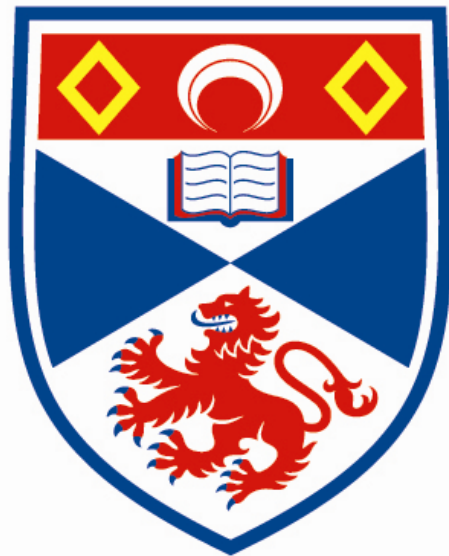


**Does the Conservation of Energy Principle  
prove the falsity of Interactionistic Dualism?**



University of  
St Andrews

---

600  
YEARS

Student ID: 080003548  
Dissertation Supervisor: Derek Ball  
PY4699: Dissertation in Philosophy  
Word Count: 5300

## Contents

	<i>Page</i>
<b>Introduction</b>	1
<b>Interactionistic Dualism</b>	2
<b>Conservation of Energy Principle</b>	8
<b>Redistribution</b>	11
Quantum Indeterminacy	14
Advantages	19
Criticisms	20
<b>Summary and Outlook</b>	22
Acknowledgements	24
Bibliography	25

## Disclaimer

*"I hereby declare that this piece of written work is my own work and that I have not reproduced, without acknowledgement, the work of another."*

ABSTRACT. This paper will explore the argument that the conservation of energy principle (CEP) proves interactionistic dualism wrong. The principle is often posited as showing that there cannot be bilateral causal interaction between a non-physical mind and physical body, because the energy transfer in such causal situations would violate the conservation law of classical physics that for any losses or gains there must be the opposite gains or losses respectively. I consider redistribution counterarguments to the CEP, primarily that of quantum indeterminacy. I believe these counterarguments show that it is far from certain that the CEP proves interactionistic dualism wrong.

## 1 Introduction

The debate as to the nature of the mind stretches back to the time of Plato and Aristotle, and currently this debate continues.<sup>1</sup> The belief that we have an immaterial soul or mind was often a commonly held position, however now, with the rise of scientific methods, physicalism and perhaps a prejudice against the super-natural, there has been a significant decrease in those who champion it. My ambition for this discussion is to be a *tabula rasa*, reasoning firstly why I believe dualism is worthy to be upheld and moving from there to the conservation of energy principle (CEP) that is argued to be fatal to it. I will consider specifically redistribution counterarguments to this, the foremost being quantum indeterminacy. Although impressed by these counterarguments, I find there to be unilateral/bi-lateral complications that threaten the interactionistic aspect of this interactionistic dualism. I conclude that quantum

---

<sup>1</sup> Plato (2002:93-155); Aristotle (1987); also, for other possible pre-modern texts including features of the cotemporary debate, see Caston (1997).

indeterminacy offers significant hope to interactionistic dualism in light of the conservation of energy principle, in that it makes respectable dualism's plausibility.

## 2 Interactionistic Dualism

Dualism is fundamentally the belief that the mind and the body are distinct in some way.<sup>2</sup> This view can be contrasted with the theory of physicalism which purports that the mind and body are identical.

Substance dualism is most famously championed by René Descartes (1641)<sup>3</sup> who argues in particular for interactionistic (substance) dualism. Descartes' interactionism states that, as mentioned above, two substances exist: matter, of which the essential property is that it is *spatially extended*; and mind, of which the essential property is that it *thinks*.<sup>4</sup> These two substances, it is held, can affect one another.

For example, I *desire* a cup of tea and consequently my body *moves* so as to fashion a cup of tea. This is a case of mind-affecting-body. If we step with a bare foot on a pin on the other hand, there will be an intense *feeling* of pain. This is a case of body-affecting-mind. As well as these rather basic common sense justifications for this belief, there are various other systematic, stronger reasons. As Roelof warns, we must be aware of the pitfalls of commonsense evidence due to its philosophically-disinterested and hence *ad hoc* nature.<sup>5</sup> So what we shall do is supplement the

---

<sup>2</sup> Crane & Patterson (2001:1-2)

<sup>3</sup> Descartes (1996)

<sup>4</sup> Howard (2003:§1¶8)

<sup>5</sup> Roelof (1955:454)

intuition that there are two substances. I do not want to assume dualism from the outset, which is why I am calling attention to it, for it to be reasoned from the start.

