various treatments of the Einstein-Podolsky-Rosen paradox. My slow understanding of the solution was expressed in a large, three-dimensional figure, a sort of solid letter "Y," which I was amusing myself with by drawing on the office blackboard.

"William," a voice cried suddenly. "What a pleasure to find you here, hard at work!" I turned a bit too abruptly --- he had startled me --- and we shook hands.

Ion Stepanek was a short, wiry man, given to wearing suede vests and jackets. His hair was thinning, and rather greasy. He had a large nose and a wide, amused mouth. His eyes were very quick, and he had a disconcerting habit of staring me in the eye when he sensed I might be holding something back.

Although he was ten years my senior and, nominally, my supervisor, Ion began by treating me as an equal. He had read my experimental work and my recent, unpublishable theorizings. In return I had read everything he had written, even including a stack of freshly typed pages I had found on his desk.

His sharp eyes took in my diagram of the EPR paradox, and then he turned to gesture at the window. "So, William? Do you like the fog? The indeterminacy?"

I shrugged. "I can live with it. Did you enjoy your vacation?"

"Must it be yes or no?" I didn't know quite what to answer. Stepanek savored the moment, then clapped me on the shoulder. "Have you read my latest?"

"You mean this?" I pointed to the pages on his desk. "Yes, I took the liberty. But ..." I stopped, not wanting to offend him.

He plucked the thought out of my eyes and answered it. “You are wondering why I would waste my energy on a chimera like time-travel.”

I nodded. “Surely you are aware of the paradoxes. One can so easily produce a yes-and-no situation with a time-machine.”

Ion smiled widely, mirthlessly. “Do you not understand your own work? This is just what you want.”

We dropped the matter for then, and went on to discuss the bus routes, my apartment, the restaurants ... the minutiae of life in a foreign country.

Ion insisted on taking me home with him for the midday meal. His house was only a few hundred meters from the Institute. His wife, Klara, greeted me like a long-lost cousin.

“Ion has been so looking forward to your visit, William. It is wonderful that you are here!” She had soft eyes and dark, sensual lips. A perfect wife, a perfect mother. How comfortable she made me feel!

I accepted a glass of kirsch before lunch. The clear, dry alcohol went straight to my head, but Ion assured me that Klara’s after-dinner coffee would remedy that. Then the two children, twin ten-year-old girls, came crashing in.

The German school-day ends before one o’clock, and it is not unusual for the whole family to have their big meal together at midday.

“Do you fix such a big supper as well?” I asked Klara as we sat down to our cauliflower soup.

“This is not big,” she said, looking down the loaded table. “This is nothing.”

Besides the soup, there was a roast stuffed with hot sausage, a platter of fried potatoes, creamed spinach, cucumber salad, smoked cheese, two kinds of salami, dishes of pickled peppers, and a large carafe of excellent white wine.

“I have never seen such a magnificent meal in my life!” I exclaimed.

The twins giggled, and Ion laughed appreciatively. “You see, Klara? William is already learning the art of Hungarian exaggeration.”

In the course of many happy hours spent at the Stepaneks’ over the next three months, I was to become very familiar with this sort of conversation. A Hungarian is never happy without being ecstatic, never sad without being suicidal, never your friend without being ready to give you everything he owns, never displeased without being ready to kill. But there was, for all that,

a consciously playful element to their exaggerations which somehow kept them from ever being oppressive.

Klara was thirty-five, about halfway in age between Ion and I. Before long I was thoroughly infatuated with her, and flirted shamelessly. Ion must have noticed, but perhaps he welcomed the excitement for Klara. Or perhaps he pitied me too much to object.

I got in the habit of dropping my spoon at most of our frequent common meals. Bent and straining under the table, I would stare at Klara's legs. She could feel my gaze, and would slowly rub her nylons against each other. When I sat up she would give me a look of dreamy speculation, her full lips parted to show a few of her perfect teeth. I hoped my hopes and dreamed my dreams.

Meanwhile, Ion and I were working long hours on our joint project. His intention was to push the Feynman time-reversal theory of antimatter hard enough to get time-travel. He had the clout to get the necessary components and material --- some of them totally new. My job was to assemble the components into a working system.

