

## The Implausibility of the Causal Closure of the Physical

Richard Swinburne\*

Received: 26 October 2018 / Accepted: 7 November 2018

*Abstract:* Much recent neuroscientific work, and in particular the programme initiated by Benjamin Libet, seeks to show “the causal closure of the physical”—that mental events never cause physical events, and in particular that our intentions never cause brain events and thereby our intentional bodily actions. But no one is justified in believing any scientific theory unless they are justified in believing that it successfully predicts certain events. Someone is justified in believing that certain events predicted by some theory did occur, if they apparently remember having perceived these events or if some other scientist apparently testifies that they have perceived these events. But we believe our apparent memories of our past perceptions of events because we believe that perceiving those events has caused brain events which have caused our present apparent memories of them; and we believe the apparent testimony of others because we believe that their intentions to testify have caused brain events in them which in turn have caused the words of their testimony to come out of their mouths. So someone could only justifiably believe the theory that mental events never cause physical events if they believe that either their past perceptions or the intentions of other scientists to tell them what they perceived, both of which are kinds of mental events, have caused brain events, which are physical events. So that theory is self-defeating; no one could ever be justified in believing it, or more generally be justified in believing the theory of the causal closure of the physical.

---

\* Oxford University

 50, Butler Close, Oxford OX2 6JG, United Kingdom

 richard.swinburne@oriel.ox.ac.uk



---

*Keywords:* Causal closure of the physical; mind-brain causation; physical determinism; Libet.

I begin with some definitions.<sup>1</sup> Although “physical events” are often defined in terms of events involving properties designated by predicates belonging to a true and complete physics, or ones supervenient thereon<sup>2</sup>, this is not a very helpful definition since we do know much about what a future true and complete physics would be like. But there is surely one property which all the events with which a future physics would be concerned, would have; that is the property of being publicly accessible events. So I shall define “a physical event” as “an event to which no one person has privileged access.” If I can show that the causal closure of the physical is implausible on this definition of physical events, it will surely be implausible on any other currently available definition. I shall contrast a physical event with a “mental event”, defined as one to which its subject (the person whose it is) necessarily has privileged access by experiencing it; and “a pure mental event” as a mental event which does not entail the occurrence of a physical event. By a person having privileged access to some event, I mean that necessarily he or she is in a better position than anyone else to know that it is occurring; whatever ways others have of finding out whether or not it is occurring, the subject can also use—but they have an additional way, by experiencing it. Among physical events are brain events; anyone who learns how to use the relevant apparatus can find out as much about my brain events as can I or anyone else. Perceptions such as me seeing a tree are mental events since whatever ways others can use to discover whether or not I am seeing a tree, such as observing my behaviour and studying my brain events, I could also use—I could watch a film of my behaviour and study the brain events just as well as anyone else—but I have an additional way of knowing about my perception, that is by actually experiencing seeing

---

<sup>1</sup> The ideas contained in this paper were first published in (Swinburne 2011). I am grateful to the editor of the *Journal of consciousness studies* for permission to reuse them. For a more developed presentation of these ideas see my book (Swinburne 2013), especially chapter 4.

<sup>2</sup> For definitions along these lines, see (Montero 2009).

the tree. Perceptions are however not pure mental events, since seeing a tree entails that there is a tree present—and that is a physical event. But me seeming-to-see-a-tree, that is me believing that I am seeing a tree does not entail the existence of the tree.

The class of pure mental events includes all conscious events, that is apparent experiences, events of kinds such that they occur only in so far as we are aware that they are occurring. Conscious events include sensations such as pains and feelings of nausea and patterns of colour in my visual field. They also include occurrent thoughts which cross my mind, such as “today is Thursday;” if I am not in any way aware that I am having a pain or the thought “today is Thursday,” I am not in pain and the thought isn’t crossing my mind. They also include apparent perceptions—such as my apparent perception of a tree, apparent awareness of one’s beliefs and desires, and apparent awareness of truths of reason such as being conscious of “ $23 \times 3 = 69$ ” as I think about it.

