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DANCES WITHOUT FEATHERS

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Kick...two, three, four...*twist*...six, seven, eight...*hip walk, hip walk*—pause—*pivot step* and...bow.

I didn't need the pivot step—the clouds started forming by the first hip walk.

Call me a perfectionist, but it's attention to detail that separates the good from the great meteorologist. And if you're doing jazz—my specialty—you have to have style.

The farmer whose fields I had just danced over was appreciative. He gave me a clap, which coincided with a brief peal of thunder just before the rain started.

I had been called out by the Wichita Central office of the National Weather Service to do a small, private irrigation job. It was an unusual request for this time of year, but I didn't complain. I needed the gig. Spring is a dry time for rainmakers like me; too much competition from Mother Nature.

The farmer had an NWS account and wouldn't be paying cash, which meant that I'd have to wait six months for my pay day.

I could dance up a storm, but that wasn't making me rich. Any rainmaking I did "fell as precipitation and not pennies from heaven." That lousy pun was Flinty's. He used it with all freelancers to comfort us while we sat tight, waiting for our money. He'd have his joke and laugh and laugh. Big fun.

I was sweaty and out of breath and I needed a beer, but I had to check in first—which I wouldn't have had to do if I were in the service. The Weather Service, that is. The prestigous, full-fledged Feathered Uniform Forces.

The feathers were a holdover from the old days. I don't mean from the Cherokee—although we influenced early researchers—but

from when weather dancing was a new science. Feathers (from birds of prey only) are "turbulent sticky", meaning they tame non-laminar flow. In English, this means feathers calm the air so that it becomes "chaos predictable". Turbulent air can't be danced. Expert dancers didn't need the feathers, but it was tough to buck tradition.

I got in my car and punched "office" and soon the real reason I didn't enlist showed outside my port window. The Chorus Line. The Kansas branch of it, anyway. The biggest group was in Oklahoma, with Texas right behind. Every newbie weatherdancer had to put in time on the Line.

Their job was to perform an almost endless Rockettes-like kick dance, arms linked, knees to the chin, the whole nine yards. They were at it three, four hours every day in the spring. They looked like complete idiots.

"But Fred," Flinty always called me Fred, after Astaire of course, because he knew it irritated me. He also knew I modeled my best work after the old hoofer, "The Chorus Line performs a necessary function. Why, since they began their routine there hasn't been even one tornado anywhere in the tri-state area."

"What about Tulsa?"

"Oh, yeah." Flinty reminisced, already chuckling. "Tulsa. If Brakowski hadn't got that Charley horse and thrown off his high kick...Well, these things happen."

"These things" being an F5 tornado. It rumbled through the center of town and onto the Tulsa Drillers' minor league ball field on what had up until then been a sunny Saturday afternoon. Killed everybody in right field bleachers. Served them right for being cheap. People who sat in box seats got away without a scratch. Something good did come of it. The Drillers were ahead 7-5 when the tornado hit, but since they had played 7 innings, the game went down as a badly needed win. They even made the playoffs that year.

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I got back to the office and tossed my signed chit on Flinty's desk.

"I ain't accepting this, Freddy-boy." He kicked back in his chair and re-lit his forbidden cigar, blew the smoke into an electronic filter. A good one, because the cigar smell was barely noticeable. Everybody knew about Flinty's cigars, but he had never been caught smoking by any Higher Ups. The chair uttered its soft and familiar clicking grown. I wondered again how it could take his heft without breaking.

"What now, Flinty? Job is done."

"No, it isn't. The farmer called ten minutes ago complaining that you dropped a butt-load of hail on his fields. Says he's screwed and has to re-seed. He's pissed." He saw me about to protest and held up his palm. "Hail, Freddy. I already checked it."

He swung his monitor around and showed me successive satellite shots. Clear sky, then clouds, rain, and, sure enough, hail. Right after I left.

There wasn't a lot of hail—the farmer was exaggerating—but there shouldn't have been any. I did the standard rain dance. How did hail come out of it?

"What dance did you do?"

I admitted it. "The same number I always do for small fields like this. I checked with the Lorenz Group before I went out. Conditions were OK."

Flinty shook his head. "The jazz routine, right?" More cigar puffing, more complaints from his chair. "Freddy, you know a slow waltz is standard."