Consciousness has been the main stumbling block for material monism in that the physical reduction of consciousness clearly lacks what makes the state significant.<sup>6</sup> In direct contrast to this view, Descartes argues that we know the mind significantly better than the body.<sup>7</sup> He rhetorically asks in relation to his knowledge of the melting wax in front of him:

“Do I not know myself not only much more truly, more certainly, but even much more distinctly and evidently? For, if I judge the wax exists, from the fact that I see it, certainly it follows much more evidently that I myself exist, from the very fact that I exist.”<sup>8</sup>

Though as I have expressed above, reason for believing in dualism can have a more thorough foundation than simply than which the *cogito* offers. Interestingly, Roelof argues counter to Descartes that we know significantly more about material bodies than minds, both in quality and quantity.<sup>9</sup> He uses this information to give a representative<sup>10</sup> account of what we can consider to be the essential nature of matter and bodies, which in consequence he argues, sheds light on what minds can and cannot be. There are four notable contrasts:

---

<sup>6</sup> Howard (2003: §1¶1)

<sup>7</sup> Wilson (1978:93)

<sup>8</sup> Descartes (1969:1:156)

<sup>9</sup> Roelof (1955:455)

<sup>10</sup> Roelof (1955:459)

- i. Bodies are essentially within *space*; they have an essential spatial-referent.<sup>11</sup>

This is seemingly not true of the mind. However, it is worth discussing briefly why this is so. I look in front of me and wonder whether my mind has an essential spatial-referent. My gaze falls on an open area above the chair a couple of meters away from me. At this particular moment I can be sure that my mind is *not* there, spatially. This however, seems to imply that I have a sense of where, spatially, I expect my mind to rightly be, which intuitively is roughly behind my eyes.

Consider this however; imagine you are in a surgery room and you are able to see into your own brain by way of mirrors or a video camera (your scalp has been painlessly removed). If you were to imagine a flying pink elephant, while observing what is in theory behind your eyes, you would not see, nor recognise your current thoughts, let alone the flying pink elephant. One might argue that information, the conceptualisation of the flying pink elephant, is encoded within the microscopic firing of the nerve cells in the brain. However, if we were to alter the experiment so that you were looking through a microscope pointed at your currently nerve-firing brain, we would still not be in a position to grant thoughts spatial location, one would still not see the existence of the conceptualised flying pink elephant. All they would see would be nerve firings, granted probably with a correlation to the thoughts themselves (requiring reference to the raw experiential thought), but this is far from finding identity between these two clearly distinct happenings.

---

<sup>11</sup> Ibid. p. 456

- ii. Bodies can be determined *quantitatively*. They can be measured; one can have height, width, breadth. The same for the mind is not true. One cannot weigh the mind; one cannot define any spatial boundaries. The category of quantity is simply not appropriate to the mind.<sup>12</sup>
- iii. Bodies are unities in that they are a collective of many *parts* brought together, spatially connected. The mind is not composed of parts; it cannot be cut in two.<sup>13</sup>
- iv. The body is indifferent to *time*. The mind however lives in time, incorporates the past in the present, apprehends the future in terms of the past and present and this living in time is irreversible; as Roelof points out:

“A man can walk through a house, retrace his steps, and go out by the door he came in, but for his mind to go back is not simply the original experience in reverse, it is the re-experience of the *earlier, first* experience.”<sup>14</sup>

Another facet of Roelof’s argument is found in the nature of *knowledge*. He argues that were one to burn a book, it is not correct to express “knowledge has been lost” as it might in a figure of speech be correct to say. Considering strictly books *qua* bodies, paper and ink have been lost to the flames, but not *knowledge*. Rather, we should say “*potential* knowledge has been lost.” Knowledge only appears in the mind; one does

---

<sup>12</sup> Ibid. p. 457, 462.

<sup>13</sup> Ibid.

<sup>14</sup> Ibid. p. 462. A further reason to believe that the mind and body are separate can be found in E.J. Lowe (2006). He supplies a very interesting modal argument that unfortunately is not explicitly relevant here. Also see Chalmers (1990) on the plausibility of dualism in a matrix-like situation.

not find and hence take knowledge from books. If one took knowledge from a book, we would expect someone to exclaim “put that knowledge back!” However, this does not happen; knowledge is not in space, *simpliciter*.<sup>15</sup>

These facts all<sup>16</sup> point toward the conclusion that there must exist something that we call ‘mind’ that is entirely distinct from what we call ‘body’. Roelof upholds that

“[Dualism] refus[es] to deny, suppress, or pervert facts in order to simplify and sustain a theory. It accepts the facts and then as best it can develops a theory to interpret them. Matter and Mind are declared to be each real in existence, each irreducible to the other, each with a distinctive nature, because a careful examination and comparison of what we know of them both, discloses that such they are.”<sup>17</sup>

Before we consider the conservation of energy objection, it is worth briefly explaining the reason for the belief in specifically *interactionistic* dualism as opposed to either unilateral-causal dualism or parallelism.