There is something magical about scientific apparatus. A witch doctor assembles decorated stones, special herbs, pieces of rare animals ... and he expects that putting these valued objects together will cause something unusual to happen. Spirit voices, levitation, miracle cures ...

The constructions of engineers and physicists are not really so different. Bits of etched silicon, special chemicals, oddly shaped pieces of metal ... the experimentalist places them together, and suddenly one has a radio, or an airplane, or an X-ray machine.

Stepanek's design for a time-machine was a bit more obviously allied to sorcery than is customary. The key components were six of the brand-new "phase-mirrors." It was only as a result of his years-long friendship with the director of the Max Planck Institute that Ion was able to get these fantastically rare and valuable plates of ... what?

The phase-mirrors were made of a completely new type of substance called quarkonium, a hyperstable compound something like metallic helium --- but with some of the protons' component quarks replaced by the newly obtainable "bottom" quarks. Quarkonium is, strangely enough, neither matter nor antimatter. The stuff exists in some fantastically charged tension between the two. The fact that quarkonium is thus hyperstable made it possible that, in certain circumstances, the phase-mirrors could emit or absorb almost their entire mass-energy without

disintegrating.

Two of the thin, inflexible quarkonium plates were square, and four were longish rectangles. I assembled the six into a box, setting an evacuation nozzle into the hole with which one plate had been provided. The material was strange to work with, slippery and utterly rigid. Although they were supposed to be a sort of mirror, the plates did not reflect images in any ordinary way ... at least not most of the time. But, over and over, as I was assembling the phase-mirrors into a box, I seemed to glimpse isolated images of my fingertips here and there on the mirrors' surfaces.

We spent forty-eight hours pumping the box out to a state of near-perfect vacuum, and then sealed it off. While the pump was running, Ion instructed me to mount a series of wire loops on the table, loops which could be charged to produce a weakly guiding magnetic field. We set the box in the middle of the loops, and that was about it. A transparent box like an aquarium with a glass top. Ion called the box a time-tunnel, but I found this colorful description misleading.

We ran our first tests with an electron beam. The idea was that a signal could come out of one end of the box before it went in the other. It's called an advanced potential in quantum mechanics. We got the results Ion had predicted, so we moved up to atomic nuclei, and then to a series of larger and larger iron bullets.

Shooting the bullets into that phase-mirror box made me a little nervous... I expected the box to shatter. But somehow it didn't. I assumed it was because the quarkonium plates were, in some sense, liquid, and thus able to close up after a rapid enough object.

I believed that for a while, anyway. But before long I had come to believe something stranger ... that the box was able to create and destroy matter/antimatter pairs. But where was the energy coming from? And where did it go?

Ion had an explanation. But I was not ready to accept his description of what we had built. That way lay madness.

"Do you know what your husband and I have done?" I asked Klara at lunch the last day of February. The twins had already left the table to do their homework. I glanced at Ion, and he gave me an encouraging nod. Until now I had been sworn to silence.

Klara looked a bit nervous at my question. Ion was, I had learned, something of a philanderer. What a fool to betray a woman as wonderful as Klara!

"Nothing too depraved, I hope?" Her voice was gay, but with the faintest tremolo of real

worry. She drew out a cigarette and placed it between her wonderful lips, waiting for the touch of my lighter ... the lighter which I had bought solely so that I could light Klara's cigarettes. She tilted her head back, away from the smoke, and looked at Ion questioningly.

He smiled his broad, mirthless smile. "William and I have assembled a rather interesting piece of apparatus. It creates and destroys matter, according to William's way of looking at things."

Klara arched her eyebrows at me. "Is that true, William? Perhaps you have solved the energy crisis?"

I laughed, a bit exasperated by Ion's misdirection. "No, no. This is a very expensive machine to build. We have used most of the quarkonium in the world to build it. And really it creates and absorbs matter/antimatter *pairs*, rather than just matter. But Ion thinks ...