"Yeah, well, the waltz takes twice as long."

"But it always works. You freelancers. Always cutting corners." He chomped down on the cigar, narrowed his eyes through the smoke, gave me a look. "Or were you trying to show off?"

I kept my mouth shut while he pulled out some paperwork. "I'll have to comp the guy, and after he re-seeds you'll have to go back out there." He paused for the best part, pointing his cigar at me. "And I'll have to halve your rate on this one, Freddy."

"Look, Flinty, you —"

"Look, nothing. You're lucky to get anything out of this. Service don't need no negative publicity."

I plunked down into a chair, thinking about my empty wallet. "This is going to leave me short."

He punched a few keys. Looked me over, sighed, and took a draw from the cigar. "I don't have anything now. Why don't you go downstairs?"

I nodded. "I'm sorry about the hail. Won't happen again."

"Yeah, I know. These things happen."

#

"Downstairs" was the Lorenz Group, where they kept the brains of the outfit. That meant the computers, the geeks who programmed them, and the brains who told the geeks what to

program. Dancers weren't trained here, but in the Florida Keys, where any mistakes could dissipate harmlessly over the ocean.

The original rain dance research began at the Severe Storms Lab, down in Norman, Oklahoma. You probably heard that that office was destroyed in a training accident. Officially, it was a training accident. But it's an open secret that the guy who started the program—Cecil Lang—pushed things too far, too fast, and that the accident wouldn't have happened had he been less zealous.

At the time of the incident, predictive chaos had only just begun be investigated systematically and made a real science. Lang contributed the first theorems on how the rain dance could push the air one way here and have it move another way there. The Dance was developed as a way of controlling the Butterfly Effect. A lot of cultures through history hit on the idea of rain dancing, but was Lang who figured out how to make it reliable.

What happened? Lang wanted to control all weather, everywhere. No more hurricanes, no tornadoes, no floods. No blizzards, no droughts, no heat waves. Ambitious. But his dances were too complicated and could only be mastered by a few. One false step and, well, you get what happened. He and his recruits created a storm so big that...Let me put it this way: there's this ancient Ray Stephen's song (*Speedball*; my old ma is a big fan of 20th century music) describing a motorcycle crash where the lady rider *just* smeared her lipstick...*aallllll* over the highway. Lang just caused a breeze, and spread the Storms Lab *aallllll* over the highway. Killed most everybody.

Anyway, that was history. Now, I couldn't stop thinking about that hail. Where did I go wrong? I mentally went through each step, checking my hand positions. A common rookie mistake is to forget about the hands. But, no, my hands were on target. Everything seemed OK. Only thing that was different from my last dance was that I had the heels replaced on my soft-shoes. New heels could account for the lightning, but not the hail.

Letting it bug me would be a mistake. It would affect my dance and then I'd make more mistakes, which would make me worry more, and so on. A negative feedback. I knew all about feedback. We dancers build our lives around feedback.

I walked past Dawn, gave her a smile. She didn't smile back. I wasn't surprised: women take longer to forgive than men. I went by the math guys, who were gathered around a desk, arms waving, arguing about something. Despite what you might have heard,

mathematicians are high strung. Least little thing sets them off. Least little mathematical thing, that is.

I ignored them and went all the way back to Rapheson's office. As usual, he was standing with his back to the door, tracing out equations in the air with his forefinger. This would have affected the weather, incidentally, at least on a small scale, had the Group not been sealed off from the air outside.

Rapheson was one of Lang's surviving recruits and the man who had pushed the field farther than any other since Lang's death. I knocked on his open door.

Took a couple of knocks, but he finally noticed me. "Ah, Mr. Blackfox."

"Just saying hi, doc." I tried the friendly approach.

"Looking for work, eh?" No fooling the doc.

"Somebody's gotta pay my bar tab. Might as well be me." I took a seat.

Rapheson smiled. "Good thing you came by. I was going to put the word out for you. Wait a minute." He walked over to a map which took up an entire wall. "See this? We've begun to notice some anomalies." He indicated a couple of spots.

"I thought anomalies were your business."

His bushy eyebrows furrowed to form a large V. He peered over his glasses and said in a concerned voice, "They are, the controllable ones. But not these. What we're seeing—and I stress it's only on a small scale and sporadic—are events that appear direc... That have not been predicted." He stopped, narrowed his eyes and appeared to be waiting for me to say something. I didn't. He went on in a lighter tone. " Why, it's like the old days of forecasting, when we had no idea whether or not precipitation would occur."

