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# *The Inevitable Implausibility of Physical Determinism*

**Abstract:** *I shall understand physical determinism as the doctrine that every physical event has a physical event as its necessary and sufficient cause (and no non-physical event as either a necessary or a sufficient cause). This paper seeks to show that no one would be justified in holding this doctrine unless it could be shown to make successful predictions; and that such predictions could only be obtained if we assume the doctrine to be false.*

## 1. Ontology

Before proceeding further I need to define a ‘physical’ event. Philosophers who attempt a definition of the ‘physical’ usually define it in terms of the subject matter of a future true and complete physics and what supervenes thereon.<sup>1</sup> On such a definition a ‘physical’ event would be an event canonically describable in terms of the categories of that physics or an event supervening on events of that kind. But since we do not have an adequate idea of what a future physics would be like, that definition is not very useful. However, whatever other characteristics a future physics might have, there is one characteristic which any event lying within the scope of a future physics will surely have, the characteristic of being a public event, necessarily equally accessible to any investigator who is properly located, equipped with the right instruments, and possessing the categories and expertise

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<sup>1</sup> See the various slightly different definitions of the ‘physical’ analysed in Montero (2009).

needed to recognize it. I shall therefore define a ‘physical’ event as one to which no one necessarily has ‘privileged’ access (in the above sense). A brain event, for example, is a physical event; anyone suitably located, etc. can find out about my brain events as well as can anyone else. As I need also for this discussion the concept of a ‘mental’ event, I shall define it as an event to which necessarily there is privileged access; and I shall assume hereafter that the event consists in some individual having some property and that that individual is the only one who has privileged access to that event. And it does rather look as if most events normally considered to be mental events in virtue of being phenomenal and/or intentional events<sup>2</sup> are in my sense mental events. (‘Phenomenal’ events are conscious events, such as sensations and the ways things seem to be; ‘intentional’ events are attitudes, such as beliefs and thoughts, towards some state of affairs. ‘Intentional’ events are not as such the same as ‘intentions’, which are a particular class of ‘intentional’ events.) Whatever ways others have of finding out whether I am in pain, or have a thought that today is Thursday, I can also use; like others, I can study my behaviour (by watching a film of it) or inspect my brain (via some instrument). But I have an additional way of finding out whether I am in pain or have a thought that today is Thursday, by actually experiencing the pain or thought; and necessarily no one else has that way. So these events are mental events. In my sense of ‘mental event’, necessarily mental events are not identical to and do not supervene on physical events. The only remaining philosophical issue is which kinds of events are mental events, and I shall make below some debated but (to my mind) fairly obvious assumptions about what these are.

I define a pure mental event as one which does not entail the occurrence of a physical event. Perceptions such as my seeing a tree are mental events since I can know better than can anyone else whether or not I am seeing a tree, but they are not pure mental events since seeing a tree entails that there is a tree present — and that is a physical event. But sensations such as pains, and beliefs such as the belief that I am seeing a tree, are pure mental events, since it is not entailed by the occurrence of those sensations or beliefs that anything public is happening.

Conscious events are a sub-class of pure mental events. They include both those pure mental events which occur only while the

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<sup>2</sup> See the analysis of these terms in Graham, Horgan and Tienson (2009).

subject is conscious of them, and also pure mental events of which the subject is conscious but which may occur while the subject is not conscious of them. The first group includes not merely sensations such as pains, but also, as I have assumed above, occurrent thoughts. If I am not in any way aware that the thought 'today is Friday' is now crossing my mind, it isn't crossing my mind. It also, I suggest, includes — as I shall use the word — intentions (intentions in what I am doing, not intentions for the future), what I am trying to achieve by my bodily movements. 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 (in my sense) there was no intention in what I was doing. If an intention causes my bodily movements it clearly does so by causing the brain events which cause those movements. Among the pure mental events of which I can become conscious but which may continue to occur while I am not conscious of them are beliefs and desires. As I shall use these words, if I behave in the way I would behave if I had some belief or desire, but am entirely ignorant of having that belief or desire (even when helped by some psychiatrist to probe my 'unconscious'), I am not to be counted as having that belief or desire.