Ion was pouring himself a glass of wine, and the carafe clattered against his glass. "I do not *think*, William, I *know*. We have built a time-machine." Suddenly, on some level, we were fighting over Klara.

She blew a thick stream of smoke and put out her cigarette. "I would like a time-machine. Then I could see what the castle looked like in 1400, before the French blew it up. And I'd like to see dinosaurs. And fashions one thousand years from now." It was clear she didn't believe Ion. "Dearest, do you think you could bring me back a kitchen-robot from the future? It would be even nicer than that dishwasher you're always promising to get me!"

Ion was breathing heavily. He had had several glasses of kirsch before lunch. This quarrel had been brewing for three months. I thought his experiment interesting, but I saw no reason to take Feynman's theory so literally as to assert that we had produced time-travel. Ion could see this in my eyes.

He stood up suddenly, almost as if to attack me. Was he, on top of it all, jealous of my attentions to Klara? New Year's Eve, after he had passed out, Klara and I, how close we had come! I tried to keep this out of my eyes. I stood up clumsily, and my chair fell to the floor behind me.

"Don't panic, William," Ion said, shrugging on his suede jacket. "I only thought we could give Klara a demonstration."

The twins, attracted by the noise of my chair, had come running in from the study, and insisted that they too be allowed to come see Daddy's machine. Ion acquiesced, on the condition

that they bring a certain toy.

We all bundled into our coats ... Klara wore a charming fox coat sewed in herring-bone strips ... and we walked the three blocks to the Physics Institute.

The twins ran ahead of us, screaming and trying to slide on the frozen puddles. Klara walked between Ion and me, linking an arm with each of us. The sky was low and grey. The eternal mist seemed to form a circular wall around us, always ten meters off.

“Should we show Klara the bullet series?” I asked Ion, speaking across Klara’s lovely, upturned face.

Ion pursed his lips and shook his head. “Too fast. Klara has to see it to believe it.”

“Believe what?”

“We have a sort of tunnel,” I explained. “The size of a toy train tunnel. And if we shoot a bullet through it, the bullet seems to come out the right end *before* it goes in the left.”

Klara laughed. “Now *that* sounds useful. We could use one of your machines in the tunnel under the castle ... where those dreadful traffic jams are.”

“Actually,” Ion said, “I thought I *would* use a little car today --- the little three-wheeler that I helped the twins make last night.”

The twins had brought the little car, a bright red-yellow-blue mass of Lego blocks. On the top was a battery-run motor, with a cog wheel linked by a black plastic chain to a gear on the single front wheel.

Klara examined our “time-tunnel” with interest. The core of it was the shoe-box-sized vacuum chamber made of phase-mirrors. You could see in quite easily. The thick loops of the guiding-field wires arched over the box like croquet wickets.

I removed the rifle from its mount on one end of the lab-table, and waited while Ion got the car from the little girls.

Then, bustling a bit, he lined up his three women in chairs against the wall, and set the car down at one end of the table. I cleared my throat, preparatory to telling them what they might expect, but Ion shushed me.

“First let them see, and *then* we’ll discuss it.”

I taped an iron nail to the bottom of the Lego car, and dialed the guiding-field’s power up to some hundred times the level we had used before. The Lego car made a pretty big test-particle.

In all frankness, I expected the experiment to be a failure. The car would roll up to the phase-mirror box, bump into the side and stop ... nothing more. But I was wrong.

As the little car labored across the table towards the left end of the box, something happened at the right end. Seemingly out of no place, an identical Lego car pushed out of the right end of the tunnel and went chuffing on its way! “And there’s one inside now, rolling left!” Klara exclaimed, leaning forward. She was right. For a few seconds there were *three* Lego cars on the table.

