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Time Machines and Predictors are Possible but Unlikely

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The concept of time is prevalent in Ted Chiang's writing. In "The Merchant and The Alchemist's Gate", Fuwaad and other characters travel back and forth in time through the Gate of Years. In "What's Expected of Us", a device called a Predictor always flashes green a second *before* someone presses its button. And, in "Story of Your Life", Louise and the Heptapods experience the past, present, and future all at once.

These stories beautifully demonstrate that both time travel and infallibly predicting the future are possible. But, if, like me, you'd love to have a time machine or a Predictor, don't get your hopes up. With just a little philosophy, we can see that these technologies, though possible, are unlikely to ever exist. No engineering or physics required.

Why Time Machines are Possible

The word *possible* is tricky. Sometimes when we say something is possible we mean it's consistent with current technology. Self-driving cars are technologically possible, but flying cars are not (yet). Sometimes when we say something is possible we mean it's consistent with the laws of physics. It's physically possible (though extremely unlikely) for me to run faster than Usain Bolt. But it's physically *impossible* for anyone to run faster than the speed of light. When I say that time machines and Predictors are possible, I'm not talking about technological or physical possibility. I'm talking about something much broader, which philosophers sometimes call *metaphysical* possibility.

Almost everything is possible in this very broad sense. It's metaphysically possible for there to be flying cars. It's even metaphysically possible to run faster than the speed of light. As the great sage and power forward Kevin Garnett once said: "Anything is possible!" More precisely, *almost* anything is

possible. The main exception is this: contradictions are impossible. A contradiction is a situation in which a sentence is both true and false. For example, it's contradictory to say both that I am in Portugal and that I'm not in Portugal. It's possible for me to be in Portugal. It's possible for me to *not* be in Portugal. But it's not possible – metaphysically – for me to both be in Portugal and not be in Portugal at the same time. That's a contradiction.

So, when I say that time machines and Predictors are possible, what I mean is that both of those technologies could exist without anything contradictory happening. How do I know this? Well, for one thing, Ted Chiang has written entertaining stories about these technologies with no contradictions. This is no small feat. Many time travel stories and many stories about infallible predictors (or oracles) contain contradictions. Consider this very short and very cliché time travel story:

### *Changing the Past*

Eighty years after the Holocaust, a scientist builds a time machine. She travels back in time and kills Hitler when he is a baby. As a result, the Holocaust never happens.

Can you spot the contradiction? The first sentence contradicts the last sentence. The first sentence says the Holocaust happened and the last sentence says it never happened. An event can't both happen and not happen; that's a contradiction. So, this story is not only cliché. It's impossible.

In fact, any story about someone changing the past is contradictory and thus impossible. This happens in a lot of stories. Let's take a famous example: the movie *Back to The Future*. It's initially true in the movie that a car hit Marty McFly's dad in 1955, which led to Marty's parents falling in love. Marty then travels in a time machine from 1985 to 1955 and pushes his dad out of the way so that the car does not hit his dad. The car hits Marty instead, Marty's mom becomes enamored with Marty, and hijinks ensue. This is a contradiction. Either the car hit Marty's dad, or it did not. It's impossible for it to be true that the car hit Marty's dad *and* that it did not. The number one rule of time travel is this: you can't

change the past. It's impossible to change the past, because doing so would create a contradiction. Don't get me wrong. I'm not a snob. I love the movie. It's just contradictory and thus impossible.

But, and this is a subtle point, even though it's impossible to *change* the past, it's still possible for a time traveler to *affect* the past. Ted Chiang's "The Merchant and the Alchemist's Gate" illustrates this difference between changing and affecting the past. Raniya, the wife of the wealthy merchant Hassan, enters the Gate of Years and travels to Cairo twenty years in the past. There she enacts a clever scheme (with the help of her older time traveling self) that prevents Hassan from being killed by bandits. After saving Hassan's life, Raniya instructs him "in the art of love", without him knowing that one day he will marry her. Note that Raniya is *not* an invisible time traveler who quietly observes but does not affect the past. She affects it vividly, both in saving Hassan's life and in sleeping with him. But – and this is the key point – in doing so she does not *change* the past. There is only one timeline, and it is one in which Raniya "always" saves Hassan's life, and then they subsequently sleep with each other. There's no alternative timeline where these events don't occur.

