

## The Tyranny of Prescience

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“For a quantum physicist, you sure have a disdain for uncertainty.” Matt chides me.

“Well then, you can deal with Vadym when he finds out that his fifty-thousand dollar single photon detector array and half-a-million dollar micro-positioner are being kept on twenty-four seven to satisfy your mischievous urges.”

“Nah, it’s cool bro. He’ll think it’s awesome. Have a fun time with your slits.” Matt winks at me and leaves for a weekend of doing whatever neat stuff 20-somethings like me should be doing.

It’s just past noon on a Saturday. Laser trade off time. Matt gets the laser from Friday at noon to Saturday noon, I get it until Sunday noon. We are both grad students in a quantum optics lab run by the renowned Dr. Vadym Tereshchenko, world expert and record holder in the field of quantum memory. Sounds impressive, right? Except that I currently do nothing related to the scientific revolutionary project that is the quantum memory. I work with optical slit experiments, doing various quantum games that confirm theoreticians pet quantum oddities but have absolutely no application to anything useful.

Matt, on the other hand, is the lab’s golden boy. He built and ran Vadym’s quantum memory array. It can store and read out the quantum states of 10 different photons for distances lasting up to 10 seconds. 10 seconds! When I started my grad degree the world record for coherence was 2 photons for 4 micro-seconds. Matt built that, all with an air of a chill, relaxed frat boy.

Matt’s in thesis writing mode now, but for shits and giggles he set up the quantum memory as a source of RAM on one of the lab’s computers. It is such a futile endeavor. Ten bits of memory is nothing compared to several gigabits of stable transistor-based memory. All he is accomplishing is leaving on expensive lab equipment with limited lifetimes. Vadym will eventually hear about this and he might not find it as funny.

But Matt has a different relationship with Vadym than I do. Vadym treats Matt like an adult nephew, or a junior colleague. I, on the other hand, am terrified of Vadym, and I’m fairly certain that he also sees me as lazy and incompetent.

It is such a shame, because I am sure I could shine if I were more involved in my project. These quantum slit games are interesting, but nothing to write home about. They aren’t easily explained to my parents, and they won’t impress future employers.

What I would really like to do is re-tool the quantum memory array to perform the world’s largest simultaneous quantum state teleportation. I have a folder on my desktop full of ideas, of part numbers and experimental plans. But I have never brought it up to Vadym, because he seems so invested in finishing the project he assigned to me, and it requires a major investment in parts and lab space. It seemed like too much to ask of a grad student who he probably already sees as a lost investment.

And yet I still keep that folder, and keep adding to it every time I read an interesting paper on teleportation. It keeps me up at night, knowing that there is a project I was meant to do so close to my reach. I don’t know how Vadym feels about it, and considering how I think he feels about

my abilities, it's not something I risk. He will probably be mad at me for sinking so much time into researching a project I shouldn't have even considered. If only I could get inside his head.

It's an hour into my shift now. Everything is behaving nicely in the slit experiment. I just finished off another video of a Japanese house cat jumping into boxes. My grandmother calls on skype. I keep skype on in the lab computer so I can bug the lab tech when the humidity of the lab changes drastically. Most of my family members know not to call me even on Saturdays because I won't answer, but not grandma. Time to play the game. Should I answer and tell her I can't talk, or should I hang up, knowing she'll call again immediately after? Well, let's see how many rounds of this we can do this weekend. I press the red phone button.

About two minutes later, skype crashes. Weird. Windows shows me the core dump, and it is massive. Weird. I open up the dump and realize it's a binary file. Last weekend I taught myself how to pipe binary data to the audio card on linux machines because I read a cool internet post about generating minimal music using C. I copy the file over to the linux partition and run it.

The first couple of minutes are rubbish. Probably not audio data. And then I hear my voice.

"Hello grandma, can't talk now, I will call you tomorrow evening."

"Good, good, Rhea. Are you going to your auntie's birthday party next Tuesday?"

"Yes grandma, I'll see you there. I really can't talk right now."

"Well I got her the cutest antique cookie jar from the Springhill flea market..."

"Goodbye, grandma."

And the file goes back to random noise.

This is so weird. I have only one aunt, her birthday is this Tuesday. But I don't remember having this conversation. It is like I am listening to the conversation I would have had with my grandmother had I answered the skype call.

I call my grandmother, to confirm. I ask her whether she has bought my aunt an antique cookie jar for her birthday. She seems frazzled, and then accuses her husband of spoiling the surprise by telling everyone about it.