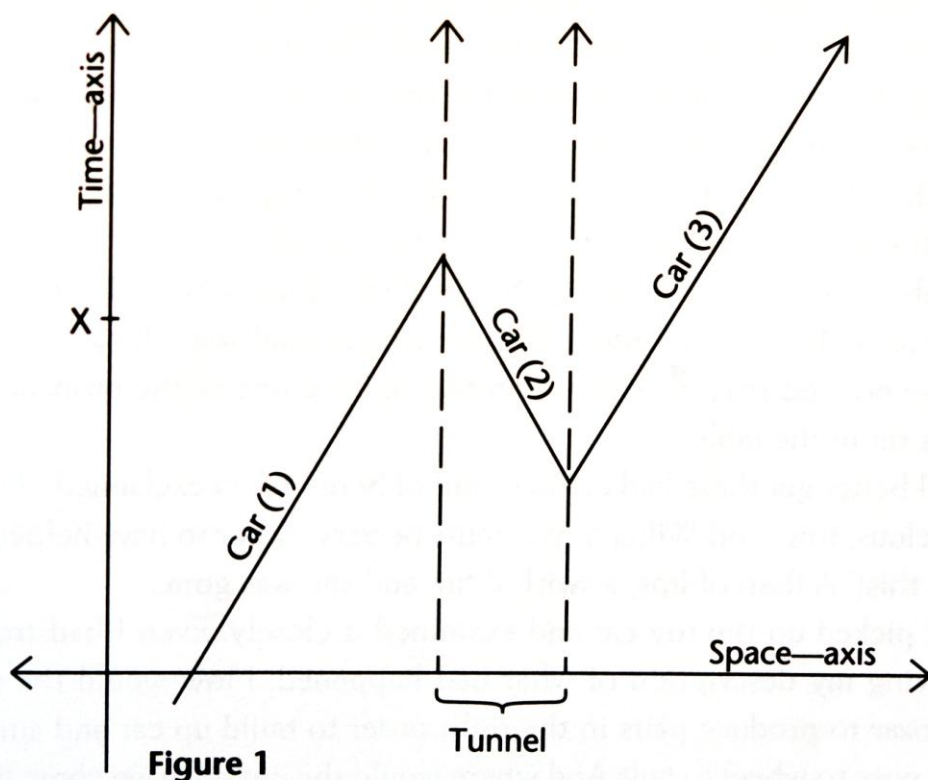
Car (1): The original car, still approaching the tunnel’s left entrance. Car (2): The one moving in the tunnel, from right to left. Car (3): The new one moving away from the right end of the tunnel.

And then car (1) and car (2) met at the left-end mirror. They melted into each other ... nose into nose, wheel into wheel, tail into tail. It was like watching a Rorschach ink-blot disappear into its central fold.

One of the twins squealed and ran to catch car (3) before it ran off the other end of the lab table. I took it from her and examined it closely. Car (3) appeared to be identical to car (1). We had already done this experiment with electrons and with small bullets ... but one bullet or electron is much like another. Until now I had been unwilling to accept Ion’s interpretation of our experiment. But it certainly looked as if car (3) really *was* car (1).

Ion stepped to the blackboard and drew a diagram.

“Look,” he said to Klara. “Here’s a spacetime diagram of what happens. If we think of the zigzag line as the history of a particular object, what we have is this: First, car (1) goes forward in time till it gets to the left phase-mirror. Second, inside the tunnel it flips and moves backwards in time, but still left-to-right, and we call it car (2). Third, upon passing through another phase-mirror it flips back to run forward in time again, and is called car (3). By evolving into car (3), the original car (1) manages to come out of the right end a few seconds earlier than it goes in the left.”



“That’s one way of looking at it,” I interrupted. “But we can read the picture a bit differently. Just think of moving that space-axis upwards through time, and see what happens. First there’s just car (1) moving to the right. Then suddenly something happens at the right end of the tunnel. Car (2) and car (3) come into existence together --- by a process called pair-production. Car (3) is matter and car (2) is antimatter. With enough energy present, you can convert zero Lego blocks into plus-forty-nine Lego blocks and minus-forty-nine Lego blocks. You can get something from nothing ... as long as you get anti-something too.”

My voice was baying evangelically. At Wankato State the students used to call me “Rover.” Now Klara smiled at me. Politely. She didn’t know what I was talking about. Ion hid a smile by pretending to rub his nose.