"'Red sky at night' doesn't mean what it use to." Maybe I should have mentioned the hail, but I was thinking more of the possible gig.

"Not that bad. Not yet. Here's what I'd like..." He thought for a moment, chewed his nails. "Here. I want you to go here," his wet finger hit a spot on the Texas panhandle, "and make me a cirrocumulus. Let's see..." a few mental calculations "about six and a half klicks up. Plus or minus, say, a quarter klick. The size doesn't matter, but it should be visible from the ground. And I need it by tomorrow noon. Can you do that?"

"Oh, sure. No problem."

Problem. The higher the cloud, the more work, and the longer the dance. It's not that cirrocumulus were weird or anything:

cumulus were the easiest clouds to make. It was the six kilometers that worried me. Worse—I shuddered—it meant ballet.

#

Now before you accuse me of anything, I *like* ballet. Not to watch it, that's as dull as listening to a politician speak. Performing it, however, as long as nobody is watching, can be fun. Ballet is the poetry of dance. It's the strict rules of ballet that allow true freedom of expression. And if you can figure out what that means, then you'll understand the true nature of meteorology.

But you have to be in great shape for ballet. Last ballet job I did was a duo. I was supposed to toss my partner—excuse me, execute an *en l'air* movement—a certain distance so that she could do a small *cabriole* caper and land. I was hamfisted about it, didn't have the strength, and so used two arms when only one was required. She landed a foot further than she was supposed to, nearly breaking her left ankle. But she was a pro and managed to salvage the dance with a quick-thinking *pas de bourrée couru*. She hasn't spoken to me since.

Why ballet? It has to do with the height of the clouds. Low clouds, like simple cumulus, can and even should be brought about with a vigorous dance, like the jitterbug or swing. Salsa works great in low humidity. High clouds, because they are so far away from the air in contact with the dancer's body, require subtlety. The soft, flowing, restrained nature of ballet ensures minimal tropospheric effects (no low clouds), but it also means it takes time for the dance's air currents to rise high enough and spread to the proper places.

Noon tomorrow would be cutting it close. I had to get home, change my gear, and drive down to Texas. Once I was there, I'd put in a call to the Center and ask for particulars. I'd have to go solely on satellite data, because the soundings —measurements from balloons sent up twice daily—would be several hours old by the time I'd have to start. Best get going.

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The spot Rapheson picked was isolated. About thirty miles east of a town called Stinnett, the size of a stoplight. I had to go down a private road to a farmer's field. The field was an enormous circular cut-out, made that shape by an irrigation system on wheels. Attach one end of the system to a tractor, pin the center, and then you can drive the elevated pipe in a circle, sprinkling as you go.

This field wasn't being irrigated. I checked in with the farmer, showed him my badge, explained what I wanted to do. He didn't care if the field got wet, but he didn't want any other fields south and east

to get any more water because those had already been irrigated. I told him it was just some high clouds. He didn't want to cut back too long on the sun, but I assured him the clouds wouldn't make any difference, and that I would dissipate them soon after I made them. I don't think he believed me, but he couldn't argue with the badge.

I talked to the Lorenz Group guy and he told me that my best bet would be a spot near the northwest edge of the field. I stretched best I could in the car so that I didn't upset the air unnecessarily. I also changed in the car. As you know, ballet requires skin-tight clothes to reduce unnecessary friction, and I didn't want the farmer to see me. I didn't need any guff with my ego still smarting from the hail.

I began my dance. I didn't want to rush, but I wasn't in the mood to embellish unnecessarily. Just a few simple *pas de valse* to start, then a pirouette, a couple of *rond de jambe en l'air*, but with my hands on my head, fingers extended to enhance friction, and then repeat. Really, that was it. A simple dance, but everything had to be just so. Rigid control throughout, had to keep your concentration high. Calculations showed I'd have to do this for at least half an hour, maybe three-quarters, and I'd have my cloud.

But about the third time through I began to get hot, started really sweating. I knew I wasn't in the best shape, but this was ridiculous. I was coming to the end of the cycle, and this time I kept my fingers down. Slowed me a little, but it made the moves easier.

