

Freedom in a physical world

J. A. Durieux¹

1 Introduction

If I take a free decision, how does this express itself physically? If God acts in this world, how does he do so? The answers to those two questions may be different or the same. Here we sketch a typology of possible answers. Chapter 2 deals with the possibility that there is no freedom; chapter 3 with the possibilities for immanent, synchronic influence; chapter 4 with the possibilities for immanent diachronic influence; et chapter 5 with the possibilities for transcendent influence.

1.1 Randomness

Before we start, a remark is in order. If the laws of the universe do not fully determine the outcome – if the past underspecifies the present – there is *randomness*. An obvious candidate for filling the hole is freedom – instead of the regularity, it is some free decision to which the event can be attributed. We shall look into that option in section 3.2 below; here we are concerned with the notion of *brute randomness*, or *brute facts*. Something happens, and it was neither the regularity encoded in the laws², nor some free decision that is responsible, yet it *does* happen. I must admit that for me this idea is incomprehensible: a negative observation (it cannot be attributed to regularity) is turned into a positive claim, without any further basis. It is not as if all possible attributions have been ruled out, but more like a throwing one's hands up in despair. Physics is slowly recovering from this where it concerns quantum effects – the Copenhagen interpretation is held by an ever-decreasing fraction of physicists – so why introduce it here? It merely means stopping looking for explanations, not giving one, while explicitly excluding an option not otherwise eliminated – freedom. But given that others seem to judge otherwise, I'll try to accommodate the option of brute facts in my overview.

So, what are the options for freedom to influence the physical world?

2 No influence

The first option is obvious – that there is no such influence. The world ticks the way it does, and we tick along with it. If we think we are free, that is simply because the laws of the universe happen to have the result that we do think so.

2.1 Hard determinism

One possible reaction is simple acceptance of the purported fact that there is no freedom. It is hard, but we'll just have to swallow it. *Whether* we believe in determinism, and *whether* we swallow the consequence, depends on whether the world makes us do so – where *the world* is meant to encompass the past, the laws of physics, and any brute events.

2.2 Immanent compatibilism

Bordering on the hard determinism camp is the immanent compatibilist one³. Immanent compatibilism seems a rationally untenable position. Let me take the formulation by Simon Blackburn in his *Think*:⁴

The subject acted freely if she could have done otherwise in the right sense. This means that she would have done otherwise if she had chosen differently *and*, under the impact of other *true and available* thoughts or considerations, she *would* have chosen differently. True and available thoughts and considerations are those that represent her situation accurately, and are ones that she could reasonably be expected to have taken into account.

1 E-mail: truth@b.biep.org; orcid: [0000-0003-2582-4973](https://orcid.org/0000-0003-2582-4973); web site: <https://biep.org>.

2 I'll use "laws" as a shorthand for "regularity described by the laws", or whatever it is that necessitates them.

3 Immanent compatibilism is normally simply called *compatibilism*, but I add the qualifier to distinguish it from *transcendent* compatibilism, described in section 5.1 below.

4 His defining freedom on *acts* may have contributed to his seeming confusion. That the acts happen the way they do *given* the decisions seems uncontroversial, so the question is whether the *decision* is free.

Even as a stipulation, this seems confused. Expected by whom? Not by an omniscient observer, because there are precise – either deterministic or brute – reasons why any consideration was or was not taken into account. In non-deterministic terms she may have been *this* close to actually taking it in account⁵, but some neural threshold was just missed by a hair – as the laws predicted. Or some brute decay of an atom flipped the outcome. No-one with the proper information could reasonably expect her to avoid the decay, or have the laws of physics have a slightly different outcome.

Maybe it is meant as an observer-dependent notion: she was free *in my sight*, but not *in yours*. That would make freedom a property of agent-observer pairs, and a very different notion from what is usually understood by the term, and no valid basis to build an account of responsibility on. Are people more responsible to those who know less about them, and therefore see freedom where better-informed peers don't? And not responsible at all to an omniscient being?

Compatibilism implies *compatibilist fatalism* – whatever I do, and whatever its effects, it is all because it is already fixed that I shall do that and get that outcome. If I lean back and do nothing, it is because I was determined to, and if I act, it is because I likewise determined to (or the result of some brute influence). Maybe part of the causal pathway leading up to my acting or not may consist of my reflecting on fatalism, but then I couldn't *not* have had precisely those reflections, with the outcome they had. If some more primitive fatalism (a belief that whatever I do, the outcome is already fixed) drives me to inaction, it couldn't *not* have done that. If on the contrary it incites me to action, likewise.