I continued, “When car (2) meets car (1), the two disappear into a burst of energy. It’s called mutual annihilation. Matter plus antimatter makes pure energy. The first puzzling thing about the experiment is how the tunnel knows to produce the appropriate matter/antimatter pair in time. But quantum mechanics does allow for action at a distance. *Advanced potentials.*”

Presumably an advanced potential from the approaching car (1) triggers the pair-production of ...”

Klara looked quite blank by now. I broke off the exposition and made my point. “All three cars are different. Car (2) is antimatter traveling forward in time, not car (1) traveling backwards in time. And car (3) is just a sort of correction term.”

Klara looked from one of us to the other, smiling a bit. “Ion’s right,” she said finally, and with a nod of her head. “Anyone can see that the little car which came out is the same as the one that went in.” She caught my dejected expression and laughed. “Well, what’s the difference anyway? Whether the thing in the tunnel is a particle going backwards in time or an anti-particle going forward in time. It comes to ...”

She had to break off and grab one of the twins, who had been about to try to stick her finger into a phase-mirror. A smell was filling the room, and we noticed that the other twin had opened one of the propane gas-valves set in the table.

“I better get these bad children out of here,” Klara exclaimed. “But it’s marvelous, Ion. And William, you must be very clever to have helped Ion build this!” A flash of lips, a swirl of fur, and she was gone.

I picked up the toy car and examined it closely. Even I had trouble believing my description of what had happened. How would the right end know to produce pairs in the right order to build up car and anti-car from nose to wheel to tail? And where would the energy have come from? Granted that a fantastic amount of energy was stored in the fantastically expensive quarkonium, but still ...

Ion was sitting at his desk writing, his back to me. Despite what Klara had said, the two descriptions did *not* come to the same thing. Was this car the *same* as the original car, or was it only an *identical copy*? I had to know!

Suddenly I thought of a way to test the difference. I would let the car roll towards the tunnel, and at the last minute I would stop it from going in. A decisive experiment.

Suppose Ion was right. Suppose that car (3) was just a time-traveled car (1). What then? If car (1) did not go in the tunnel, then car (2) and car (3) would not come into existence.

But suppose I was right. Suppose that the whole effect was just advanced potential pair-production, triggered by car (1)’s approach. What then? Car (2) and car (3) would already have been created even if, at the very last second, car (1) did not actually enter the tunnel.

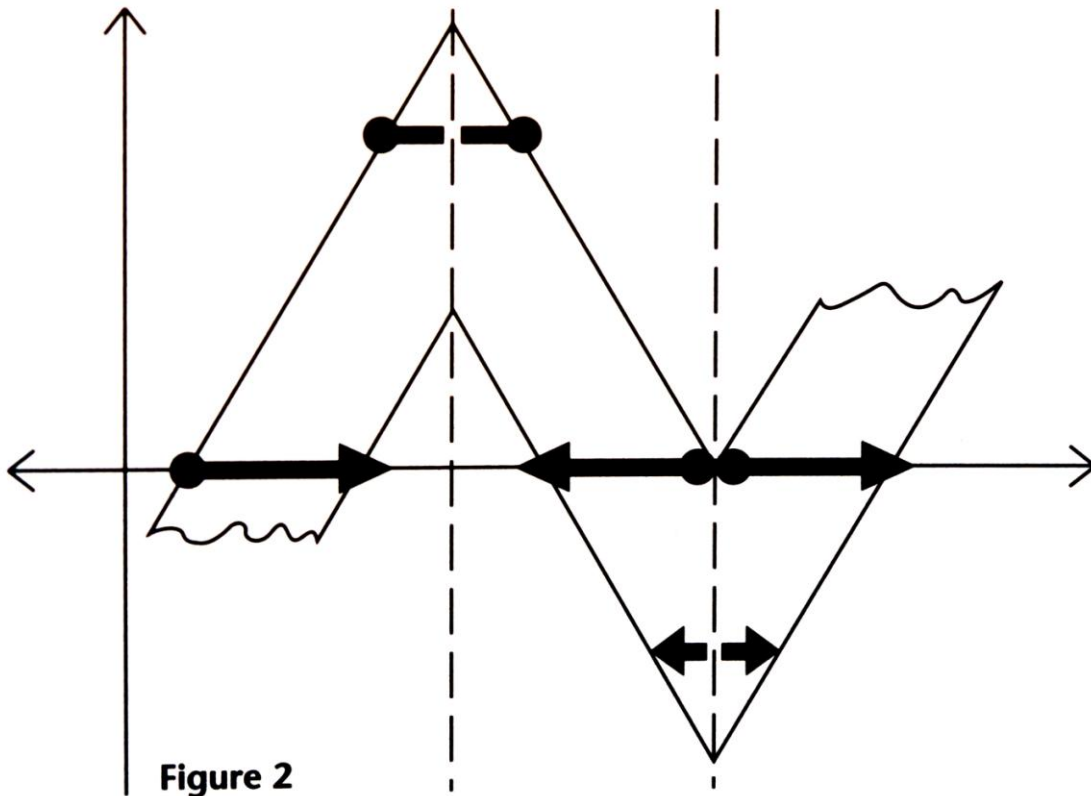
In terms of Ion's spacetime diagram, what I was going to do was to stop car (1) at the time marked "X." If car (3) came out anyway, then I was right. If car (3) didn't come out, then Ion was right.