Physical determinism, as I am defining it, is the doctrine that every event has a physical event as its necessary and sufficient cause (and no non-physical event (and so no mental event), as either a necessary or sufficient cause). Epiphenomenalism is the doctrine that physical events (in effect brain events) often cause conscious events, but conscious events never cause physical events. It is fairly obviously implausible to deny the first clause of this definition, and so I shall in future understand by 'epiphenomenalism' merely the contested doctrine of the second clause, that conscious events never cause physical events. If epiphenomenalism (on this narrower understanding) is implausible, so too is physical determinism. It would follow from epiphenomenalism that such common-sense views as that my intention to come to the Humanities Building caused my leg movements which brought me to that building are false. It follows that, in the way these terms are analysed above, no conscious event is identical to or supervenes on a physical event. Hence these theories (physical determinism and epiphenomenalism) are theories about which kinds of thing cause which other kinds of thing, and so they are scientific theories. In this paper, I argue the epistemological thesis that no one could ever be justified in believing epiphenomenalism and so in believing physical determinism, and that claims that recent

neuroscientific work provides that justification are not merely false, but couldn't possibly be true — and that is because of what constitutes a justified belief in a scientific theory. For a justified belief in epiphenomenalism requires a justified belief in a particular scientific theory; and to have 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. This will hold on any mildly plausible internalist or externalist account of justification. The internalist will regard successful prediction as an *a priori* requirement for justification, while the externalist will hold that the scientific method requiring successful prediction is a reliable truth-conducive method (or satisfies some other externalist requirement) and that that is what makes a belief acquired by that method justified. In this paper I will be arguing that (at least one of) those justified beliefs couldn't be had if physical determinism were true. Hence physical determinism is in a crucial sense self-defeating; if it were true, we could not be justified in believing it.

## 2. Epistemology

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 at the centre of the 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 the calculations in the past), or testimony (from oneself or others that they have made the

calculations); or rather, since all of these sources may be misled, it is apparent experience, memory, or testimony which provide our justified belief that the theory makes true predictions — justified in the absence of counter-evidence, that is, in the absence of 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.

It is a fundamental epistemic principle that what we seem to (that is, apparently) experience is probably so — barring counter-evidence; this includes what we seem to observe in the public world, what we seem to experience as conscious events, and the logical consequences we seem to ‘see’. This principle has had a number of different names, among them ‘the principle of credulity’.<sup>3</sup> If this were not a fundamental epistemic principle, total scepticism would follow. It is a second epistemic principle (which follows from the former, though I shall find it useful to treat it separately) that what we seem to (that is, apparently) remember having experienced, we probably did experience — barring counter-evidence. I shall call this the Principle of Memory. And it is a further fundamental epistemic principle that what people seem to be (that is, apparently are) telling us that they experienced, they probably did experience — again barring counter-evidence; and I shall call this the Principle of Testimony. Beliefs

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<sup>3</sup> Other names are ‘Phenomenal Conservatism’, ‘Epistemic Conservatism’, and ‘Dogmatism’. See the discussion of these principles in Tucker (2013). Different philosophers have sought to put qualifications on this principle — for example by restricting its application to propositions of certain kinds, such as propositions about what we seem to perceive with our senses. For my arguments against any such restrictions see Swinburne (2013, pp. 42–4). For arguments supporting the Principle of Memory, and the Principle of Testimony, see *op. cit.* (pp. 55–7).

acquired by apparent experience, memory, and testimony are probably true — in the absence of counter-evidence. Science relies on the applicability of these principles to determine what constitutes evidence. A scientist takes his (apparent) observations, experiences, and calculations as probably correct, at least when he has looked carefully and checked. 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 had certain experiences (normally in the form of observations) 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 experiences.

