

EFFECT AND CAUSE

What does determinism profess? It professes that those parts of the universe already laid down absolutely appoint and decree what the other parts shall be.

William James (1884)

Today faith in unbroken causality is threatened ... by the representatives of physics.

Albert Einstein (1928)

Perhaps the most venerable of all the philosophical definitions holds that the world is deterministic just in case every event has a cause.

John Earman (1986)

The Copenhagen writings ... are permeated by the heavy rhetoric of finality, of inevitability of acausality, of the impossibility of a causal alternative.

Mara Beller (1996)

The view that causality is a more fundamental organising principle, even than space or time, is an ancient tradition of thought.

Fay Dowker (2005)

Ideas cause events.

Michael Gruber (2010)

A few weeks of this thinking resurrects the central angst of my existence. It wasn't surf that caused my uncompleted thesis. It was predestination.

That's the word I used before it overtook my education. The course outline said determinism. It had never caused me trouble under any label. The course taught that determinism's *not* about cause and effect. That's what it taught. It's not what I learned. Somehow I didn't get it. Even now I don't.

Whatever. That's a minor problem. What took me down was free will. The idea is, or was back then, that laws of physics rule the entire thing. Or, as James would have it, they decree the future. Mine included. And Reichenbach's; the laws of physics killed him just before he was to speak at Harvard in the fall of '53. From the grave his topic, 'Time and Free Will,' tells me that he might have had the answer or an answer that would ease my mind.

I tried to focus on my thesis topic. But in weeks I went from worry to obsession. All roads led me to the question of free will. In this very thing it seemed my mind was not my own to command. My hand—those days we wrote by hand—

could write of little else. In the end it made me crazy.

So the topic for today weighs heavy on me. I fret about it on the Metro; it's nearly seven but I find a seat. I need a way to break old mental habits. I need another angle. And as we pull into North Hollywood some kind of other angle comes to mind.

Scientists say 'So.' Just thinking it, it seems to echo in my head. They say it all the time. I notice when I listen to a science show. Mostly they say it as they start a sentence. 'So ...', as in: This follows from what was just said. It's not just a way of speaking. It's a way of thinking. Scientists see science as how causes cause effects. It's so ingrained that out of habit they say, 'So ...'.

Most people seem to see the world in terms of causes and effects. Of course they often disagree with others about what the causes *are*. And what the effects may be. This doesn't stop most everyone from trying to manipulate the causes.

A hundred years ago most physicists believe such trying is a waste of time. But most of them believe in time and, strange to say but so it seems, mostly do not waste it. The basis for their first belief is called causality. It's the concept that strict rules of physics govern causes and effects. With causality there's no room for free will. But with no free will how do they choose to not waste time?

The Copenhagen story says: We can't have QM *and* causality. QM, it says, is too good to give up so it's causality that gets to take a powder. Probability, says QM, determines everything. There is, says Copenhagen, no other possible interpretation; it has been proven, so shut up and dance. Liberty X, I say. Or is it Aer-smith?

Instead I bite the bullet: The philosophic side to this is called determinism. It says there is an unbroken chain of prior cause-effect events all the way back to the origin of the universe, all governed by the laws of physics. All his life Einstein is a determined determinist. Or rather, I should say, he clings to causality.

So could a good-enough computer predict everything forever? Well, it would need to know exactly where everything is now and what it's doing. And that of course is what QM says we cannot tell it. This seems straightforward. But as I read on it soon appears that nothing about determinism is straightforward. For starters, Earman says, 'A real understanding of determinism cannot be achieved without constructing a comprehensive philosophy of science.' Of course such a philosophy must give answers to such questions as: What is space? And: What is time? Without which it seems no one can ask: What is determinism? Nor give an answer to: What is causality?

So while I'm digging into QM and causality and Copenhagen by remote control, she's doing something in Genève in person. I know she's there because she had me book two nights in a hotel. Fine lake view, fine week-day per-night price,

800 Swiss francs, might as well be dollars.

What's in Genève? All I recall is the world's most spick-and-span youth hostel. Not. Could it be the big UN bureaucracy and its fancy restaurants? I think also not. And the chic nightclub scene—does she show any interest? A double not! I have an idea so I google geneva+physics just to check. Sure enough, the top hit is *CERN*. Its big physics lab's just out of town. In fact, of the top ten hits, seven turn on CERN. Odds-on it's where she's going. But she has me book her and she doesn't mention CERN? Does she imagine that I'm *not* about to check it out? As I piece together the causation story for Frank, only half my mind is on my work.

CERN? She must know that right now I am thinking of it. So she doesn't care. And she doesn't care that I can figure out she doesn't care. But why doesn't she just tell me who she's meeting? Whom, I mean. Because, I reason, she knows that then I'd sit here checking the *next* level. It's the only answer I can find that fits. What is she hiding? I've already answered my own question. She's hiding *who* she's meeting. *Whom*.

In the days before QM it is hard to find a physicist who doesn't think that everything's deterministic. After QM it's hard to find one who does. QM flips physics. But few philosophers let physics tell them how to think, so the debate goes on. It's a debate that leaves a problem for anyone who thinks they exercise free will. Neither side has much room for it. Simply put: There is no theory to support free will.

Of course there's no way Frank will solve this problem. But there's no way he can duck it either. It's built into the landscape that he's setting out to lurk in if not work in. It goes like this: If there is a beginning, whatever happens next, the next step, so to speak, must follow from the laws of physics. And the next. Until today. That's a deterministic universe. If the laws of physics don't say causes cause effects—if they roll the dice instead—then it's all up for grabs. But what happens if the laws of physics turn out to be based on both? What happens if they can't pin down what *is* a cause and what is an effect? What happens if the laws don't even define time?

Time is tightly tied up with the question of causation. There's that tale about the tail. The man who sits next to a fence that has a paling missing. The donkey that walks past the missing paling every day. The man's observations: Nose *causes* tail! It's *propter hoc*, a famous fallacy of logic. But can a cause come *after* an effect? If we can't get time in line, would we even see this as a problem?

So the question he can't duck is this: How does all this play out as the universe begins?