I started the car and set it down. "Look, Ion." I didn't bother saying more ... he would understand. I fixed my mind on grabbing the car at the last possible instant before it went through the ... looking-glass. I leaned over the table, concentrating. I didn't dare look away to see if car (3) came out of the other end or not.

I seized car (1) just before its nose touched the phase-mirror. Then I stepped back and looked down the table. There was no car (3) at the other end ... and no antimatter car (2) at my end. Ion was right.

I returned the little car to the starting position and let it run through the time-tunnel undisturbed, trying to see it Ion's way.

A car moving *right to left* is the same as a car moving *left to right and backwards in time*. Suddenly I could see the pair-production and the mutual annihilation as corners in time. Ion was right, he really was. We had time-travel, admittedly over just a three-second range, but time-travel nonetheless. Even the strange fact that the phase-mirrors turned things backwards as well as reversing them in time made sense. The fact that the front of the car moved backwards in time as soon as it passed through the left end meant that a normal observer *had* to see it as disappearing first.



“Well?” Ion was smiling his wide, mirthless smile, his eyes picking my brain.

I nodded. “Okay. But how does the car get through the phase-mirrors? They felt so hard when I was gluing them together.”

Ion shrugged. “How does a reflection get through an ordinary looking-glass? It is the property of a mirror to produce images. But this particular mirror works only when the guiding-field is on.” He pointed to the left end of the time-tunnel.

*Time-tunnel.* As I said the word to myself, my last remaining question dissolved. If car (1) was car (2) was car (3), then no mass or anti-mass at all was really being created or destroyed. So of course there were no huge energy drains or blasts going on. Looked at differently, the quarkonium plates were a closed system which could pass energy back in time ... so the pair-producing drew its energy from the annihilation, even though it happened first.

I nodded again, harder. “Okay. But now what?”

“Aren’t you worried about time-paradoxes anymore?” Ion’s voice was challenging, almost angry. It was as if he hadn’t wanted me to agree with him ... hadn’t wanted it to be true.

The next question: What if one were to stop car (1) if and only if car (3) has already appeared?

I didn't say it, but he could see it in my eyes. The fear. Suddenly fatherly, he patted me on the shoulder. "Take the rest of the afternoon off, William. I want to write all of this up before ... before I continue."

I nodded and left him there. I spent the next few hours drinking Schlossquell beer, and then I went to the Eros House, a shabby building full of legal prostitutes. With the lights off, I could almost believe I was with Klara. Later I had more beer.

I slept badly that night. At four in the morning an unpleasant dream woke me up so completely that I couldn't go back to sleep. It was a scene inspired by Kafka's *The Castle*.