Beliefs acquired by apparent experience, memory, and testimony are however open to counter-evidence or defeaters. There are two kinds of defeaters — undermining defeaters and overriding defeaters. If we have inferred (consciously or subconsciously) the occurrence of some event  $y$  from present evidence  $x$ , then an undermining defeater is evidence (making it probable) that  $x$  did not occur or is not good evidence for  $y$ , whereas an overriding defeater is new evidence that  $y$  did not happen. If, for example, I apparently experience hearing my telephone ring, and then someone points out to me that the noise (from which I subconsciously inferred that my telephone is ringing) is coming from the television set where someone is depicted as hearing a telephone ring, that constitutes an undermining defeater for my apparent experience. It doesn't show that my telephone was not ringing, but it does show that the noise was not evidence that it was, because the noise had a different cause. Again, if I have come to believe that  $y$  happened because some person apparently testified that he saw  $y$ , evidence that that person was somewhere else at the relevant time and so could not have seen  $y$  undermines his evidence, and I no longer have reason to believe that  $y$  happened. By contrast the apparent testimony of two independent witnesses that they were at the place of the alleged occurrence of  $y$ , and that they saw that  $y$  did not happen, overrides the evidence of the original witness. But the evidence constituting the defeater must itself be provided by apparent experience, memory, or testimony. This evidence need not be direct evidence of, for example, the non-occurrence of the event or of the evidence for it — for example in the form of apparent testimony that the testifier was not present at the site of the alleged event — it may

be indirect evidence, in the sense that it may be evidence supporting a theory which has the consequence that the event or the evidence for it apparently experienced, remembered, or testified to couldn't have happened — for example, evidence supporting a theory that the testifier was blind and so couldn't have seen what he testified to having seen.

Further, I claim, in having beliefs resulting from experience of physical events such as the apparent observation of a desk, we assume that the event (of the presence of the desk) experienced caused the belief (with its accompanying sensations), 'caused', that is, in being a necessary part of the total cause. In perception we seem in contact with the event apparently observed. That event seems to force itself upon us; the presence of the desk seems to force itself upon me, and so I have no option but to believe that it is there. That, we assume, is because there is a causal chain from the desk to the belief — only causes exert 'force'. Hence the generally accepted causal theory of perception. (Maybe not any perceptual belief caused by the object apparently observed constitutes an observation of it. Maybe the causal route must not be 'deviant'. But that does not affect my point that a causal route is necessary for perception.) It is natural to suppose that the same goes for our beliefs about our currently conscious events; that in believing that we are having certain sensations we assume that the belief is forced upon us by those events, and in believing that our calculations are correct we assume that that belief is forced upon us by the calculations — the marks on the paper or in our mind symbolizing the calculations cause us to have the belief that the calculations are correct. But, as some writers (for example, Chalmers, 1996, pp. 172–209) have denied that our beliefs about currently experienced conscious events are caused by those events, and claim instead that in this special case we have direct access of a non-causal kind to our conscious events, I shall not assume that a causal route is required for access to our presently conscious events.

So with respect to beliefs resulting from experience (with the above mentioned exception) evidence that such a belief was not caused by a causal chain (of necessary parts of total causes) from the event believed constitutes an undermining defeater for it — as in my example of the telephone ring. A similar assumption of the existence of causal chains, although longer ones than for experience and ones involving different kinds of event, undergirds our beliefs in the deliverances of apparent memory and testimony. I trust my apparent memory of an event because I assume that that apparent memory was

caused by a past apparent experience of the event recalled, and that the experience was caused by the event itself. Thus in trusting my apparent memory that I was in London on Monday I assume that it was caused by my apparent experience on Monday of being in London, itself caused by my being in London. Hence the generally accepted causal theory of memory. (The apparent memory must of course correspond to the previous experience, and maybe the causal route must not be 'deviant'. My point is merely that a causal route is necessary for memory.) Any evidence that the (apparent) memory was planted in me by a hypnotist or a brain surgeon constitutes an undermining defeater for that apparent memory belief.

