

What I Know about Quantum Mechanics (the Uncertainty Principle)

After seven years at this university, this is what I know of quantum physics:

1. *Energy is not continuous. Rather it comes in small, discrete units of energy.*

Each night when you come to my apartment—and I have learned to never expect when or if you will come—you show up at my door with a quiet double knock. As if we need some secret code. Something to let me know that it is you and only you. As if there is someone else who might come.

When I open the door wide, you sneak in. Only after the door has closed do you press me against the wall. And then your mouth is dry and angry and hard as it searches mine—as if you are looking for all the words I might speak to others. You show no patience. Only after this kissing do you take off your shoes. You place them besides the door. You lay your coat across the arm of the sofa so my little dog won't lay on it. Only then do you ask how I have been.

2. *The elementary particles of quantum physics behave both like particles and waves.*

Not much later, upstairs in my big bed, your fingers reach for my chest, grasping at the untanned parts of my skin. Sometimes I close my eyes and tilt my head back, exposing my neck to you. I make, you tell me, mewling sounds. And your hips move until I am raw and sore—in a thankful way for the most part.

Afterward, I feel filled, not necessarily by you, but filled nonetheless by something I struggle to understand. These moments are when I stare at your face, your thin beard, your thin nose. I stare into your eyes that always seem as blue as crystalline snow.

3. *The movement of these elementary particles is inherently random.*

Then I fall asleep while you lean your arms on my windowsill and smoke a cigarette. As I am fading off—so close to sleep—your

smoke-wisps curl around themselves, like two lovers desperately holding on, but to what I can never figure out. By then I am too near sleep.

When I wake and put on my bathrobe, it is early afternoon, or even into dusk, and you are downstairs reading my graphic novels—a quirk of mine you say you find endearing—or eating my French bread in the kitchen, always with olive oil.

Or maybe you are gone and the front door is again locked. Then the house seems emptier, quieter than I expect. Just me and the little dog. Though I woke knowing you would be gone and that you should be gone and that you must be gone. But knowing doesn't make this apartment any less quiet.

4. It is impossible to know both the position and the momentum of a particle at the same time. The more precisely one measurement is known, the less precise the measurement of the other becomes.

When I say, *Stay*, you say, *You know I can't*. Still, I say it again, *Stay*. You never face me when you say these things. You stare at the windows, even if they are draped. Or at the tallest branches if the blinds are drawn.

But when you are taking a bath with me—maybe it's a Tuesday morning when neither of us teaches—you cup my face in your hands and kiss me. I think of what might be—you could leave her, move in here, it's not too late for children.

5. The atomic world is nothing like the world we live in.

I sometimes wonder what I am doing here, or rather what I am doing with you. Why do I invite you over—week after week? I know what I want. I know what you want. I know what I want. But knowing doesn't make these wants the same. It's like trying to know the position and the momentum of a thing. The more one tries to bring them together, the more they become irreconcilable.

When students ask where quantum physics sprang from, I tell them:

Toward the end of the nineteenth century, the science of physics had

been nearly perfected, but then the models that explained things on humanity's scale failed to apply to the ultrasmall, the ultramassive, and to interactions at the highest speeds.

The first day we met, really met, it seemed as if what I had known before—of love—was something else entirely. Not wrong or nothing or useless. Just not this. Just not what you and I have.

It wasn't long after our first meeting in the Holt Hall of Science that I held out my hands and you filled them up as if they were a cup. Though, like always, I expect you to say, *Show me the proof.*

When my students ask how quantum physics has changed science, I say in these ways:

1. *Relativity theory showed that time does not pass at the same rate for all observers, that matter can convert to energy and vice versa, that time progresses more slowly near massive objects.*

We went for that walk through the cedar forest. It was late autumn. Remember?

The clouds had settled down almost against the earth. It made everything both more mysterious and more romantic. We had gotten lost. As I grew nervous, you held my hand and said, *Shhh.* You said, *We're nowhere if not here.* You pointed at the muddy trail. The scientist in you can never disappear. Nor in me.

We made it out of the woods just after dusk. You pressed me against the car door, and as you kissed me, I felt the metal soft against my back, my shoulders. The last thing you said that night before we drove down the mountain—back to town—was, *My wife is waiting. We better get going.* Then you started humming.

2. *Photons and electrons do not have location and a traceable trajectory between the point where they are emitted and the point where they are detected.*

As a young girl, my favorite song was "Wildfire" by Michael Martin Murphey. I sang that song every day—*On a dark flat land she rides / on a pony she named / Wildfire.* God, I sang that song every day.

I wanted nothing more than to break a wild pony—though gently—so she would love me like I needed to love her. But I was a town girl living in a vinyl-sided house on a cul-de-sac. I never lived near where wild horses—only married men—ran.

3. *Physicists have warned that if one comes up with some explanation of quantum physics that makes sense, then that explanation is likely to be flawed.*

I think again about my childhood. Surrounded by a world of little girl dolls with porcelain faces and plastic faces and fabric faces. I named each doll. I was so careful with their namings, knowing that a name can last a lifetime—or until a woman gets married.

Looking back from this great distance in time (though I've long ago learned that time doesn't work this way), I realize that I had no male dolls. I had Raggedy Ann but no Andy. I had so many Barbies. Not a single Ken.

