What is determinism?

(Following chapter II of John Earman’s *A Primer on Determinism*)

A **world** is a four-dimensional spacetime.
- It encompasses the whole history of the world throughout all of space.

The **actual world** is the collection of all events that have ever happened, are happening now, or will ever happen.

A **possible world** is a way that the actual world could have been, a possible alternative history of the entire world. (Of course, parts could be the same as the history of the actual world.)

A **physically** or **nomically possible world** is a possible world that conforms to the basic physical laws of our universe. For the time being, we will pretend that these basic laws are the laws of Newtonian mechanics.
- We can then assign times to events “absolutely”—that is, in a way that is independent of the state of motion of the clocks used to assign the times.
- So we have a meaningful notion of the **state of the world at time** $t$. It is the *entire* set of events that happen at the given time.

So let $\mathcal{W}$ stand for the collection of all physically possible worlds.
Then the world \( w \in \mathcal{W} \) is **Laplacian deterministic** iff for any other world \( w' \in \mathcal{W} \), if \( w \) and \( w' \) agree at any time, then they agree at all times.

One can refine this definition into two subcomponents:

The world \( w \in \mathcal{W} \) is **future** (or **past**) **Laplacian deterministic** iff for any other world \( w' \in \mathcal{W} \), if \( w \) and \( w' \) agree at any time, then they agree at all future (or past) times.

Perhaps a world can also be **partially deterministic** —that is, deterministic with respect to some magnitudes but not others.

But this definition may be problematic. Consider, for example, a hypothetical particle called *the freeon*, which is supposed to be indeterministic in a world in which the magnitudes that characterize the rest of the ordinary matter are deterministic.

- Does the Freon interact with ordinary matter or not?

Some further applications of the definition of Laplacean determinism:

**First**, the acts of the self in the theory of agency (or, what Hobart calls *libertarian indeterminism*) are indeterministic. As Taylor notes (51): “No antecedent
conditions were sufficient for his performing just that action.”

Taylor seems to think that the theory of agency is deterministic, but that may be because of the confusing claim that acts of the self are “self-caused”. From this it might seem to follow that they are caused, and so determined, as Taylor uses the term. They are clearly Laplacean indeterministic, and so indeterministic in the primary ontological picture of determinism that we derive from William James.

Second, the “space invaders” example shows that Newtonian mechanics is indeterministic, if the mathematics works as claimed.

§7. Fear and loathing

There are various ways in which Earman’s heuristic definition might be trivialized. It is instructive to see how they might go.

First it is worth noting that (x)Fx is logically equivalent to ~(Ex)~Fx. So if (x)Fx to be true, then ~(Ex)~Fx is also true, and so (Ex)~Fx must be false.

Consider a universe which is empty, which contains no objects at all. In such a world (Ex)~Fx is false, no matter what property F we choose to consider. Of course (Ex)Fx is also false.) So in this world (x)Fx is true (as is (x)~Fx). Both are said to be vacuously true.
It is not easy to define what a property is. Suppose, for instance, that there can be properties of the form ‘__ is at place p at time t in world \( w_i \)’. Nothing in any other possible world (that is, no world other than \( w_i \)) will have this property. So no other possible world in the set \( \mathcal{W} \) can agree with world \( w_i \) at time t. But since there is no other world that agrees with \( w \) at t, it is vacuously true that for any other world \( w' \in \mathcal{W} \), if \( w_i \) and \( w' \) agree at any time, then they agree at all future (or past) times.

That is, if there were properties of the odd form described above (Earman calls them indexical), every nomically possible world would automatically, vacuously, be Laplacean deterministic. That’s too quick a way to settle the question of determinism. The right thing to do is to disallow indexical properties like the one used in this argument.

The definition is also trivialized if one allows past-involving and future-involving properties. Does my car now have the properties of being made in 2003 or being in my garage 5 hours from now? If there are properties like this, then no distinct nomically possible worlds will agree at any time, and once again our world satisfies vacuously the definition of Laplacean determinism. Such properties, then, must not be permitted.