In the dream, through some transmutation, the Heidelberg castle is ... *science*. Endless corridors, doors, people to meet. On the white plaster walls there are things like fire-alarms, little hammers mounted over glass plates. Behind the glass is ... *cyanide*, thick gas, swirling, deadly. I hurry down a hallway, a sheaf of papers in my hand. Someone is in front of me, tangible, but invisible. My other self? Somehow the person moves so as to always be in my blind spot. A question is posed, the unspeakable question which the castle itself embodies. My tongue is slow and sticky. Yes and no. A bell is tolling. Yes and no. The hammers quiver... .

The world is clouds and fog patches, a confused smear which no magical apparatus can sharpen up. The cat knows.

That morning I found Ion sitting at his desk. He was asleep, with his head on his crossed arms. One of the phase-mirrors was cracked! Had Ion had some sort of tantrum? I examined the hairline crack. Of course the vacuum was ruined now. I wondered if the quarkonium plate could be repaired. There were some individual Lego-blocks scattered around the floor and table. Apparently Ion had been there all night.

I stood over him for a moment, looking at him with something like affection. I had been worried, too worried to even ...

"William?" The voice was blurred. His eyes flickered open, then shut. "Is it raining?"

This struck me as a very odd question. It was, in fact, a marvelously sunny day, the first taste of spring. The sky was a delicate blue and the birds were singing. A square of sunlight was lying on Ion's desk!

"It's sunny, Ion."

"I thought it was. And I thought it was raining." His voice was muffled, and seemed

somehow to come from underneath his head.

“You should get some sleep,” I urged. “Klara must be worried.”

“I’m scared to move.” A long pause. “I might disperse even more.”

*Disperse?* A strange word to use. Wave-packets disperse, but people ...

“Read my notes,” Ion said, “I ...” He let his voice trail off, and just sat there, eyes closed, his head resting on his crossed arms. There seemed to be something under his arms, some sort of pillow.

I picked up the lab book lying on his desk. It started with a description of the apparatus and the first experiments we had conducted. Nothing new there. I flipped forward a few pages.

There was a diagram like the one Ion had drawn for Klara. Under it was a sketch of the Lego car and a description of the two experiments, the one where the car comes out of the time-tunnel before it goes in, and my variation, where the car is stopped from going in, and therefore does not come out.

Ion had conducted a third experiment. The car was to roll towards the tunnel while he watched both ends. His plan was to stop car (1) if car (3) appeared, and to let car (1) go if car (3) did not appear. This meant that a car would come out of the right end of the tunnel if and only if no car came out of the right end of the tunnel. Yes if and only if no.

Think about it. Either car (3) appears or it doesn’t. Case I: Car (3) appears. So Ion stops car (1) from entering the tunnel. So car (3) doesn’t appear. Case II: Car (3) doesn’t appear. So Ion lets car (1) into the tunnel. So car (3) appears.

Question: When Ion actually ran the experiment, did car (3) appear? Answer: Yes and no.

I closed the lab book and looked around the room. The scattered bits of Legos ... how many?

“What happened, Ion? Did the car come out of the tunnel?”

“Yes,” Ion said, raising his head from on top of his arms.

“No,” Ion said, uncrossing his arms and raising up his other head from under his arms.

The two faces looked at me, each of them a bit translucent, a bit unreal. The two necks merged into his collar, making a solid, tubular letter “Y.”

I gagged and stepped back.

The phone began to ring. The second of Ion’s heads ... the no-head ... seemed not to hear it, and continued to stare at me with those prehensile eyes. Eyes which reached deep into my

mind.

But at the same time, Ion's head groped up the receiver and held it to the first head ... the yes-head ... to one of the shimmering ears. I could hear Klara's tiny voice. She sounded angry, accusing.

"I was working," the yes-head said.

"Your boyfriend is here," the no-head said, noticing the conversation. "I'm going to show him something."

Ion let the phone drop and walked over to the laboratory table. The no-head, the mean one, was doing the talking. Whichever head was talking tended to be bigger. It was as if the silent head corresponded to some part of Ion which was father away ... drifting towards some parallel universe.

"I'm in a mixed state, William. I ran the paradox. It had to come out both ways." He turned the switch to power-up the guiding-field. It was dangerous to be restarting it without a vacuum in the chamber.