Also among conscious events are intentions. By my intention I mean what I am trying to do, my purpose which I am trying to fulfil. Intentions include short-term intentions, such as intentions to move an arm or utter a sentence; medium-term intentions such as an intention to walk to the railway station or to eat lunch, which are purposes which I am trying to fulfil during the whole of a longer period; and long-term intentions, such as to write a book or pursue some career, which I try to fulfil by actions at different periods over a long stretch of time. If my body performs some movement of a kind which I normally make intentionally, but which on this occasion was simply an unintended reflex, then there was no intention in what I was doing. Other people can reach well justified conclusions about whether I had some intention in making some movement and what that intention was, from a study of my public behaviour (including what I say) and perhaps one day from a study of my brain. Yet whatever ways others use to find out about my intentions, I could also use; I could watch a film of my behaviour and study my brain just as well as anyone else. But I have an additional way, not available to anyone else, of knowing whether I had some intention and what that intention was—by actually experiencing the intention; and necessarily no one else can experience my intentions—for the person who experiences an intention is the person who has the intention.

Pure mental events include, as well as conscious events, what I call continuing mental states, that is events—such as beliefs and desires—which may occur while the subject is not conscious of them but of which she can become conscious by asking herself what she believes or desires, or by being aware of them when she is planning to take them into account in her actions. They are pure mental events because, while the subject can use all the ways available to others for discovering what she believes or desires, she has a way of discovering these states which is not available to others. The suspect who tells the police that he did not commit the crime has a way of knowing whether he is telling them what he believes, which is not available to the police—he is consciously aware of whether his intention is to tell them what he believes.

Our ordinary experience of life seems to show us very strongly that our intentions often cause our bodily movements. Consider first an intention which may or may not succeed in producing the intended effect—for example, suppose that I am trying to lift a weight. I may not succeed in lifting the weight, but if I do succeed, it seems to me strongly that it was me trying which caused the weight to rise, and so that lifting the weight was an intentional action. It seems to me strongly that this is so, because to try to do something just is to do what one believes will make it more likely that that thing will occur. And clearly the weight will not rise unless I try to raise it, and the harder I try the higher it will rise. There is a continuum of actions between actions like this in which I have to try for a short time in order to produce the intended effect, and those bodily actions which are so easy for most of us to perform and take so short a time, that we are seldom aware of a time when we are trying to bring about the effect and have not yet succeeded in doing so. But clearly there is a difference between me intentionally raising my arm and my arm just rising in a way unintended by me. That difference seems to be that me intentionally moving my arm consists in me causing the bodily movement, that is me having the intention to cause the bodily movement causes the bodily movement.

It is a fundamental epistemic principle which I call the Principle of Credulity, that what we seem to (that is, apparently) experience is probably so, and hence we are justified in believing (that is, it is rational for us to believe) that it is probably so—barring counter-evidence. If it seems to me

that I am seeing a tree, then probably I am seeing a tree. If it seems to me that I am hearing you speak, then probably I am hearing you speak—all this in the absence of evidence that I am subject to some illusion. If we could not rely on our apparent experiences of the world in this way—even after we had checked it by looking again or listening for a longer period—we could have no knowledge about the world at all. So since our experience seems to tell us so strongly that our intentions cause our bodily movements, it is—in the absence of counter evidence—very probable that they do. Science has shown us that all our bodily movements are caused more directly by brain events initiating sequences of events in our nerves which cause the bodily movements. So it is very probable that that our intentions cause the bodily movements by causing the brain events which cause those bodily movements, and so that mental events often cause physical events.

