A person never crosses the same river twice.

So said Heraclitus, who noted that the waters in the river are ever-changing and that the physical and mental characteristics of the person are ever changing (though translations differ). The constants are the “river” and the “person”, both of which are abstractions treated as unities by humans, abstractions which make life easier. If we try to say exactly what we mean by river or person (or “cross”) then we fail. It does not matter what definition we choose for river, because all are ultimately unsatisfactory. I know (most of the time) what is a river and what is a stream – I have a working definition – but sometimes I am not sure, and you might have a different working definition. And what do we mean by “person”? – it took time for some people’s working definitions of person to include Africans.

I have little idea of what others mean by “determinism”, but my working definition is: The universe runs like clockwork, so that the state of the universe at a certain time exactly produces the state of the universe at a later time. Does anybody have a working definition of “universe”? Do we have any idea of what constitutes the “state” of the universe we have defined? What are our notions of personal time, and how do think they apply to the universe? Determinism has parallels to the cosmological proof of one God:

We discern in all sensible things a certain chain of efficient causes. ... There must therefore exist one self-sufficient, efficient cause, and that is God. (Aquinas)

My working definition of determinism may not be close to those of some philosophers, but I have to start somewhere. Here is my imperfect working definition of reality described by determinism: the universe at a certain time has two aspects, the state of the universe, and mechanisms operating on that state to produce the next state. If we knew the state of the universe U at time (t), and the
mechanisms M at time (t), then we would know the state of the universe at (t+1). Given my definition, there would be a sequence of states, U(0) U(1) ... U(n), where each state would be exactly determined by the prior state in conjunction with the mechanisms – and ultimately by the initial state U(0) (the big bang?).

According to my take on determinism, the state of the universe at each now is produced by the state of the universe at the big bang by a long series of successive now instances. I do not “Predict the state of the universe now” because determinism has nothing to do with prediction, and prediction is a human endeavour. To establish determinism we need some god (or some other supra-universe entity) who could check on progress. We can ask the ultimate reality of U(-1), the state of the universe before the big bang – is it the God of Aquinas, or is the question not even sensible?

If determinism applies to everything in the universe, then the preceding description of determinism is part of the state of the universe, as are all descriptions (including predictions). Thus – if determinism is an accurate perspective – all descriptions have their origins in the universe’s initial state. Look at this sequence of assertions from D0 to D* and the auxiliary (exclusive) assertions D= and D≠:

\[
\begin{align*}
D0 & \equiv U(t)|M(t) \rightarrow U(t+1) \\
& \quad \text{The state of the universe at (t+1) is produced by mechanisms at (t) operating on} \\
& \quad \text{the state at (t).} \\
D1 & \equiv M(t) < U(t) \\
& \quad \text{The mechanisms at (t) are part of the state of the universe at (t).} \\
D2 & \equiv [E(t) + M(t)] = U(t) \\
& \quad \text{The state of the universe at (t) is composed of two distinct aspects, the existential state at (t) and the mechanisms at (t). The existential state includes thought processes, and could imply that the mind was a logical computing machine.}
\end{align*}
\]
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\[ D^* = \{E(t) + M(t)\} | M(t) \rightarrow \{E(t+1) + M(t+1)\} \]

The mechanisms at (t) operate, not only on the existential state at (t) but also on the mechanisms at (t), to produce a new existential state at (t+1) and mechanisms at (t+1). This assertion describes up to two processes, one for the existential state and one for mechanisms.

\[ D= \equiv M(t) = M(t+1) \]

Under invariance, not necessary to determinism, the mechanisms never change (one approach). There is one process in \( D^* \).

\[ D\neq \equiv M(t) \neq M(t+1) \]

In a more general formulation of determinism, the mechanisms change in a determined manner (another approach). There are two processes in \( D^* \).

How does this differ from a formulation of determinism (F) that examines the state of the world (P), the laws of nature (L), and actions (A)?

\[ F \equiv \text{If (P and L) then A} \]

Some thoughts about the state of the world, its laws, and actions:

- The state of the world is, of course, included in the existential state of the universe, but the state of the world at (t+1) is determined not only by the state of the world at (t) (however we define the world) but also by the existential state of rest of the universe (though perhaps only slightly).

- Laws are not mechanisms, and often the laws are human constructions that attempt to describe the workings of mechanisms: for example, Boyle’s Law gives a pattern to mechanisms operating at the molecular level in gases. It could be said that the laws in F are not just human constructions but, in fact, they are real (but possibly unknown) descriptions of what happens – as if Nature (or whatever) made the calculations.
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- Any action is part of the existential state of the world and of the universe: that is, if we start at (t), then A is part of P at (t+x) (a process involving thought as well as action).

One other interpretation of F could be that event P is the cause of event A. Under D*, event A is included in E(t+1) and is a result of mechanisms at (t) operating on the total state of existence at (t) not just event P included in E(t). It takes a person to define what are events P and A, and – under determinism – there is only mechanism, and attributing causality is a mental operation however plausible the connection. Or, as Aquinas wrote in his cosmological proof: “We discern in all sensible things a certain chain of efficient causes.”

Determinism is a theology with no testable outcomes, and probably needs a deus ex machina to know whether it is correct. Determinism not only takes a cosmological approach to ultimate reality but also an ontological approach to ultimate reality – for example, Anselm’s ontological proof for God includes:

Something than which nothing greater can be thought so truly exists that it is not possible to think of it as not existing.
That God does not play dice with the universe is a statement of faith. If I do not accept either the cosmological or the ontological proofs, and doubt the validity of fatalism or predestination, perhaps my thoughts do not follow any fixed mechanism? Perhaps any explanation of my thoughts can only happen after the event (where that event has a human definition)?