After undergraduate studies, a master's and PhD, and now tenure, this is what I know to be the end result of quantum physics:

It is physically impossible to know both the position and the momentum of a particle at the same time. This is the Uncertainty Principle.

It is night now—the third snow of this winter. Our third winter together. Yes, I count things. And tonight I am out for a walk. My little dog comes with me. I tell myself that I am just wandering this town—that I have no idea where I am going, that I'll let the little dog lead me.

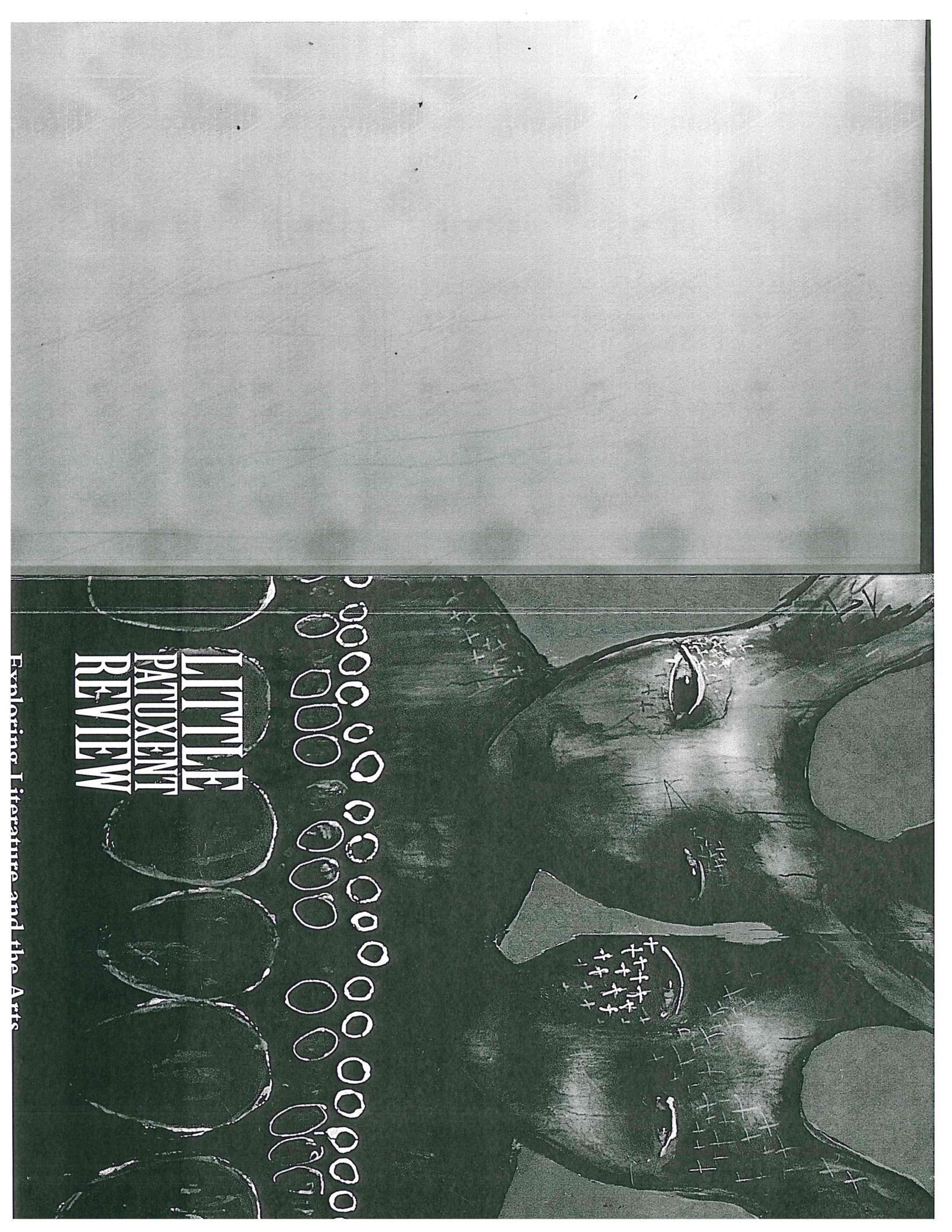
I end up outside a house. I tell myself that it is your house, though I have no idea. You said, *It would probably just make things harder*. This house that I choose, it is glowing—lights on in almost every room. The drapes and blinds thrown open even on this frozen night, as if saying, *Look inside at the love that lives here*.

There is a woman sitting in a chair reading a book. I struggle to make out the title. I lean in closer and closer toward the

window. In the darkness, I have no fear that the woman will ever see me. For some reason, I need to know what book she reads. As if that will tell me everything I ever need to know about her.

The little dog and I stand on the sidewalk as big soft flakes land on us, whitening us, until—finally—a man walks through the living room. I tell myself it is you. I tell myself that it is you. Now I can turn around and leave because I know for certain your position. I just hope that your now unknowable momentum leads you away from this house and its shining lights.

As I walk home, I no longer worry about my trail of footsteps left in the snow that lead from my house to your house and back because I know that I—like those photons and electrons—will never leave a traceable trajectory.



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