The doctrine of ‘the causal closure of the physical’ (CCP) is the doctrine that physical events are caused only by physical events. It follows from CCP that such common-sense views as that I came to this building because I had the intention to do so, and so the intention caused my leg movements which brought me here are false. Now it is logically possible that such common sense beliefs are simply illusions. But given my previous argument, it would need substantial evidence (that is, counter-evidence to what strongly seems to be the case) to show that they are illusions, and so that CCP is probably true. CCP is an empirical doctrine about which kinds of event cause which other kinds of event, and so a justified belief in CCP requires a justified belief in some scientific theory which entails it. In this paper I argue the epistemological thesis that no one could ever be justified in believing any theory which entails CCP, and that claims that recent neuroscientific work provide that justification are not merely false, but couldn’t possibly be true—because of what constitutes a justified belief in a scientific theory. For a justified belief in a scientific theory requires a justified belief that it makes successful predictions, and that means both a justified belief that it predicts certain events and a justified belief that those events occurred. In this paper I will be arguing that (at least one of) those justified beliefs couldn’t be had if CCP were true. Hence CCP is in a crucial sense self-defeating; if it were true, we could not be justified in believing it.

So how can anyone have a justified belief that some scientific theory predicts certain events? Scientists in the relevant field will have calculated that it makes these predictions. And if a scientist can hold all the calculations in her mind at one time, it will be for her a deliverance of reason, evident a priori, that the theory does make these predictions. Alas, for any scientific theory of any complexity most experts in any field will be unable to hold in their minds at one time all the relevant calculations; even as the scientist reads through the text of her calculations, she depends on her memory towards the end of the calculations for her belief that the initial calculations were correct. Later in life all that she may remember is that it did seem to her earlier that the theory made those predictions. She may have a diary in which she recorded this, which will be—as it were—her testimony about this to herself and others. Non-scientists and scientists less central in the field will depend on the testimony of those whom they regard as experts, that they have made those calculations. So what makes someone's belief that the theory predicts certain events justified is (if it can be had) experience (of oneself currently 'seeing' that the calculations are correct), memory (of having made calculations in the past), or testimony (from oneself or others that they have made certain calculations); or rather, since all of these sources may be misled, it is apparent experience, memory, and testimony which provide our justified beliefs that the theory makes true predictions—justified in the absence of counter-evidence, often called "defeaters."

And how can anyone have a justified belief that the events predicted in fact occurred? They will normally depend on the evidence of the same three sources. Certain observers will (apparently) in a wide sense experience these events—that is if they are physical events, they will perceive them, or if they are conscious events they will experience them (in a narrow sense). Later, the observers may (apparently) remember having experienced the events; and others will depend on the (apparent) testimony of observers about these (or the observers may depend on their own apparent written testimony.) Alternatively, a believer may have a justified belief that the events predicted occurred because it is a consequence (deductive or probabilistic) of some other justifiably believed theory that they did. But in that case a justified belief in that other theory would itself depend on the evidence of the same three sources.

When we believe that our apparent experiences are real experiences, as by the principle of credulity we are surely normally justified in doing—in the absence of counter evidence, we believe them because we believe that they are caused by the events apparently experienced. You believe that your apparent experience of observing some distant star through a telescope is a real experience and so that there is really a star there, because you believe that your apparent experience was caused by the star emitting light which impinged on your eyes, and caused the apparent experience of it. If you came to believe that your apparent experience was caused by a malfunctioning of the telescope, and had no other reason for believing that the star was there, you would cease to believe that the star was there. So if your apparent experience is a real experience, then a physical event is causing a mental event; and that of course is not ruled out by CCP.

Our apparent memories of our experiences are themselves apparent experiences of our past experiences, and so again by the principle of credulity we are justified in believing that the apparent memories are real memories in the absence of counter evidence. When we believe them, we believe them because we believe that they are caused by the past experiences. In the case of memories of experiences less than a few minutes earlier, it may be that the past experience causes the present memory of it directly (that is, without causing it by causing some other event which causes the memory). But we know well, as neuroscience has also shown,<sup>3</sup> that in the case of memories of events more than a few minutes ago the causation is indirect; the past experience causes a brain event (a “trace” in the brain) which later causes the memory of it. And so our reliance on apparent memory for our knowledge of past events depends on assuming that a mental event (a past experience) causes a physical event (a brain event).