Similarly, in believing someone's apparent testimony to be experiencing or have experienced some event I assume that they say what they do because they are apparently experiencing or apparently remember having experienced that event and have the intention of telling me the truth about it; that is, their apparent experience or memory and their intention causes them to say what they do, 'causes' in the sense of being a necessary part of the total cause. In the case of a past event I believe that their apparent memory was caused by an apparent past experience of the event, the latter being caused by the event itself. So, if I get evidence that the words coming out of some person's mouth were not caused by any intention of his (e.g. that the words were caused by a neurophysiologist stimulating that person's neurons to cause his mouth to make the sounds, or simply as in fluent aphasia where a neural malfunction causes a stream of words to come out of a subject's mouth), that evidence constitutes an undermining defeater to belief in the truth of what that person seemed to be saying. (The intention does of course have to be of a particular kind, an intention to tell the truth; and evidence that the person was intending to deceive me would also undermine his testimony. But my point is simply that evidence that there is no causation at all by the apparent testifier's intention undermines his apparent testimony.) In all of these cases the counter-evidence (in the form of an undermining defeater) must itself come (directly or indirectly) from apparent experience, memory, or testimony.<sup>4</sup>

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<sup>4</sup> Audi (1998) defends the causal nature of perception, memory, consciousness, and (in effect) testimony. Thus (his p. 28) 'perception is a kind of causal relation', (p. 56) 'causal connections to the past are essential to genuine remembering', (p. 81) 'the process by which introspection leads to introspective beliefs... is... causal', and (p. 137) 'with testimonially grounded knowledge... there must be a certain kind of unbroken



In summary, then, I am making the epistemic assumption (EA) that:

- (1) A justified belief in a scientific theory (which is not itself a consequence of any higher-level theory in which the believer has a justified belief) requires a justified belief that the theory makes true predictions.
- (2) A justified belief that a theory makes true predictions is (unless this is a consequence of some other theory in which the believer has a justified belief) provided by and only by the evidence of apparent experience, memory, and testimony that the theory predicts certain events and that these events occurred.
- (3) Such justification is undermined by evidence that any apparent experience was not caused by the event apparently experienced, any apparent memory was not caused by an apparent experience of the event apparently remembered, and any apparent testimony was not caused by the testifier's intention to report his apparent experience or memory.

I hope that the few examples by which I have illustrated its application show the centrality of EA in our noetic framework. The fundamental criterion (FC) behind EA is that justified belief that some event occurred requires the assumption that that event is (privilegedly) accessible to or causes effects (privilegedly) accessible to the believer (unless it is justifiably believed to be the consequence of some theory which predicts events justifiably believed to occur on grounds independent of that theory). Then justified belief that a theory makes true predictions requires (unless justified by a higher-level theory) the assumption that both a scientist's awareness of the calculations that the theory predicts certain events and the events predicted are accessible or cause effects accessible to the believer. FC, I suggest, is a criterion central to our judgments about the credibility of a scientific theory.

### 3. Epiphenomenalism

Now there could be two kinds of scientific evidence for epiphenomenalism. The first kind, which I shall call  $\alpha$ -type evidence, is evidence about when (relative to brain events) various conscious events occur. For epiphenomenalism claims that the occurrence of any conscious

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chain from the belief constituting that knowledge to a source of the knowledge in some other mode'.

event makes no difference to the pattern of later brain events. So it predicts that whether or not some type of conscious event occurs during the first part of some sequence of brain events will make no difference to whether or not the sequence is completed (and so cause public behaviour). It would seem that if this prediction were tested for a large random sample of different types of sequences of brain events and different types of conscious events (especially intentions), and found to be correct, this would be strong evidence for epiphenomenalism. To test such predictions, a scientist would have to learn about the times of occurrence of various conscious events. The paradigm way to learn about this is from apparent experience, memory, and testimony about when the conscious events occurred. Although a scientist could learn about times of occurrence of conscious events of some narrow kind from some wider theory, that theory would be a theory about when conscious events of some wider kind occurred and could itself be justifiably believed only on evidence of the same kind.