Objecting that the immense variety among people shows they are flexible is a non-starter. The fact that half the population has managed to be of the female sex doesn't mean that I have that option, and likewise for skin and hair colour, and so on. If people *as a group* are very varied, it merely means that the dice rolled differently for different people, and it doesn't say a thing about any one of them *as an individual*.

2.3 Ought

Whether in hard or in compatibilist shape, any morality has no bearing on behaviour. Our *thoughts* about morality, themselves caused by the laws and brute facts, may do so, of course – again precisely according to those laws and facts. Whether the judge condemns the culprit has been coded into the universe since the big bang (or is the result of brute randomness) – it is cosmological minutiae that serve verdicts.

3 Synchronic immanent options

The second option is that there is an influence, namely that the act influences the world at the time it occurs immanently. So the influence on the world of my free decision happens at the instant I make that decision. Here we shall assume discrete time for ease of presentation.

For ease of explanation, let us assume a time-discrete universe. Physical laws then try to describe the world at time t in terms of the world at previous times. Whereas a description of the world at time t in terms of the world at time $t-1$ is not possible⁶, it seems descriptions in terms of the world at time $t-1$ together with the world at $t-2$ do suffice, leading to laws of the kind "If p has position $x-d$ at time $t-2$, and position x at time $t-1$, then it will have position $x+d$ at time t ". For a deterministic universe, such laws together with some initial state of the world may fully describe physical reality – the laws will be functions, giving a single output for a single input⁷. There may be information *loss*, though: maybe there are several possible pasts that would lead to the present.

If there is no overall determinism, there are two options:

1. Physics itself is not deterministic.
2. Physics is not the whole story – the universe is *open*.

Both could be true, in which case either or both routes could be taken to influence the universe.

3.1 The open universe

If the universe is **open**, the rules of physics merely describe what happens if there is no mind influencing the outcome. This is still fully compatible with determinism, namely if minds are determined too. In that

5 Or to *not* taking it into account; obviously the argument works both ways, and likewise in the remainder of this section.

6 That is, without introducing extra variables. In practice introducing them is common, and to describe a particle at time t by not only its position, but also its speed. This is no fundamental difference with the approach given here, however; just a matter of convenience.

7 With some extra wording, this can be expanded to "deterministic but for brute randomness", where the main claim is that the information that flows in is *meaningless* – does not encode any intention.

case it might even be possible to incorporate the rules for minds into an extended physics, and we are back at full determinism.

3.1.1 Conservation laws

We have discovered many conservation laws – how does that rhyme with an open universe? There are again several, more or less likely, options.

- Intrusions are local and/or rare enough not to be detected by normal physical experiments. For instance, if intrusions only occur in human brains in certain conditions of normality, it is quite possible that they have never been measured.
- Intrusions occur far from observers, and then influence what needs influencing through normal physical means.
- Intrusions are truly minimal, using chaos-like behaviour to bring about an effect.
- Intrusions average out. Many of our macroscopic laws are statistical effects from a very different microreality, and describe an average behaviour.
- Intrusions consist of information only. John Polkinghorne (XXXX) has described how an influx of information could lead to influence without breaking conservation laws.

3.1.2 The nature of freedom

So how would freedom fit in such a system – without reducing to something non-free? A characteristic of freedom is that free decisions can be *attributed* – they are not something that just happens, but for which someone may be responsible, and not only at the moment the decision is taken, but also afterward. So something appears at the moment of a free decision, an aspect of the decision-maker that is the ground of that decision. Let us call it *agency*⁸.

Clearly freedom cannot be fully modelled – a full model would amount to a proof of the absence of freedom. Formulas can treat it as a hidden variable, however, and in the following we shall do so.

If minds can influence the outcome the result will no longer be describable by functions of the kind described under 3 above. Making agency explicit can regain functional laws, by describing the non-agency part of the new state in terms of older states plus the agency in the new state. Adding time t to the inputs allows one to do so, in a way that avoids self-reference⁹, because the input only references the agency part of the state at t , and the output only the non-agency part. If agency is left unspecified, the resulting underspecification of the input leads to the known indeterministic laws.