It was getting hotter. I didn't have a thermometer, but I didn't need one. Dancers are trained to sense minute changes in temperature. I could tell it was at least 104° and getting toastier by the minute. What was going on?

I stopped dancing and looked up. A sky as blue as blue could be. Deep blue, as a matter of fact. Wait a second. It shouldn't be *that* blue. It was as if my dance was having the opposite of its intended effect. Instead of air going up (and the moisture in it condensing to form a cloud), it was coming *down*!

Doesn't sound too bad, right? Most people figure that since the air aloft is much colder than at the surface, when you bring that air down to the ground it should cool things off. Most people are wrong, because that isn't how it works.

See, air when it rises or lowers through the atmosphere follows along invisible lines called *adiabats*. I won't bore you with the math, but it means that when air rises it cools because its pressure is lowered and temperature is proportional to pressure. It also means

that if you lower air, it heats up. Look up the ideal gas law and you'll see what I mean.

A large, powerful high-pressure cell was forming over my head. Wind blowing straight down, strong enough to kick up dust. About 117° now and rising.

The wind whipped up, making it hard to stand. The heat was baking my exposed arms. It was so hot it hurt to breathe. Dust made it hard to see.

I dropped to the ground and spun my body away from the dance site. The wind actually helped once I got out of the center, but it pushed me faster than I wanted to go. I felt like a tumbleweed. Nicked up my elbows and knees, cracked a rib on a rock or dirt clod; something hard, anyway.

Once I got the dirt out of my eyes, the wind stopped. First hail and now this? Maybe I should have listened to my mother and become a physicist. They didn't have dancers, but the Heisenberg Uncertainty Squad was always up to something screwy.

The upper-level winds didn't look right to me. I saw that a pair of contrails—from planes probably headed to Dallas—had developed a bizarre kink in them. The contrail pointed in my direction from the west. As I got out my phone, the kink was slowly lost its structure; the contrails dissipated naturally.

"Doc? It's me."

"Mr. Blackfox. What do you have to report?"

Besides almost getting killed? I told him what had happened and about the contrails.

"Excellent! That should be it."

"Should be what?"

"Just follow the arrow, Mr. Blackfox. Find out where it came from."

How did I know he was going to say that?

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I started driving on a series of small roads west, occasionally calling or getting called by Rapheson to update or correct my position.

When I tell this, it's obvious what was going on, but right then, in the moment, I had no idea what to expect. My side hurt, my elbows hurt, I had a slight burn on my arm, my eyes were still tearing. I didn't stop to think. I just did what I was told.

Anyway, I followed 87 north until I was outside of the appropriately named Texline, a tiny town on the New Mexico border.

I pulled off the highway and steered down a two-track, heading roughly southeast.

After ten miles, the road ended, stopping at the bottom of hill. A wide, dry river bed followed the base of the hill. I got out and looked around. I couldn't make out any tracks, human or vehicle. A scruffy brown rabbit gave me the stink eye, making sure I wasn't after a meal.

I was about to call Rapheson when I noticed the small breeze at my back. Nothing strange about that, but 500 yards to my right the wind was picking up dust and carrying it almost at right angles from where I stood. Same thing on my left. That was odd. It was as if air were being funneled up the hill from all directions.

That's when I noticed the cloud over the hill looked too symmetrical. Now, UFO clouds, altocumulus lenticularis, are not unusual and are found at the top of mountains and hills. They're made when wind flows up the sides of a hill and the water condenses out and forms a circular-shaped cloud, sometimes with stacked layers. Looks just like a flying saucer.

But this cloud was almost a perfect circle, darker and thicker in the middle.

I spoke "Rapheson" several times into my phone. Nothing. I even tried manually dialing. I checked the phone and there wasn't anything obviously wrong with it.

One of those simple facts of life that people forget is that phones are radios. It sends out a radio signal which carries your voice, and receives one back which has your friend's. If all is right with your phone but your signal isn't getting out, then it can mean one of two things. Either your phone isn't sending out a signal strong enough for the receiver to catch—which nowadays is nearly impossible—or something is causing interference.

My phone was new and had a decent spread-spectrum chip, so that whatever was interfering must have been strong. I didn't have any field meters with me so I couldn't be certain, but there was no better explanation.