The no-head bent down, peering into the cracked phase-mirror. He was still talking to me. "I know how you think I look. But that's just your projection. Actually it feels ... marvelous. You'll see in ..."

"Get out, William," the yes-head cried. "Before it's too late."

Klara's voice was quacking from the dangling phone receiver. I could feel myself going mad, as surely as cloth tearing. I seized the phone to speak to her. "This is William. Ion's had a terrible accident. He ..."

There was a crash behind me. I whirled around. The time-tunnel was billowing smoke and the phase-mirrors had smashed into pieces. For a second I couldn't see Ion through the smoke, but then he came at me.

A tangle of twenty or a hundred thin necks writhed out of his open collar, and on the end of each tentacle-like neck rode a tiny grimacing head, and every little head was screaming at me in a terrible tiny voice... .

He dispersed completely after that. As different variants of Ion Stepanek split off into different universes, each corresponding head would shrink ... get "farther away" ... and a copy of his body would split off with it, twisting and dwindling. I don't know how long it took; I don't know how I could have seen it; I wish I could forget it. The horrible squid-bunch of necks, each

little head screaming out something different ... I hope he's really gone.

I live with Klara now, and I wear Ion's clothes. I have taken over his job at the Institute ... they think he's resigned. Klara forged his signature on the letter.

It's a good life, except for having to cut the buds off my neck every morning. The wart-like little heads. Some look like me, and some look like him. Klara says I only imagine them, and that there's nothing on my neck but eczema.

I still have the specs for the time-tunnel. Maybe I'll rebuild it, and observe a yes-and-no, and disperse. I'll go into the mixed state and come out ... who knows ... maybe in heaven. But I don't really need the machine anymore.

Mixed states happen all the time. Say someone asks you whether or not you want to kill yourself. Before they asked, maybe you weren't really all that much for or against suicide. That's your original mixed state. But answering the question is like being born. You have to stick out a yes-head or a no-head to answer. And the other one has to get shaved off.

It could be any question. Do you like milk? Who are you going to vote for? Are you happy? Do you understand what I'm talking about?

In a way, mixed states are nice. Not naming things, and not forcing them to be this way or that, but just ... letting them go. Satori. There's a Zen question for it: "What was your original face before you were born?"

My original face. A mixed state. I don't need a machine, no heap of glass and wire. I'm just going to walk out on the bridge towards the castle. I'll stop. Out there, in the wind, one needs not choose this bank or that. There are other alternatives.

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### ***Author's Note***

I wrote this story in Heidelberg, Germany, in the spring of 1979. "Schrödinger's Cat," first appeared in *Analog Science Fiction / Science Fact*, March, 1981. It was reprinted in my story collection [GNARL!](#) (Four Walls Eight Windows, New York 2000).

My family and I lived in Heidelberg from 1978 to 1980. I was there on a two-year grant from the Alexander von Humboldt Foundation. The grant came through just as I was losing my first teaching job in Geneseo (a.k.a. Wankato, a.k.a. Bata). My formal duties in Heidelberg were zero: I was given a soundproofed office and a typewriter. As well as doing research on Georg Cantor's theories of infinities, I spent a lot of my time writing science-fiction. At this point in my career I didn't know that I would be able to complete and sell novels, so I put a great deal of energy into writing stories.

"Schrödinger's Cat" was inspired by my studies of numerous papers on quantum mechanics and the nature of time in journals like *Philosophy of Science*. The second diagram for this story seems to suggest an interesting new result: that a time-reversing mirror would have to spatially mirror-reverse objects as well. "By rights this should have been an important scientific paper ..."

*Analog* editor Stanley Schmidt had some doubts about the legitimacy of the mass-energy conversion processes taking place at the surface of the phase-mirrors, but I placated him by saying the phase-mirror was made of "quarkonium." Since quarks were then at the edge of scientific knowledge, quarkonium was a handy catch-all magic-maker akin to the "radioactivity" used by 1940s SF writers.

The seed for this story was a drawing I made for my cheerfully horrified children of a Santa Claus with a thousand heads, answering phone-calls from every boy and girl in the world at once.