Even though it's impossible to change the past, there's nothing to stop a time traveler from trying. In "The Merchant and the Alchemist's Gate," Fuwaad knows that his wife died twenty years ago in a horrific accident. He travels from Baghdad to Cairo, enters the Gate of Years, travels twenty years back to the past, and then travels back to Baghdad to try to save his wife. Due to a string of unfortunate events, including a sandstorm, he gets there too late, just a day after she died. This is unfortunate, but not impossible. Since Fuwaad fails to change the past, there's no contradiction. His journey, though unsuccessful in some respects, is still invaluable. Shortly after Fuwaad discovers that he has arrived too late, a nurse who was with his wife when she died passes along a loving message to him. This illustrates how, although the past is unchangeable, time travelers may affect and be affected by the past. Fuwaad is *affected* by the past—his wife's message deeply moves him.

So, nothing contradictory happens in "The Merchant and the Alchemist's Gate." Strange things still occur. One of the strangest things enables Hassan to be wealthy. Hassan as a younger, poorer man enters the Gate of Years to go twenty years in the future. There his older, wealthier self tells him where to

find buried treasure in the desert. He goes back twenty years into the past and finds the treasure. How did the older Hassan know the treasure's location? Well, he learned it when he was twenty years younger from his then older self in the way I just described. If you stop and think about this, it's strange. Really strange. Younger Hassan learns the treasure's location from Older Hassan, who in turn learned it from Older Hassan when he was younger. But what explains how "they" know the treasure's location in the first place? There's no explanation. Or, as Older Hassan says: "there's no explanation except that it was the will of Allah, and what other explanation is there for anything?"

Philosophers call these scenarios *causal loops*. An earlier event causes a later event, which in turn causes the earlier event, which in turn causes the later event, and so forth. Although each event in the loop has an explanation there's no explanation for why the entire loop exists (other than perhaps Allah's will). As David Lewis explains: these causal loops are strange but they're not impossible.<sup>1</sup> It's strange for something to happen without a bigger explanation, but it's totally possible. There's no *contradiction* in Hassan learning the treasure's location from his older self, aging twenty years, then telling his younger self the treasure's location. It's just strange. But I never claimed time travel would be ordinary. Just that it's possible.

Ted Chiang is not the only author to tell a strange yet possible time travel story without any contradictions. Robert Heinlen's "All You Zombies" and Audrey Niffenegger's *The Time Traveller's Wife* are two of my favorites in this genre. But few authors tell possible time travel stories that are as moving and as memorable as Chiang's "The Merchant and the Alchemist's Gate".

### Why Predictors are Possible

Just as "The Merchant and the Alchemist's Gate" illustrates how time travel is possible, Chiang's "What's Expected of Us" illustrates how infallible predictors are possible. Infallible predictors, unlike

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<sup>1</sup> This entire section is heavily influenced by Lewis's classic paper "The Paradoxes of Time Travel" (1976). It's my bible on the subject.

meteorologists, make only accurate predictions. Many different kinds of things could be infallible predictors: an all-knowing god, an oracle, or, as in “What’s Expected of Us,” a Predictor.

Predictors have a button that, when pressed, sends a signal a second into the past that causes a green light on the device to flash. So, if you have a Predictor that is flashing green you *know* you will press its button a second from now. Likewise, if your Predictor isn’t flashing green you *know* you will *not* press its button a second from now. In this way, Predictors make only accurate predictions. Granted, their power is limited. They can’t tell you how the stock market will do or even what the weather will be. But they tell you with absolute certainty whether or not you will press a button a second into the future. That’s still pretty cool, and I would want one.

Maybe you wouldn’t want one, because you worry a Predictor would reveal you don’t have free will and cause you extreme distress. That’s how many people in the story respond. I agree with Mark Balaguer who argues in this volume that extreme distress would be a gross overreaction. Let us set aside the question of whether Predictors are *desirable* (as I think they are) and focus instead on whether they are *possible*.

In order to appreciate that Predictors are possible we need only remind ourselves that there’s a big difference between saying something is strange and saying that it’s impossible. Whenever a Predictor flashes green the person using it presses its button a second later. Whenever the light is not on the person will not press its button a second later. There’s no exception to these rules. An exception would cause a contradiction, given the story’s stipulation that Predictors are infallible. But since there’s no exception nothing contradictory happens. Infallible predictors are strange but not impossible. Of course, I’m not claiming these devices are technologically or physically possible. I’m merely claiming that they are metaphysically possible.