I started walking up the hill.

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The climb was steep at times, but I managed to haul my carcass to the top. The backside of the hill sloped gently away. The breeze at my back turned into a stiff wind the closer I got to the apex, and I saw dust picking up in front of me, just as it was to the

sides and behind me. Air was being funneled to a spot about a mile ahead, and then forced upwards.

There's an old saying in meteorology: air that goes up must come down. It wouldn't have been too hard to direct some of the air shooting into the stratosphere back down to where I danced earlier. Where the rest of it was going, I didn't know.

On the ground at the center of the swirling air was a small cabin. Directly above that cabin was where the converging air met. When it did, it twisted itself together in rope-like vortices, each darkened by a significant amount of dust and surface matter. I figured that the rock around here must have had some iron content. So much debris aloft could cause radio interference. How could Rapheson have missed this on satellite?

I moved closer to the cabin. Off to the left was a bank of solar collectors surrounding a walled-off box. Water storage?

I spotted him then. A lithe, small figure moving from behind the cabin in a halt step, arms extended, palms down, making each step deliberately and heavily. He was dressed in the full feather regalia that went out of style years ago.

He stopped his forward crawl, projected his arms to his side, right foot forward slightly, left foot set as a pivot—and then he did it! A sudden counter-clockwise—*counter-clockwise!*—spin, growing faster as he drew his arms in. His body was a blur. The air above the dancer immediately swirled stronger.

He came out of his move and I stood gaping like an idiot. Which is how he spotted me.

He was too good, too controlled to move abruptly and spoil his dance, so he slowly straightened and looked at me.

Like a dope, I raised my hand in greeting—a mistake. Because he did a quick, tight back flip, landing with his arms swept forward, it took me a full second to realize what that dance would do. By then it was too late because a blast of wind from behind knocked me sprawling to the ground.

I was blinded by the crud in my eyes, but I could tell he did the move twice more because there were two more blasts of wind that kept me pinned down.

"So," I heard a voice say. "Somebody has finally come. But of course you are too late. Stand up."

I struggled to my knees, rubbed my eyes, and slowly stood. And do you know what? He was pointing a *gun* at me. A gun!

The man looked me over. I looked over the gun. "No feathers," he said. I didn't take my eyes off the end of the barrel. "How easily the old ways are forgotten."

He had the look of a man who had unwillingly swallowed a bug. "I *am* going to shoot you. But tell me first. Who sent you?" I started to speak. "Please. No need to dissimulate. I'll know if you're lying."

"The Weather Ser —"

"I know *that*!" He wasn't liking my first answer. "*Who!?*"

"Ted Rapheson."

He held the gun up to my nose, made a silent *pow* with his lips. "Rapheson?" His creased, weather-worn face cracked into a smile. It wasn't becoming—he should sue his dentist. "Not little *Teddy* Rapheson?" He laughed.

His reminiscing made him forget me for a moment, and he took his eyes off my hands. I couldn't do much with him standing right there, but I was trying to make use of the fact that all that flying dust created static electricity. There was more than one way to make lightning! I was able to bend one of the vortices with an extensive hand flurry, just the kind Astaire used to do. But this wasn't enough to get me everything I required. For that, I needed to move my legs.

"I remember when I hired that scrawny brat. Not bad with diff-EQs. Strong sense of rhythm. Good legs. That ambitious son of a bitch thought he knew more than everybody. Even me. Ah, the whirligig of time, eh Mr...?" He cocked an ear toward me.

"Blackfox!" I shouted, while squatting as quickly as I could and clicking my heels together. The audacity of the move surprised Lang—for who else could it be but the Old Master?—and he defensively moved back.

But not far enough. The bolt, anemic but fully capable of doing the job if it connected, came down a few meters behind him. The crack of thunder was instantaneous and stunned both of us. Lang dropped the gun.

We both looked at it lying in the dirt. Then we looked at each other. We both thought the other would go for the gun, so we left it lying there and ran in opposite directions. Brave boy that I am, I sprinted about twenty meters and turned and saw Lang return to his former spot and make some quick corrections to the vortices.

"Not enough, Blackfox! You can't stop the dance! It's almost finished! No more weather!" He didn't sound pleased.