It also follows from the principle of credulity, that when it seems that someone is telling us something (orally or in writing) we are justified in believing that they are telling us that thing, in the absence of counter evi-

---

<sup>3</sup> For example, a patient from whom portions of both temporal lobes including their hippocampus were removed, proved unable to recall anything which had happened to him more than a few minutes earlier. For a description of this patient's condition see, among many other places, (Thompson 2000, 392–93).

dence. We assume that their intention to tell us what they apparently remember has caused the words reporting the experience to come out of their mouth or to be typed into their computer. If we came to believe that the words came out of some person's mouth because they suffer from fluid aphasia (which produces streams of unintended words), or that the person's fingers pressing keys on his computer keyboard were caused to do so by a neuroscientist controlling the neural impulses to those fingers, we would no longer believe that testimony. The apparent testimony would not be real testimony. And when we also believe someone's apparent testimony to have experienced some event, we assume that their past experience has caused their apparent memory of it (again, a mental-to-physical causation). And so relying on apparent testimony to a past event involves relying on two separate processes of mental-to-physical causing ('causing' in the sense of the mental event being a necessary part of the total cause of the physical event.)

A scientist takes his (apparent) observations, experiences and calculations as probably correct, at least when he has looked carefully and checked—in the absence of contrary evidence. Almost all scientific knowledge relies on (apparent) memory (e.g. of the results of experiments or calculations only written up the following day). And for all science, we all rely most of the time on the (apparent) testimony (written and spoken) of observers to have made certain observations (or had certain experiences) and of theoreticians to have done certain calculations. And the wider public relies entirely on the (apparent) testimony of scientists with respect both to their calculations and to their observations. A solitary scientist would be justified in believing his apparent perceptions while he was apparently perceiving without assuming that there was any mental-to-physical causation. But no one would be justified in believing a large-scale scientific theory without having a lot of evidence about the occurrence of events at different times and places and having his calculations confirmed by other scientists. So it would seem that we cannot have any significant justification for believing any scientific theory without relying on apparent memory and apparent testimony, and so without relying on processes which consist in mental events causing physical events. Hence it would seem that no one will ever be justified in believing CCP, since the justification would consist in believing in the occurrence of processes which would be ruled out by CCP itself.



There are two different kinds of way in which scientists have attempted or could attempt to establish CCP. The first way is to attempt to show that when mental events occur, they never make any difference to the pattern of later physical events; and the obvious way to set about this would be to show that the most plausible candidate for mental events which make such a difference, that is our intentions, never make any difference to our brain events.

The results of a recent neuroscience research programme, initiated by the work of Benjamin Libet in the 1980's, have been interpreted by many scientists as showing that conscious events (and so 'mental events' generally in my sense) never cause brain events. In the original and most influential Libet experiments<sup>4</sup> subjects were instructed to move their hand at a moment of their choice within a short specified period (for example, a period of 20 seconds). The subjects watched a very fast clock, and reported subsequently the exact time at which they formed their intention to move their hand. They reported the intention to move their hand occurring (on average) 200 msec (milliseconds) before the time at which experimenters recorded the onset of activity in the subjects' muscles initiating the hand movement. Experiments of other kinds, Libet claimed, showed that subjects report the time of sensations as occurring 50 msec before the time of the brain events which caused them. That led Libet to hold that subjects misjudge the time of all conscious events by 50 msec, and so he concluded that their intention occurred (on average) 150 msec before the muscle activation. However electrodes placed on subjects' scalps recorded (on each occasion of hand moving) a build-up of electric potential, called 'the readiness potential' (RP), which was presumably caused by the occurrence of a particular kind of brain event which occurred (on average) 550 msec before the muscle activity and so 400 msec before the occurrence of the intention. The last thirty years have seen very considerable progress in understanding the neural basis of intentional actions, made possible by new techniques

---

<sup>4</sup> For Libet's description of his own work, see (Libet 2004). For accounts and interpretations of the development of this work on the neural basis of intentional actions over the last twenty years, using new methods of discovering what is happening in the brain at different times, see the surveys in (Hallett 2007), (Haggard 2008), and (Banks and Pockett 2007).

which allow neuroscientists to identify far more precisely than by measurements of electric potential on the skull, which areas of the brain are active some exact number of milliseconds before the time at which subjects claim that they form some intention. The results of this work seem initially to give very considerable support to the view that a prior brain event of the kind which gives rise to RP is a necessary condition (although not necessarily a sufficient condition) for the occurrence of a simple intentional bodily movement of the kind studied by Libet.