Yet, if apparent testimony is to constitute evidence that conscious events occurred, the scientist must — by EA — assume that the testifying subjects are caused to say what they do by a belief that the conscious events occurred and an intention to tell the truth about their belief — a causal route which must go through a brain event. But, if epiphenomenalism were true, no conscious events will cause any brain event to cause the subjects to say what they do. Yet no theory could be justifiably believed on the basis of evidence about the occurrence of events about the occurrence of which we could have evidence only if we assume that theory to be false. Hence epiphenomenalism couldn't be justifiably believed on the basis of apparent testimony. A scientist might remember his own conscious events. (By EA) someone is justified in trusting his apparent memories on the assumption that they are caused by his past experiences. But we know that true memories are caused directly by brain events, and so, in order to be justified in believing that his memories are caused more ultimately by his past experiences, he must believe that those experiences cause brain events, and so he must assume that epiphenomenalism as a whole is false. Hence apparent memories of past experiences cannot provide a justified belief that epiphenomenalism makes true predictions, any more than can the apparent testimony of others. I have conceded that a scientist might have a justified belief about which conscious event he was currently experiencing, without assuming that the conscious events caused that belief. But the evidence of one private event currently experienced by a scientist would hardly constitute enough

evidence of successful predictions to make it (together with any amount of evidence about brain events) at all probable that epiphenomenalism is true. I conclude that no one could have a justified belief in epiphenomenalism on the basis of  $\alpha$ -type evidence for it.

I now apply this result to the research programme initiated by Benjamin Libet which seeks to provide evidence of  $\alpha$ -type showing (i.e. providing a justified belief) that a sample of brain events of one kind which cause intentional actions (i.e. actions which the agent believed that he had the intention to perform) are not caused by intentions. In the original and most influential Libet experiments (Libet, 2004, pp. 123–137) participants were instructed to move their hand at a moment of their choice within a period (e.g. 20 seconds). They watch a very fast clock, and report subsequently the moment at which they first had the ‘intention’<sup>5</sup> to move the hand. They reported the ‘intention’ to move the hand as occurring (on average) 200 msec before the onset of muscle activity initiating a hand movement. However, electrodes placed on their scalp recorded (on each occasion of hand moving) a build up of ‘readiness potential’ (RP), which was evidence of a particular kind of brain event (which I’ll call  $B_1$ ) occurring an average 550 msec before the muscle activity. Experiments of other kinds, Libet claimed, showed that subjects report the time of sensations as occurring 50 msec before the time of 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 the ‘intention’ first appeared 150 msec before the muscle activation.<sup>6</sup>

So, if the subjects’ reports are at all accurate there is a succession of events: a brain event ( $B_1$ ), then a conscious event (the intention, which

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- <sup>5</sup> One problem with Libet-type experiments is that Libet and other experimenters describe the conscious event which the subjects report, and which I have described as the onset of an ‘intention’, sometimes instead as the onset of a ‘wish’, or of an ‘urge’ or a ‘wanting’, or as a ‘decision’. These are events of very different kinds — ‘wishes’, ‘urgings’, and ‘wantings’ are experienced as involuntary occurrences which happen to us, and to which we may or may not yield, whereas ‘intentions’ and ‘decisions’ which initiate intentions are experienced as voluntary chosen occurrences. On this see Mele (2006, pp. 32–4).
- <sup>6</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 by Hallett (2007), Haggard (2008); and philosophical commentary in Banks and Pockett (2007) and Mele (2009).