Free decisions can be attributed after the fact – we can hold people responsible *precisely* to the extent their decision was free. So the agency remains, and is absorbed in our selves. In fact, a self, a personal identity, may be nothing more than the total agency of all free decisions taken, and Occam's razor tells us to suppose that until counter-evidence comes along. Yet our self is one – *I* am responsible, not some “bit of agency” in my mind. In that respect agency is more a new property of the self than a new part of it – the property of “having freely chosen thus”. It is precisely the mind with the property of having freely chosen X to which X can be properly attributed, and that can under appropriate circumstances¹⁰ be responsible for X .

To the extent that our self at time t constrains our freedom, agency only acts within the bounds of mental laws.

3.1.3 Freedom as the mirror-image of causality

By modelling intentions deterministically in terms of the resulting choices, the full model can be symmetrical and in a way deterministic, with agency the time-wise mirror image of causality.

In that case there are deterministic laws describing the situation at time t in terms of the situation at previous times, and those we call *causal* laws – and there are deterministic laws describing the situation

⁸ I have tried to find a word that doesn't suggest “parts” or “elements”. Agency is uncountable, as we shall see.

⁹ Self-reference would allow trivial laws such as “The state of the world at time t is the state of the world at time t ”, which describes a function (deterministic output given the input).

The formulas treat agency as a hidden variable. I have placed it at t , as that is where it stops being hidden, and to prevent people from mistaking it for a hidden *physical* variable that could be traced back in time (which would remove precisely the freedom it is meant to model). The “freeness” itself of freedom cannot be captured; only its resulting indeterminism can. Agency is *concomitant* with free decisions, but neither the antecedent cause of them nor their effect – vaguely reminiscent of a particle that comes into existence together with its antiparticle.

¹⁰ One major circumstance is *having someone to respond to*. God might well never be *responsible* for anything, having no higher authority to answer to. Others include reason, understanding the criteria involved in justification, and actually being morally subject to those criteria.

at time t in terms of the situation at subsequent times, and those we call *agency* laws. Causal influence diminishes in forward time due to the influence of agency, and agency influence diminishes in backward time, due to the influence of causes.

The state *after* the moment of the decision then defines the decision, in a fully deterministic way when looking backwards in time: the fact that I am a person having chosen X is what, looking backward, causes me to choose X – but, looking forward, I wasn't a person having chosen X up to the point that I freely did choose X . Causality works from the past to the future, whereas freedom works from the future to the past. This makes causation and freedom mirror-symmetric, the difference being the direction of the time arrow.

3.2 Underdeterminism

In section 1.1 above we already mentioned freedom as an obvious candidate to fill the gap left by underdetermining laws. If the laws of physics do not fully describe a situation at time t given the situations at previous times, there is a natural place for freedom left.

If some loci of incompleteness of the known laws reflect a true underlying incompleteness, then physics is indeed underdetermined – its laws will necessarily be non-deterministic, relations, not functions, and our freedom could exist in precisely that underdetermination.

3.2.1 Transcendent agency

If physical laws are truly incomplete, agency might act by “plugging” the holes – but there is another possibility. Instead of agency *filling* the holes left by (physical and mental) laws, agency could *be* the natural state of underdetermination. In that case there would *almost* be an answer to the question why there is something rather than nothing.

Transcendently, agency would not be time-bound: free decisions simply *are*. Given that fact, why isn't there nothing? If there were nothing, there would be no laws, let alone laws that there be nothing. So the (non-existent) laws underdetermine, which means that there would be freedom, agency, and there would be a free decision *I am* attributable to that agency¹¹. Since this is not nothing, we see that the assumption that there be nothing leads to its own negation¹².

We shall now consider two candidates for this underdetermination.

3.2.2 Symmetry breaking

Imagine two point particles of equal mass colliding. The laws of motion tell us that impulse and energy will be conserved – but not much more. Taking their centre of gravity as in rest, their combined impulse is zero and their total energy is $m|v|^2$ – both of which are conserved as long as afterwards both particles will have the same speed as before, and still move in opposite directions. Neither value, however, gives any indication as to *which* directions that will be¹³.

Here the initial situation is symmetrical, but the outcome isn't. Whereas the example given is chosen for ease of explanation, and not for realism, *spontaneous symmetry breaking* occurs in many ways in physics. Some forms depend on minimal variations in the initial state, and would fall under section 3.2.3 below, but others are like the example given, reflect true underdetermination of the laws themselves, and could constitute loci where freedom could have an influence.

3.2.3 Quantum freedom

According to among others the Copenhagen interpretation, quantum theory is necessarily incomplete – Heisenberg's famous uncertainty relation is not merely an epistemic limit, but reflects a genuine absence of physical fact.