So, if the subjects' reports are at all accurate, there is this succession of events: a brain event ( $B_1$ ), followed by a conscious event (the intention represented by 'M<sub>1</sub>' in the diagram), and also followed by other brain events (represented by  $B_2$  and  $B_3$ ) and then (later than  $M_1$ ) a brain event (represented by 'B<sub>4</sub>') which directly causes the muscle activity and so the movement.

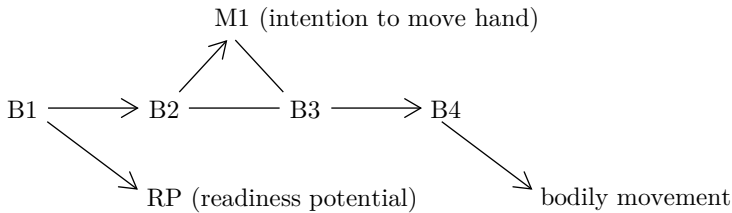


Diagram to illustrate the Libet experiment. 'M' represents a mental event. The 'B's represent brain events; events to the left of the diagram are earlier than events to the right. Arrows represent evident causal action. Lines without an arrow indicate possible causal action.

Many neuroscientists have argued from this kind of evidence to reach the extraordinary conclusion that the intention does not cause the movement; but rather a brain event  $B_2$  (caused by  $B_1$ ) causes both the intention ( $M_1$ ) and the subsequent brain event  $B_3$  which (via  $B_4$ ) causes the bodily movement, without the intention causing anything at all. Thus one group of neuroscientists concluded that Libet's data "contradict the naïve view of free will—that conscious intention causes action. Clearly conscious intention cannot cause an action if a neural event that precedes and correlates with

the action comes before the conscious intention.”<sup>5</sup> But that is a totally unjustified conclusion. One event X may cause another event Z by causing an event Y which causes Z. So it is equally compatible with all the data showing the correlations between an earlier event ( $B_1$ ), an intention ( $M_1$ ) and the brain event ( $B_4$ ) which causes the movement, and also the most natural explanation of those correlations, to suppose that  $B_1$  causes (via some intermediate brain event  $B_2$ ) the intention ( $M_1$ ), and that the intention causes (via some intermediate brain event  $B_3$ ) the brain event ( $B_4$ ) which directly causes the movement. (By ‘causes’ I mean ‘is a necessary part of the cause of.’) To show that the intention was not also a necessary part of the cause, you would need to show that an earlier event  $B_1$  causes the very same sequence of brain events with or without subjects having the requisite intention (to produce that bodily movement). And the Libet programme is nowhere near attempting to show that.

But the major problem with Libet-type experiments is that, in order to show that or anything else, the programme depends on the apparent testimony of subjects for information about the time of the occurrence of their mental events. And so all Libet-type experiments designed to show that mental events do not cause physical events require the experimenter to assume that sometimes mental events do cause physical events. Such experiments might serve to show that certain kinds of bodily movement (for example, those studied in Libet-type experiments, or—more obviously—some very quick reactions such as jumping out of the way of a passing car) which we might have regarded as formed by our intentions are in fact not formed by our intentions. But they could only show this if we assume that other bodily movements (such as the movements of our lips in telling others about our intentions) are formed by those intentions. Clearly the same general objection applies to any attempt to establish CCP, which relies on evidence about which mental events occur when. We could only get enough evidence to show the theory to be true by relying on the apparent testimony of other people, and that involves assuming that that theory is false.