### *Unilateral-Causal Dualism*

Unilateral-causal dualism is a form of substance dualism that states that causation only happens in one direction between the body and mind, rather than both directions.

This suggests either (a) *epiphenomenalism*, that only the body affects the mind or that

---

<sup>15</sup> Ibid. p. 459

<sup>16</sup> Ibid. p. 458-9. Roelof also included a comparison that matter and bodies never act for the sake of an end, whereas minds do. I disagree with Roelof on this point, arguing that purpose is apparent via evolution – that we act in certain ways in order to achieve an end the nature of which is survival.

<sup>17</sup> Roelof (1955:464)



(b) only the mind affects the body. It is worth noting that some philosophers have argued that epiphenomenalism may get around the conservation of energy principle due to the lack of energy required for the epiphenomenon to occur.<sup>18</sup> However, I reject both (a) and (b) firstly for the reasons above, that it appears that from intuitive experience the connection is bilateral. Furthermore, if we were to hold (a) we would seemingly have to reject freewill which I consider too high a price to pay, and if we were to hold (b) we would be unable to explain the affecting power of the body on the mind, which appears *equally* present. It also raises the question as to *why* it is only in one direction rather than both; considering one must assume the complicated psycho-physical causal link in the first place. This appears to be more problematic and counterintuitive than interactionism.

#### *Parallelism – Occasionalism & Pre-established Harmony*

Parallelism is a substance dualist theory that holds that there is *no* causal link in either direction between the body and the mind (or the ‘soul’ in this context) but it is believed that their connection is divinely ordered. Encouraged by the then heavily criticised Cartesian interactionism (due to its mysterious causation), Malebranche’s ‘occasionalism’ and later Guelincx and Leibniz’s<sup>19</sup> ‘pre-established harmony’ grew supporters.<sup>20</sup> The former equates to a theory of constant miracles on the part of God who actuates the apparent causation on each occasion. The latter argues that there is a divinely pre-established harmony which allows the causally disconnected states of mind and body to unfold harmoniously. Although these theories of parallelism do

---

<sup>18</sup> See for example Campbell (1970/1980:53)

<sup>19</sup> Leibniz (2012) *Discourse on Metaphysics XIV*

<sup>20</sup> Williams (1990:287-8)

have some advantages, even perhaps for the conservation of energy principle,<sup>21</sup> the divine assumptions are highly *ad hoc*, on top of the ontological difficulty in the belief of a transcendental deity. Due to this I believe a simpler answer is preferred, additionally in light of Ockham's razor, which points me to interactionism.

### 3 The Conservation of Energy Principle

The conservation of energy principle (CEP) is considered to be one of the most threatening criticisms facing dualistic interactionism. It has often been considered to be a fatal flaw, as has been expressed by some of the leading philosophers of mind:

“[a]ll forms of substance dualism inherit Descartes' problem of how to give a coherent account of the causal relations between the soul and the body, but recent versions have an additional problem. It seems impossible to make substance dualism consistent with modern physics. Physics says that the amount of matter/energy in the universe is constant, but substance dualism seems to imply that there is another kind of energy, mental energy or spiritual energy, that is not fixed to physics. *So if substance dualism is true then it seems that one of the most fundamental laws of physics, the law of conservation, must be false.*”<sup>22</sup>

In a similar vein, Dennett claims:

---

<sup>21</sup> Montero (2006:390) “[G]iven that pre-established harmony denies causal relations between mind and body, the problem of how to account for mind-body interaction (when the mind is nonphysical) is clearly avoided.”

<sup>22</sup> Searle (2004:42)

“[N]o physical energy or mass is associated with [the effects of an immaterial mind]. How, then, do [these effects] get to make a difference to what happens in the brain cells they must affect, if the mind is to have any influence over the body? A fundamental principle of physics is that any change in the trajectory of any physical entity is an acceleration requiring the expenditure of energy, and where is this energy to come from? It is this principle of the conservation of energy that accounts for the physical impossibility of “perpetual motion machines,” and the same principle is apparently violated by dualism. [...] [It] is widely regarded as the inescapable and fatal flaw with dualism.”<sup>23</sup>

In Owen Flanagan’s opinion,

“If Descartes is right that nonphysical mind can cause the body to move, for example, when we decide to go to a concert, then physical energy must increase in and around our body, since we get up and go to the concert. In order, however, for physical energy to increase in any system, it has to have been transferred from some other physical system. But the mind, according to Descartes, is not a physical system and therefore it does not have any energy to transfer. The mind cannot account for the fact that our body ends up at the concert... We could maintain that the principle of the conservation of energy holds, but that every time a mind introduces new energy into the world – thanks to some mysterious capacity it has – an equal amount of energy departs from the physical universe – thanks to some perfectly orchestrated mysterious