Chiang’s writing provides an example of another infallible predictor: Fuwaad himself. Fuwaad convinces a guard he is from the future by predicting that a governor’s son will be born with albinism. Soon after, that prediction comes true. Fuwaad is confident in his prediction, because he is from the future and remembers it happening. “The Merchant and the Alchemist’s Gate” ends with Fuwaad offering his

predictive powers to the Caliph of Baghdad. Assuming that there's nothing wrong with Fuwaad's memory, he is an infallible predictor. His predictions will come true, because, just as there's no way to change the past, there's no way to change the future. Doing so would cause a contradiction.

### Why Time Machines and Predictors are Unlikely

Even though time machines and Predictors are possible, I'm convinced they are unlikely to ever exist. This is due to an argument about time travel originated by Paul Horwich and defended more recently by Katrina Elliott.<sup>2</sup>

Here's the basic idea. Suppose people were to have time machines. What would happen? Some people would go to the past to witness some famous historical event, maybe a concert or something like that. Many others, however, like Fuwaad, would try to change the past. It's very natural to *try* to change the past. Fuwaad is convinced he cannot change the past, but still can't help but try. I'd probably do the same. It's human nature.

No time traveler, however, would successfully change the past. Because doing so, as we've seen, is impossible. So, *something* would stop them from changing the past. In Fuwaad's case there's a string of unfortunate events, including a sandstorm. Fuwaad is unlucky but not uniquely so. Any time traveler who tries to prevent a loved one who died in the past from dying will fail. They'll have a sudden heart attack, or their mode of transportation will fail them, or they'll slip on a banana peel at the most inopportune time, or something of that sort. Even if thousands and thousands of time travelers try, they will all fail, just as Fuwaad failed. For each time traveler there will be a coincidence, or, as in the case of Fuwaad, a string of coincidences that will thwart their plans.

We can now see why time travel is unlikely. If time machines were ever available, many people would try to change the past. They would all fail, due to unlikely occurrences. But so many unlikely

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<sup>2</sup> Paul Horwich (1987) and Katrina Elliott (2019).

things happening is, well, unlikely. So, it's unlikely that time travel will ever occur. That's Horwich's argument in a nutshell.

This argument doesn't say time travel is impossible. Just that it's unlikely. It's possible that if I flip a fair coin it will come up heads 100 times in a row. It's just extremely unlikely. It's also possible that I will make 100 free throws in a row next time I go to a basketball court. That's also extremely unlikely. We know that time travel is unlikely, because we know that time travelers will consistently fail at things that are very easy to do. It's possible for people to fail at things that are easy to do. Indeed, it happens occasionally. I can be a bit of a klutz and fail to do some easy things, like walk across the room without tripping. But it's unlikely I will fail to walk across the room without tripping most of the time or every time I try. And yet time travelers, if there were any, would fail at a ton of very easy things many, many times. So, time travel is unlikely.

We can extend this reasoning about time travel being unlikely to see that infallible prediction is unlikely. If a Predictor's light flashed green, I would try *not* to press its button for a whole second. It's human nature. Similarly, if its light were not flashing green, I'd try to "beat" the machine by pressing its button within a second. That, too, is human nature. But, no matter how hard I try, I would fail every single time to outwit the device. Some coincidence would cause me to press the button every time I would try to refrain—a gust of wind, a friend pushing me, a spasm. Conversely, something unlikely would prevent me from pressing the button every time I would try to press it—a sudden distraction or change of heart. I'm not unique. Many people with Predictors would fail in similarly unlikely fashion. Since such extensive failure is unlikely, Predictors are unlikely.

And here's the really strange thing. I haven't said anything sophisticated about physics or engineering. Unlike Ted Chiang, I know very little about physics or engineering. I'm just a humble, country philosopher. You might have thought that, in order to know whether time machines or Predictors are likely to ever exist, you should consult a physicist or engineer. But I've relied on very basic facts about human psychology, about whether time travelers would try to change the past or whether people with Predictors would try to "beat" the machine. I've relied also on very basic evidence about how easy it

is to do things like travel from Cairo to Baghdad when you've got plenty of time and means, or just refrain from pressing a button for a whole second. No physics. No engineering. And yet I can't see any flaw with this argument for time travel and infallible prediction being unlikely. So, although I'd love to have a time machine or a Predictor—and I'm convinced they're possible—I won't hold my breath.<sup>3</sup>

## References

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<sup>3</sup> Thanks to Mark Balaguer, Patrick Grafton-Cardwell, and Bradley Rettler for helpful discussion.