Then an insane thought occurs to me. What if adding the quantum memory array to the lab computer's hardware somehow increased the coherence length of the bits in the computer? It's a question we ask ourselves constantly in the course of quantum optics experiments. The quantum state will decohere when measured, but where does that measurement occur? Is it when the photons hit the detectors? Is it when the signal from the detectors hits the electronic logic? Is it when the electronic logic interacts with the lab computer, or even when we observe the data on the screen? To a philosopher, all these scenarios seem equally plausible. To a scientist, we say that electrons are much heavier than photons so obviously it couldn't possibly extend past the logic and interpret our results as such.

But maybe the quantum memory is extending the coherence length to the internal state of the computer, and thus also my actions on the computer, and when the conversation on skype ended, it caused the state to decohere, and skype crashed because it had two records in its

cache for the same period of time.

No, there's no way that could possibly happen. I think about telling Vadym or Matt about this, but then realize that I will look like one of the cranks who occasionally emails us with their pet theory of everything.

I reboot skype in the hopes of getting another crash. I stare at the contact list. Williams comes online. His name isn't really Williams. I call him Williams because he wears skinny jeans and shirts from H&M and is obsessed with fixie bikes- like someone from Williamsburg. We are both teaching assistants for the same large first year class. I have had several flirty conversations with him during tutorials, but I can't tell if he's really interested in me or whether he's just flirting with me out of boredom. I've seen the type he dates, they're definitely not like me. He dates outside of physics, women who look like models for American Apparel.

I should add that Matt loves to make fun of Williams and his hipster tendencies. I always defend him even though if I didn't have a stupid crush on him I would agree with Matt.

Skype crashes again. Again I take the core dump and pipe it to the audio card.

"Hey" a hesitant me says, "do you want to hang out somewhere where there aren't a bunch of teenagers?"

Whoa, this is the clever line I've gone over in my head a million times trying to come up with the most nonchalant way of asking him out.

"You mean, like a date?" I hear Williams boy say.

"Um... yeah. I guess."

"Oh. Don't take this the wrong way, I like talking to you but you're really not my type."

"Okay. See you next lab."

And the audio ends.

In some alternate history of the past two minutes, I got rejected by a guy who wears purple and green plaid shirts and thinks Foster the People is a great band. I have made my working relationship with him very awkward. But in this one, I'm still his acquaintance who is neutral to him. I mean, getting rejected still sucks, but at least I did it while saving face.

When I was in junior high, I tried to figure out which boy would ask me to to the dance by ranking all the girls at my school versus all the boys, and then estimating the probability that I would get asked out by a dividing the number of boys by the number of girls who outranked me. Having now studied more statistics, I realize that you can't apply the equipartition function to this situation because being asked out by each individual boy are not equally probable events. Boys can be gay, not settle for less than their ranking, or just hate stupid junior high dances. I hated junior high dances, for that matter, but I just longed to be asked out, or at least know what my odds are.

I still do that when it comes to dating. I don't like imperfect information, so I usually don't make any moves. But now, with the quantum memory, it seems like I have the ability to attain some

fraction of additional information.

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I start trying to negotiate with the other grad students and post-docs for more laser time. Matt's attitude to me has changed. I have stopped riding him about leaving the quantum memory on for extended periods of time. I have also joined in with him in mocking Williams.

Another thing I have discovered is that skype doesn't crash unless I have an actual intention of making the call I would like to hear. I will never hear myself telling my grandmother off for calling me at inappropriate times, because I would never do that.

In the extra lab time I harangue out of my colleagues, I discover from skype crashes that the department chair will not let me cut back on my teaching hours for the next semester, that my aunt really wants a new watch for her birthday, and most surprisingly, that Matt does not think I am an incompetent researcher, and that he is actually intimidated by me. Apparently he is impressed that I have taken on such a theoretical project, compared to his, which is basically engineering.

I would never have thought that Matt thinks so highly of me. I guess all grad students suffer from some form of impostor syndrome, even the golden boys.

My new-found confidence in my research abilities pushes me to actually call Vadym and tell him about my teleportation idea. I practice my elevator pitch over and over again, trying to figure out the right amount of flattery to work in.

Heart racing, I deliver my spiel. At the end, his response is:

"An interesting extension to Matt's project. Why don't you make a budget and a grant proposal for me and we'll work from there."

My life is awesome!

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Matt stops by the lab more often now to talk to me. I think he's jealous of the teleportation experiment. Williams shows me some photos from this DJ-ing set he did on the weekend. He's flanked by women who look like they need to stop wearing clothes meant for children and eat a sandwich. It hurts, a little, because I know I will never be like them. Whatever, my life's ambition is not to be sexually harassed by Dov Charney.