11 The freedom would be transcendent, translating to necessity from our immanent point of view. For more details about this distinction, see my [How to Speak about a Supreme Being](#).

12 This is *almost* a sound argument, but not quite, as if there were truly nothing, the truth that the absence of determination equals freedom would not be either. For an argument why answering the final question requires transcendent mediocrity, see my [Transcendent Mediocrity is the Neutral Position](#).

13 Maybe more realistic might be particles of which a mind could control whether they see each other (and bounce off) or don't (and pass uninfluenced). Given that fields extend indefinitely, would it be possible to switch off influence and switch it on again afterwards at precisely the right moment to conserve the values that need conserving?

A particularly promising interpretation in this context is the Conceptuality one of the theoretical physicist Diederik Aerts (2014). He shows that *concepts* naturally manifest quantum behaviour, such as obeying Heisenberg's uncertainty relation, breaking Bell's equations, entanglement, coherence, and so on.

If I dream up a story, the world I create will typically be underdetermined. A novel may say there is a small fruit bowl on the table, without specifying the fruit in it. Later on in the story, a character may take an apple, or a banana, or a peach, or any of a huge number of possible fruits out of the bowl – there are many more options than would fit in the bowl.

If in a story, Pat and Sam have a Roman-Catholic wedding, they get entangled. Now Sam becomes an astronaut and goes to Mars, and then we learn that Pat delivers a healthy baby girl. At that point in the story, Pat turns out to be a woman, and because of the entanglement, *at the same instant* Sam turns out to be a man, despite the great distance between the two. The Einstein-Podolski-Rosen experiment in the macro-world, in a fundamentally non-mysterious way.

Within the resulting story, the fruit in the bowl had always been, say, apples, and Pat had always been the woman in the couple, but actually those facts were *created* by what seems a *measurement* process. That is simply the way concepts behave, and the quantum (and, for that matter, relativistic) behaviour of our world can be explained from the hypothesis that ultimately, the world is conceptual in nature.

The greater the detail in which the world has been described, the smaller the places where such under-determination will tend to show up. A novel only very broadly describes its world – we may read about a tree near the house, without having an inkling whether it stands at its right or left, or whether it is an oak or an elm, let alone whether it has an odd or an even number of leaves. The world we live in, however, is sensed by us to a much larger degree, leaving less space for such unspecified elements. The quantum level might be where our probing runs against the description level of the world – decisions have to be taken whenever we probe, leading to the typical quantum behaviour of small elements of our world.

So if God is thinking the world, that would explain its quantum behaviour. Measurements correspond to decisions (Aerts 2010), i.e. God deciding what the outcome should be. This would make God *as dealing with the world* temporal – not just in acting, but in actually *deciding* how to act, and seems to have important consequences for omniscience.

4 Diachronic immanent options

If we accept that, in McTaggart's terminology, God stands in a B-series relation to the universe, other options open up. God might have created the world in such a way, that all his decisions have been "coded in". And if our consciousness resides in God, it might also be transcendent to this world, and act on it in a comparable way. Fully immanently, this might be modelled by God solving a vast but sparse (i.e. widely underspecified) set of equations that includes equations relating our (and His) decisions to an outworking¹⁴.

To us, this would look like determinism – from an A-series point of view the freedom would be in the precise initial state the universe started from¹⁵, and these would be cases of *pre-established harmony*. Again we shall enumerate some options.

4.1 The lifeless universe

The state of the non-living part of the universe encodes an enormous amount of information. Any decision we make is likely influenced by a large number of particles from outer space interfering with our brain processes. If the state of outer space were carefully created so as to emit precisely those particles that would lead to our thoughts and decisions going the way we freely choose, then no breaking of any fully-determining physical laws would be necessary.

4.2 Deterministic quantum states

Hidden variable interpretations of quantum theory offer an obvious place for coding this information: in those hidden variables. For instance, the pilot wave model of David Bohm supposes a hidden state of the pilot wave of each particle, which might be just so that it leads the particle to behave in the way that corresponds with the free decisions at that moment.

¹⁴ Compare Douglas Hofstadter (1982)'s technique of **Robinsonising** to solve self-referential sentences.

¹⁵ Or the state "inherited from the infinite past", in case of a universe without a beginning. This other possibility is implicitly present in the remainder of this chapter wherever we speak of the initial state of the universe.