I'll call  $M_2$ ), and then some brain event (which I'll call  $B_3$ ) which directly causes the muscle activity and so the movement. Many neurophysiologists proceed from that to reach the extraordinary conclusion that the intention does not cause the movement. Thus Roediger, Goode and Zaromb (2008) conclude 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>7</sup> But that is a totally unjustified conclusion, since it is equally compatible with all the data and the most natural explanation of them to suppose that  $B_1$  causes (in the sense of being a necessary causal condition for) the 'conscious intention' ( $M_2$ ), and that the intention causes the brain event ( $B_3$ ) which directly causes the movement. Causation is transitive. If I flip the light switch and thereby cause the light bulb to light up, that doesn't rule out the possibility that my flipping the switch caused an electric current to pass to the bulb and that the current caused the bulb to light up. Despite this obvious point many neurophysiologists prefer one of two rival explanations of the data over the natural explanation, of which the favoured one is that an earlier brain event ( $B_1$ ) causes both the intention ( $M_2$ ) and (in 'parallel') a sequence of brain events leading to  $B_3$  which causes the hand movement without the intention causing any brain event.

Even if it were shown that  $B_1$  causes a sequence of brain events which are necessary for the bodily movement, when that constitutes an intentional action (in virtue of the agent believing that he had the intention to make that movement), that wouldn't show that the intention was not also a necessary part of the cause. To show that you would need to show that  $B_1$  causes the very same sequence of brain events with or without subjects having the requisite intention (to produce that bodily movement) and so with or without the bodily movement constituting an intentional action. As far as I know, no one has attempted to show this. If this were shown, we would have evidence against the natural interpretation of the Libet experiments, that a brain event causes the intention which causes the brain event which causes the bodily movement.

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<sup>7</sup> See Roediger, Goode and Zaromb (2008, p. 208). For a collection of similar quotations from neuroscientists, see Mele (2009, pp. 70–2).

Experimenters seeking to establish a scientific theory, such as those performing Libet-type experiments, assume that they have access to the conscious lives of many different subjects (and so evidence of  $\alpha$ -type about them), in order to test the predictions discussed in the last paragraph, that the same sequence of brain events would occur in the absence of the intention, without which the experimental results do not show that the intention does not cause the movement. The only way for experimenters to acquire this information about the conscious events of subjects is from what those subjects tell them (or by a higher-level theory itself justified by what subjects say). So experimenters assume that subjects' beliefs about their conscious events (including their memory beliefs) are correlated with their testimony (in the sense that the testimony is a true report of their beliefs). The normal reason for assuming this is provided by EA — subjects' intentions to tell the truth about their beliefs plus their beliefs cause the testimony. If we assume that the correlation holds for this reason, then we would already be assuming the falsity of epiphenomenalism in one respect in order to test the crucial prediction necessary to provide justification of either of the interpretations of the Libet experiments which claim that intentions do not cause the hand movements. We can only justifiably believe that intentions do not cause the hand movements if we justifiably believe that they do cause the apparent testimony about them.

However, we might have good grounds to believe that, in the particular circumstances of Libet-type experiments, apparent testimony is not caused by the intention to produce it, while nevertheless being in general reliable (i.e. correctly reporting the testifiers' beliefs). But these grounds could only be provided by a wider scientific theory about when apparent testimony to a belief about a testifier's conscious life was or was not correlated with the occurrence of that belief, and about when someone's apparent memory of their past conscious life was true. A justified belief in that scientific theory would require a justified belief that the theory made true predictions. The predictions would need to be predictions of when on other occasions subjects' apparent testimony was correlated with their beliefs and their own apparent memories were true. But in order to have a justified belief that these predicted correlations occurred we must rely ultimately on apparent testimony and memory and so — by EA — assume that subjects' apparent testimony was caused by intentions to report true beliefs, and apparent memory was caused (via brain-events) by the conscious events apparently remembered.