Williams tells me that dubstep is over because he saw one of the undergrads wearing a Skrillex shirt. I laugh in his face.

When I repeat what Williams said to Matt, he gives me a high five. It becomes an in-joke between us. Blue is so last season; I saw an undergrad wearing a blue shirt. Our university is lame; I saw an undergrad wearing a shirt with its name on it. Or, my favourite, shoes are so mainstream; I saw an undergrad wearing them.

I really misjudged Matt. Even though he comes off as a laissez-faire frat boy who coasts through

life on his rich parents and bros, he's really not like that. He's not careless, he just chooses to go with the flow of life, and to consider the emotional investment in every project. For example, he knows that if he spent 70 hours a week studying, he could get a perfect grade point average, but that he can get a less than perfect but still adequate GPA by studying 30 hours and spending the other 40 hours having a life.

And get this – Matt loves board games. All those weekends I imagined him getting trashed at the swim team's house parties, he actually spent playing role-playing games with his childhood friends over skype. Is that not adorable?

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I think Matt and I may be dating.

He's been coming over to my apartment outside of work recently, nominally to “try out new games”. I suck at board games. As always, my anxieties about imperfect information get in the way of forming a cogent strategy or reacting to his moves. I can beat him in the first round, when the game is new to both of us by playing a less risky strategy, but he adapts better and learns from his risks.

I thought perhaps he enjoys playing against me for the feeling of accomplishment from beating someone who beat you in the first rounds, but it seems to be something else. Last night he asked me if I found him attractive. I said something awkward, like “I guess, for someone who wears hats from the lids store.”

And then he leaned in and kissed me. I should also note that this was after consuming a couple of litres of wine between the two of us, so it's probably nothing.

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Yes, we are definitely dating.

Matt's modus operandi when it comes to romance is very different than mine. I spend months wondering if some guy would make a good potential boyfriend, then even more time trying to figure out the best way of asking him out, like I'm a hunter trying to trick my prey into a trap. He honestly didn't think of me as someone he'd date until a week ago. He treats his social network like a drunkard's walk.

Matt doesn't go in expecting a long term relationship. I usually avoid guys unless I can see myself in five years with them. Matt is just happy with what he gets.

I haven't gone back to analyzing the skype crashes in a long time. Other research group members have ranted about skype crashing, but they haven't discovered why. I have been engrossed in plans for the teleportation experiment and spending time with Matt.

He even went to my aunt's birthday party with me. My grandmother really loves him. Maybe a little too much: she asked him to come dance with her at the swing band concert at the local retirement village.

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If I have one complaint about Matt, it is the gambling.

Matt loves board games, as I have said previously, but he likes more than just innocent games where you pretend to be a sheep farmer or a vampire hunter. He also like to play online poker.

He claims that he has figured out how to always pick winning tables at online poker sites and then beat the newbies using math and memorization. He claims he only does it to relax, after all his grad student stuff is taken care of, and that he always makes back his money.

But he's supposed to be writing his thesis. He devotes the time in his day when his brain is fresh to playing poker instead of writing.

I don't want to be emotionally invested in someone with poor financial judgement. What if three or four years from now we get married, and then our finances are merged, and he gambles our shared finances away? What if he has poor financial judgement in other parts of his life, like he joins some multi-level marketing scheme or rents things from easyhome? I should get out now.

I really hoped I wouldn't but I am falling hard for Matt. I don't want to push him away, but his gambling is freaking me out.

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So I go back to the lab and hope to get an answer. Skype crashes, but it's nothing useful. Williams wants to know if I will cover his proctoring assignment. Grandma calls to tell me about her glaucoma surgery. Nothing from Matt.

What am I doing? If this is causing me so much stress, why don't I confront him about it? Surely when he sees how distressing his gambling is, he will stop for my sake. I am sure he cares about me enough to do this one thing.

I call him.

"Matt," I say. "Your gambling worries me."

"Gambling?"

"Online poker."

"Oh, don't worry babe. I'm on a poker fix now, it will go away when I get closer to thesis deadline and realize how much work I have. Don't worry, I always pull through."

"Don't you think you have a problem?"

Matt laughs.

"No, Matt, I am serious, this is seriously bugging me. Are you dense? Can't you see the warning signs? Why can't you stop playing, at least while you write your thesis? "

"Because I don't want to."

"I don't think you realize how serious this is to me. I'm not sure I can make this relationship work

if you're going to cause me this much stress.”

“What, are you giving me an ultimatum? I'm sorry, Rhea, but I don't think I can make this relationship work if you're going to control me with insane demands to satisfy your own insecurities. We're done.”

Matt ends the call, and I think also our relationship.