But there is another way by which it might seem that scientists could establish CCP, and that is on the basis of evidence merely about which

---

<sup>5</sup> (Roediger, Goode, and Zaromb 2008). For similar quotations from other neuroscientists see (Mele 2009, 70–73).

physical events occur when, without relying on any evidence about which mental events occur when. Could not observation merely of physical events provide us with a justified belief in some very general deterministic physical theory from which it follows that every physical event has another physical event as an immediately prior necessary and sufficient cause? If so, it would follow that no brain event could have a mental event as a necessary part of its cause. For if a deterministic physical theory of this kind were true, the physical event would have occurred anyway; whatever mental events the subject had could have made no difference to the brain events. Suppose that scientists discover that for each physical event F studied in large samples of many different kinds of physical events (including apparently intentional bodily movements), there is some other immediately prior physical event E which a certain deterministic theory claims will have F as its immediate effect. That would seem to be powerful evidence in favour of that theory and so in favour of CCP.

The problem however remains that our evidence about which physical events occur when in these large samples of events must come from the reports of scientists about the results of their experiments, that is from the apparent testimonies and memories of scientists about what they claim to have perceived. But we have seen that we are only justified in relying on apparent memory and testimony if we are justified in assuming that past observations cause brain traces which cause present memories and that people's intentions cause words to come out of their mouths. So again relying on the evidence of the apparent memory and testimony of scientists about what they have observed already seems to presuppose the falsity of CCP.

It is however possible to avoid this objection, as an objection to this second way of trying to establish CCP, by modifying our understanding of 'memory' and 'testimony,' in such a way that we could be said to 'remember' some past physical event without assuming that the memory involves remembering a past experience of that event; and we could be said to give 'testimony' to the occurrence of a past event without assuming that that involves testifying to a past experience of that event. We could understand 'memory' simply as memory of the occurrence of events, and not only of events which are experiences of the occurrence of other events. A subject

could be said to ‘remember’ past physical events in virtue of those events causing traces in his brain, which at a later time cause the apparent memory of those events without any mental-to-physical causation being involved. The memory traces caused in a person’s brain by the occurrence of some event sometimes cause that person to become aware later of details of that event of which they were not at the time aware; and it does not seem too unnatural a use of the word ‘remember’ to say that they ‘remembered’ those details. So the only assumption that someone would need to make in order to rely on his ‘apparent memory’ of some past physical event, would be that the past event caused his present belief that it happened; and that does not involve any mental-to-physical causation. And we could come to understand ‘testimony’ to amount merely to the public utterance of sentences reporting that an event occurred caused by a chain of events in the utterer, itself caused by the event reported, a chain which need not include any conscious events. The ‘testimony’ would not be testimony that the testifier had observed the events, but merely testimony that the events had occurred. Thus someone’s eyes could receive light rays from physical events, and—because those physical events caused brain events in that person—subsequently report them, without that causal chain proceeding through any conscious events. So the only assumption that someone A would need to make in order to rely on B’s ‘apparent testimony’ that some past event E occurred, would be that a past event caused a brain event in B which caused B’s mouth to produce words stating that E occurred (‘caused’ in the sense that it was a necessary part of a sufficient cause); and that does not involve any mental-to-physical causation. Counting as a witness’s ‘testimony’ to an event any utterance of his claiming that the event occurred which was caused by the event, certainly seems to involve giving a stretched meaning to ‘testimony.’ We might reasonably want to claim that science ought to rely on the reports of observers about their own experiences, rather than merely on words coming out of their mouths (whose content is not further justifiable) that certain events affected their brains. Still, it is worthwhile to see if we can save CCP by stretching our understanding of ‘memory’ and ‘testimony’ in these ways. We would not then need to make any assumptions about conscious events causing physical events in order justifiably to believe what we learn from ‘memory’ and ‘testimony’ about the occurrence of physical events.

And in that case the evidence that events occurred which were in fact predicted by some physical theory entailing CCP would not be undermined by the use of that evidence presupposing the falsity of the physical theory.