I conclude that the Libet-type experiments have not so far shown that in their experimental circumstances intentions do not cause bodily movements; and — even if the crucial predictions necessary to show this proved correct — that would only show that epiphenomenalism held in these circumstances on the assumption that in general it was false. And, more generally, no  $\alpha$ -type evidence could have any tendency whatever to show that epiphenomenalism is true, and thereby begin to show that physical determinism is true.

It might, however, seem that someone could have a justified belief in physical determinism, not because of  $\alpha$ -type evidence for epiphenomenalism, but because of a justified belief in some physical theory, that every physical event has another physical event as its immediate necessary and sufficient causal condition. In that case of course no brain event could have a conscious event as its necessary causal condition; overdetermination would be excluded. It might be thought that we could establish that deterministic physical theory on evidence solely about which physical events occur when, which I will call  $\beta$ -type evidence. If we found that for any random sample of physical events (including brain events) that each of them is related to some other physical event as its immediate necessary and sufficient cause in a way calculable from such a theory, that would seem to be powerful evidence in favour of that theory and so in favour of physical determinism.

Someone could justifiably believe certain physical events to be occurring on the evidence of apparent experience (a current observation). But to get enough evidence to acquire a justified belief that the deterministic physical theory is true, a scientist would require evidence provided by apparent memory of past observations and apparent testimony by others to having observed various physical events in the past. But a justified belief in the deliverances of apparent memory of past experiences and apparent testimony to them is — by EA — undermined by evidence that they are not caused by experiences of those events. So — given EA — there could not be a justified belief in a physical theory which entailed epiphenomenalism.

However, a modified understanding of memory and testimony is possible, which keeps apparent memory and testimony as sources of justified belief, and is still compatible with the fundamental criterion (FC) (lying behind EA) that (barring justification by a justified theory) justified belief in the occurrence of an event is dependent on the assumption that that event is accessible to or causes an effect accessible to the believer. One could understand memory simply as

memory of the occurrence of events, and not only of events which are experiences of the occurrence of 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. People sometimes become aware later of details of some event which they observed and 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. 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. This certainly seems to involve giving a stretched meaning to 'testimony', but relying on apparent testimony of this kind to the occurrence of physical events would still be compatible with the fundamental criterion (FC). Given these modified senses of memory and testimony, someone could have an apparent memory of or receive apparent testimony to the occurrence of physical events without making any assumption about anyone's conscious events causing physical events. 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. Given this modified understanding of apparent testimony and memory, anyone could have justified beliefs in the occurrence of any set of physical events (including brain events) which occurred without presupposing causation of the physical by the mental; and so come to believe in the occurrence of the physical events (the  $\beta$ -type evidence) predicted by a deterministic physical theory.

There is, however, a further problem 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. But if the deterministic physical theory were true, the scientist would not have been caused to give that testimony by any conscious event — neither by his intention to tell the truth nor even merely by his conscious belief about what the theory predicted. Hence no one could justifiably believe what the 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. Scientists normally check each other's calculations, but for the same reason — if the deterministic physical theory were true — no scientist could rely on the testimony of another scientist to have made the same calculation as he had. 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 memory of having calculated these consequences. For, since this would involve the causation by his past experiences (of his calculation) of the brain event which caused his memory, he would not be justified in relying on his own apparent memory about his calculations. Only if a scientist could hold in his mind at one time all his calculations 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 epiphenomenalism. For most scientific theories and most scientists, this is most unlikely.

I conclude that, given the fundamental criterion (FC) which guides the acceptability of scientific theories, (with the above very small exception) no one could have a justified belief that any deterministic physical theory made certain predictions, and so no one could have a justified belief in physical determinism. Hence, given the principle of credulity, we should believe that things are as they seem to be, that often our intentions do cause our bodily movements, which clearly they do by causing brain events; and so we should believe that physical determinism is false, because the physical domain is not causally closed.

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