No more weather? What was that about? Wait a second. Couldn't be...could it? Makes some kind of sense and would explain

all the dust shooting into the atmosphere. It would also explain why he'd holed up here keeping quiet for so long after everybody thought he was dead.

When I was in training, I heard that Lang had this cockamamie idea of the *Last Dance.* It would solve all the world's problems, fix it so that there was no more weather.

What causes weather is the sun differentially heating the earth. The equator is hotter than the poles, right? Hot air rises at the equator and sinks at the poles, actions which create all wind and weather. Lang's idea was to pump a load of reflective material into the upper atmosphere to block sunlight near the equators, thus balancing out the amount of radiation received all over the globe.

Using the twisted logic common to all Utopians, Lang "proved" this ploy would have ended all strife, restored Peace and Harmony to all mankind, etcetera. It was said the *Last Dance* would take years to properly perform. Had to be done at several different spots all over the planet, in conditions just so. Must have taken him years. I was interrupting the final steps.

Lang was apparently satisfied with his corrections, and he turned toward me. I could see he was going to try on me the same trick I had attempted on him. It was obvious his dance was better—such form! And from such an old man! If I stayed where I was I'd never have to worry about evening out my tan again. Running away would have just postponed the inevitable, so I did the next best thing. I ran *toward* him. This wasn't out of bravery, but necessity. The lightning hit harmlessly behind me.

Lang didn't wait for me to get to him. He reached his hands over his head, locked fingers, rose on one foot and locked the other against his knee, and then the old fox jumped up and down. Clever. If I had been closer, I could have dodged it. But I wasn't and I didn't. A cloud opened and dropped a load of water on my skull, soaking me and knocking me flat on my stomach. I sucked some of the water into my lungs, coughed, and struggled to catch my breath.

I could see Lang move in for the kill. He began to tap dance as fast as he could—even in my sorry state, the calm swooping motion of his arms impressed me. I felt the same hot air I did earlier. I barely had strength to stand. I saw Lang laugh. He was enjoying this.

I groaned and managed to get on my feet, spit ot the reamining water, and do you know what I did then? The *Charleston.* It's known as a joke dance, a hack. Nobody teaches it or uses it because its effects are unpredictable. Since our job was making order out of chaos, the *Charleston* was scorned.

You've probably never heard of it, so I'm going to tell you how to do it because some day it could save your life, too. Incidentally, all our official dances are written in form of dense mathematical equations, for obvious reasons. Takes years to learn how to read them. This one is simple, so we don't need the math.

Start by squatting about three-quarters of the way down. Put your knees at wide angles from your body. Place your left hand on your right knee, and your right hand on your left knee. Keep them there as you move your knees toward each other. When they touch, switch hands so that your right hand is on the right knee and vice versa. Then swing your knees back out, and back in again, crossing your hands each time your knees meet.

Once you get good at this, you look like you're made of rubber. Fluidity is the key. It was what allowed the wind blast that was directed at me from behind to flow over me, like a climbing roller coaster. The old saw that "air that goes up must come down" held, as the air that came up went back down under Lang's feet, just when he was starting his last jump.

It was simple: the extra force popped him up like a cork from a champagne bottle, right at one of the swirling vortices that he had created. The wind snatched his body and flung it upwards at a tremendous velocity—so fast I couldn't follow—but fast enough to have shot him straight into the stratosphere.

Now, I don't want you to worry. It wouldn't be the eventual fall that was going to kill him. Because it was damn cold up there, and there wasn't enough air to fill his lungs, he'd freeze or suffocat long before he hit the ground.

With Lang gone, the wind decreased and the vortices dissipated. I straightened painfully and caught my breath, wondering what else was broken.

I went to Lang's cabin and looked around. A cot, electric stove, cans of stewed tomatoes, refrigerator, empty bottles of Irish whiskey, an exposed toilet in the corner, a ceiling bulb, ancient copy of Holton, and pages and pages of dense mathematical script. His master theory. My expertise was limited to reading dances, but I could tell this was sophisticated stuff, so I collected it and put in a call to Rapheson, betting the interference would be gone.

It was. I told Rapheson what had happened, and since but my gray matter was thawing fast, I wasn't surprised at his calm reaction.

I finally mentioned the pile of Lang's work that I found and Rapheson perked up.

"Wonderful, Mr. Blackfox! Protect those papers. Save *The Last Dance* for me."

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