There is however a further (and to my mind insuperable) difficulty in supposing that we could have a justified belief that some deterministic physical theory gave true predictions about relations between physical events. This is that we would also need, not merely a justified belief, that certain relations between physical events occurred, but also a justified belief that these relations were predicted by that deterministic theory. But anyone who had not calculated for himself what that theory predicted about the relations between physical events must depend on the evidence provided by the apparent testimony of scientists to have calculated this and ‘to have seen’ (that is, had a conscious belief) that that was what the theory predicted, that is evidence of the conscious events of scientists, not merely evidence of the occurrence of physical events. But if the deterministic physical theory were true, the scientists could not have been caused to give that testimony by their intention to tell what they believed about what the theory predicted. Hence no one (and so no other scientist) could justifiably believe what any scientist reported about his calculations, and so believe that the theory made the predictions which he claimed that it did (as well as believing that the predicted events occurred), since believing what the scientist reported would undermine the credibility of his apparent testimony to it. Neither—for the same reason—could any scientist rely on his own testimony to himself recorded in a diary that he had previously calculated the consequences of the deterministic theory. Nor could a scientist rely on his own apparent memory of having calculated these consequences, since this would involve his past experiences (of his calculation) causing the brain event which caused his memory. Only if a scientist could hold in his mind at one time all his calculations (or perhaps do all the calculations within less than a few minutes), from which it apparently followed that the deterministic theory predicted certain events, could he have a justified belief that that theory made successful predictions, and so a justified belief in CCP. For most scientific theories and most scientists, this is most unlikely. The crucial difference between having a justified belief that certain physical events occurred, and having a justified belief that a certain theory predicts certain

events, is that for the latter we need evidence of conscious events (we or others ‘seeing’ that certain calculations are correct), while for the former (given extended senses of ‘memory’ and ‘testimony’) we need only evidence of the occurrence of physical events.

I conclude that (with the above very small exception) no one could have a justified belief that any deterministic physical theory made certain predictions. So neither by the route of trying to show the inefficacy of mental events, nor by the route of trying to show the total efficacy of physical events, could anyone (with the stated very small exception) have a justified belief in CCP. Hence we should believe that things are they seem to be, that often our intentions do cause our bodily movements, which clearly they do by causing our brain events.

### References

- Banks, William P., and Susan Pockett. 2007. “Benjamin Libet’s work on the Neuroscience of Free Will.” In *The Blackwell Companion to Consciousness*, edited by Max Velmans and Susan Schneider, 657–70. Oxford: Blackwell Publishing. <https://doi.org/10.1002/9780470751466.ch52>
- Haggard, Patrick. 2008. “Human Volition: Towards a Neuroscience of Will.” *Nature Reviews, Neuroscience* 9: 934–46. <https://doi.org/10.1038/nrn2497>
- Hallett, Mark. 2007. “Volitional Control of Movement: The Physiology of Free Will.” *Clinical Neurophysiology* 118 (6): 1179–92. <https://doi.org/10.1016/j.clinph.2007.03.019>
- Libet, Benjamin. 2004. *Mind Time*. Cambridge, MA: Harvard University Press.
- Mele, Alfred R. 2009. *Effective Intentions*. Oxford: Oxford University Press.
- Montero, Barbara. 2009. “What is the Physical?” In *The Oxford Handbook of the Philosophy of Mind*, edited by Brian McLaughlin, Ansgar Beckermann, and Sven Walter, 173–88. Oxford: Oxford University Press.
- Roediger, Henry L., Michael K. Goode, and Franklin M. Zaromb. 2008. “Free Will and the Control of Action.” In *Are We Free?*, edited by John Baer, James C. Kaufman, and Roy F. Baumeister, 205–25. Oxford: Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780195189636.003.0010>
- Swinburne, Richard. 2011. “Could Anyone Justifiably Believe Epiphenomenalism?” *Journal of Consciousness Studies* 18 (3–4): 196–216.
- Swinburne, Richard. 2013. *Mind, Brain, and Free Will*. Oxford: Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780199662562.001.0001>
- Thompson, Richard F. 2000. *The Brain*. 3<sup>rd</sup> edition Worth Publishers.