4.3 Chaos

Minute differences in the initial conditions can magnify through chaotic processes, and lead to radically different outcomes. Under the proper conditions, this fact could be used to encode the behaviour that ought to happen in the initial state of the universe.

4.4 Physical rules

Our universe started with an exceedingly low entropy – but still an entropy larger than zero. Possibly, what we see as physical *laws* are merely *rules*¹⁶ describing the regularity that is the result of this low entropy. In that case, because the entropy is low but not zero, we may expect (rare) deviations from the rules we found. These deviations might bring about the harmony between God’s and our free choices and the state of the physical world.

4.5 Non-invariance

An intelligent ant walking along the ribbon around a birthday present might well formulate a “law” that the ribbon always goes straight. This might make her disbelieve any claim about the bow. Yet, the whole *reason* for the ribbon *is* the bow, and only some principle of pervasive mediocrity – a principle that stated not merely that we are at a non-remarkable place in the universe, but that there are no remarkable places in it – could undergird an argument that the bow cannot be there.

Likewise, points of mind-matter interaction could be exceptional, and different from the mediocre measured matter-only behaviour that is being studied by physics.

5 Transcendent options

Once we fully embrace God’s transcendence, the field widens considerably – and mostly in ways we are fundamentally unable to grasp. That doesn’t mean they can’t be actual, however – limiting our notion of the possible to what is graspable by us merely means adding another handicap to what finiteness entails already.

5.1 Transcendent compatibilism

If God is the solipse at the top of the transcendence hierarchy¹⁷, there is nothing to constrain Him. He is the source of whatever fact is true in our world, including the facts of logic, and so on. As such, he can decide what the outcome of applying some law is. We can get a vague inkling of this by looking at stories featuring a deterministic world, e.g. Douglas R. Hofstadter’s *Who shoves whom around inside the careenium? or What is the meaning of the word “I”*. On the level of the story, the world behaves fully according to the deterministic laws governing it – yet what happens is precisely whatever the author intends to happen.

In the case of a story written by someone on our level, this can only be done by being vague¹⁸. Not every movement of every particle is described; if it were the story would either break the laws of its world, or the outcome would not be in the hands of the author. This is because we ourselves are constrained by the laws of *our* world, including laws of logic that constrain the outcome of the application of laws. God is not so constrained, however, having no world above him: the outcome of a law application is whatever he intends it to be¹⁹.

To us such a transcendent influence would be undetectable. If the laws are deterministic, the actual outcome – the evolution of the world as it actually happens, would seem inevitable to us: if we know the

16 I make the traditional distinction between laws (which hold always), rules (which tend to hold), and chaos (where no regularity is discernible). So the exception proves the rule, because if there were a law there would be no exception, and if there were chaos there would be nothing to except from. Hence the use of the phrase “as a rule” to indicate the existence of both a regularity and exceptions.

17 See my [Transcendent Mediocrity is the Neutral Position](#) for more on the transcendence hierarchy.

18 This vagueness reduces the example to transcendent underdeterminism, akin to the version described in section 3.2.3 above. Such vagueness definitely is one transcendent option, but as this section tries to show it is neither the only, nor the most obvious option, as God has no need for vagueness and underdeterminism to influence the world.

19 This may lead to questions about evil – why doesn’t God let the outcome be better? An abstract answer to that would be that, being transcendent, He can also let the current outcome be the best. This would lead into questions about the Euthyphro dilemma (for which also see my [From “Is” to “Ought” in One Easy Step](#)), which are beyond the scope of this paper.

laws we can conclusively show that no other outcome would have been possible. Yet, as seen from God's level, there is total freedom.

If our will is transcendent, "implemented by God", as it were, then our decisions could be free, and the world could reflect those decisions in its evolution according to the deterministic laws it obeys.

And so we see that transcendent compatibilism can provide what immanent compatibilism cannot: *true* (and even complete) freedom in a fully deterministic world.

6 References

Aerts, Diederik (2010). *A Potentiality and Conceptuality Interpretation of Quantum Physics*. *Philosophica* 83, pp 15-32.

Aerts, Diederik (2014). *What is Quantum? Unifying Its Micro-Physical and Structural Appearance*. arxiv:1401.7572v1

Blackburn, Simon (1999). *Think: A compelling introduction to philosophy*. Oxford: Oxford University Press.

Hofstadter, Douglas R (1982). *Metamagical Themas*. *Scientific American*, Jan. 1982, pp 12-17.

Polkinghorne, John (XXXX).