In some other alternate history of the last five minutes, I have not caused my boyfriend to dump me. I didn't make that call, then skype would have crashed, I would have listened to the conversation the me in this history had, and re-evaluated my priorities. But that is not the history that I am in, and my life sucks.

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Matt finishes his thesis ahead of schedule. When he comes in to drop off the draft to Vadym, he drops off a few of my things: a toothbrush, a hair elastic, and some unusual spices I bought for a meal I made him. We really weren't together very long.

Dropping off my stuff on the same trip as his thesis is an emotional double whammy. By the way, we are over, and you are an idiot, he means to say. It looks like he was right, this was just a fix. He tells Vadym and a postdoc that he plans to spend two weeks on a bicycle trip to visit his hometown. No cell phone, no internet. Cut off from the world. This is not the behaviour of someone who is addicted to internet poker.

I guess I was wrong. I shouldn't have freaked out about this. We were too soon in our relationship for me to be making demands like that. It was a dick move.

I miss Matt.

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Matt's leaving for his bike trip tomorrow morning. I should accept now that it is over, permanently. I bury myself in lab work to avoid that acceptance. It works about as well as a perpetual motion machine, meaning it doesn't.

Every little thing in the lab reminds me of Matt. The quantum memory array, the university annual report where he drew moustaches and devil horns on all the university executive, the Optimus Prime Shepard Fairey Obama 08 poster parody that reads “Change – into a truck”.

Sunday at 7 a.m. Skype crashes again. Unlike the other times, I don't immediately listen to the dump. I don't think this conversation will tell me anything interesting. Probably my grandmother. But I'm eventually I'm bored and distracted enough to listen to it.

“Matt” I hear myself saying. “Please hear me out. I was wrong, and I'm sorry. You obviously don't have a gambling addiction. I am a massive toolbag, but I miss you so much. Can I get a do-over?”

“Rhea, I missed you too. I want to make this work.”

I stop the file. Matt want to take me back? This is awesome. I think he hasn't left on his trip yet;

I can get to him in person. I grab my coat. As I leave the lab, I notice the temperature of the quantum dot array micro-positioner is about 2 degrees warmer than it should be. That was an expected side effect of leaving the micro-positioner chiller on constantly. It's probably got less than 24 hours to live, but I don't have time for the proper shut-down sequence.

I catch Matt as he is checking the pressure on his bike tires.

"Matt!" I yell, "I want to get back with you."

He gives me a quizzical look and says, "okay."

"Yes!"

Matt gets up. "Whoa, sorry Rhea, I was saying okay as an acknowledgement to your statement, not as an affirmative. I do not want to go out with you."

"Come on Matt, don't lie to me, I know you've missed me."

"How do you know that?"

"Matt, I know you."

"Like how you 'knew' I had a gambling addiction?" he says defensively. "You don't know me, Rhea."

"But that can't be. I have my sources." I stare at him blankly. Do I confess? Do I make myself out to be a crank? Matt stares back at me.

I tell him everything. My aunt's birthday present, hearing about how Williams turned me down, about knowing that Matt respected my ability as a researcher, and how wonderful having access to all this information is. Matt doesn't say anything.

"So," I say. "I know that all sounds crazy. But please answer, what do you think?"

"I think I was right not to take you back. You are crazy, but not because you believe in some exotic quantum theory, but because you can't handle not knowing the future. Instead of trusting people and yourself, you huff and puff and get yourself all worked up about things that may or may not happen. Yes, Rhea, I missed you. But that does not mean that me, at this moment, wants to take you back. That was some other Matt that took you back, not me. And you have to accept that."

"Matt..."

"No, Rhea, I'm done. That's my final answer. If you're going to cry, please do it somewhere else. I have a lot of shit to get done before my trip."

I turn around. The funny thing is, I don't cry. In plenty of other similar situations, I would have, but now I merely feel perplexed. Maybe in the alternate history I caught Matt at a better time, or maybe if I had started with a more sincere apology I would have gotten a different answer. Maybe I need to accept that in this history, that is how the cookie crumbles and I am never getting Matt back.

Maybe I need to accept that perfect information does not lead to happiness, and it is better not to know the alternatives.

A couple hours later I get an email on the research group mailing list. The chiller on the micro-positioner died, causing the micro-positioners to break. It will take a month and several thousand dollars to repair. Vadym is confused as to why the chiller failed so quickly, but is otherwise nonplussed.

When the replacement comes, I try to get the quantum state to cohere to the rest of the computer, but I can't get it back to the place it used to be. I decide that in the interest of the equipment's longevity, and my sanity, keep it apart from the computer.

And then I load another cat video.