---

<sup>23</sup> Dennett (1991:35)

capacity the universe has. Unfortunately, such an assumption is totally unwarranted except as a way of saving Cartesian Dualism, and therefore utterly begs the question.”<sup>24</sup>

And finally in a wider-reaching claim, Jerry Fodor argues that

“[T]he drawback of dualism is its failure to account adequately for mental causation. ... How can the nonphysical give rise to the physical without violating the laws of the conservation of mass, of energy and of momentum?”<sup>25</sup>

All the above quotes focus on the CEP as confronting interactionistic dualism, and their general argument can be comprehensively set out as follows:

**ACE:** The Argument from the Conservation of Energy<sup>26</sup>

1. Energy is conserved in any closed system.
2. The universe is a closed system.
3. Causation involves the transference of energy.
4. There are bilateral causal relations between the mental and the physical.

-----  
Thus:      The mental must be physical.

---

<sup>24</sup> Flanagan (1991:21)

<sup>25</sup> Fodor (1994:25). For other philosophers expressions of the CEP see van Inwagen (2002:196) and Putnam (1999:79).

<sup>26</sup> Montero (2006:385)

The conclusion of the ACE is tantamount to saying “physicalism holds and hence interactionistic dualism must be false”. I believe this argument to be false on account of the nature of the ‘causal relations’ in premise 4. The discussion of this nature concerns *redistribution* of energy.

#### 4 Redistribution

There are a number of ways of arguing against the ACE, none of which are particularly attractive. We could argue against premise 1, that energy may not be conserved in a closed system, but that would be contradictory. A closed system by definition is closed to change in quantity of its contents, in this case energy.

We could argue against premise 2, that the universe is in fact not a closed system, however this puts in jeopardy the law of the conservation of energy which states that concerning energy, for any gain there must be a loss and *vice versa*.<sup>27</sup> The fact that energy being created *ex nihilo* is put aside exclusively for transcendental deities I do not think supports this line of argumentation. Were the universe not a closed system in regards to energy, the laws of physics would not appear as they do – there would be a randomness to them, which is not the case.

We might also argue against premise 3, that causation does not involve the transference of energy. However, this again leads to a dead end. For in all cases of human experience of causation, there is an observable transference of energy. There is no denying that when I lift my hand, there is energy which causes that motion. If

---

<sup>27</sup> Roelof (1955:457)

there was no energy doing this job, it simply would not move. So in the current context, saying that causation does not involve transference of energy would be saying that the body is caused to move without it being moved, which is contradictory.

So this leaves us with premise 4. Worth noting is that by focusing our interest on premise 4 we are able to uphold the former three premises, which is a huge positive for this theory.

So how do we go about deconstructing premise 4? As I said above, what needs to be clarified is the *nature* of the causal relation. What I am positing is a quasi-causal relation. That is to say, it is not itself causal in the current sense, being understood as physical causation which is limited by conservation laws, but it is causal in a sense that *makes use* of a possible loophole which is itself physically causal. This theory can be seen to be similar to, or spring from the foundations of, redistribution of energy. This counter argument has however come under criticism, as Searle again points out:

“[Some] have said that the mind rearranges the distribution of energy in the universe without adding to it or subtracting from it....There is something *ad hoc* about these manoeuvres, in the sense that the authors are convinced in advance of the truth of dualism and are trying to find some way, any way, that will make dualism consistent with physics.”<sup>28</sup>

---

<sup>28</sup> Searle (2004:42)

I do not think such a manoeuvre is *ad hoc*. More than likely, an explanation of the mysterious nature of the relationship between the physical body and what *can be reasoned* to be the immaterial mind, will itself be complicated, mysterious and unusual. As I said at the beginning, I am considering the situation from base reasons – I have a reason why I do not believe in physicalism and that is because it stumbles over the irreducibility of consciousness, whereas dualism does not.

Campbell holds that

“arguments [for physicalism] from the conservation of energy [fail because] ... changes in the distribution of energy, and hence causal changes can be brought about without supplying any energy.”<sup>29</sup>

C.D. Broad<sup>30</sup> is one of the first twentieth century philosophers to have proposed this idea of the redistribution of energy to combat the ACE. His idea is that the immaterial mind alters the distribution of energy that is already within the material body/brain.

Although his theory has some faults<sup>31</sup> which we do not currently need to go into, he does introduce the general idea of redistribution. The more up-to-date theory which I believe has more influence in the current debate does concern redistribution, but at a quantum level.

---

<sup>29</sup> Campbell (1984:52); also see Rosenthal (1998).

<sup>30</sup> Broad (1925)

<sup>31</sup> See Averill & Keating (1981:106) “Broad [...] works from a statement of a law of physics that is stronger than is necessary to develop physics, and that has metaphysical implications which beg the question against interactionism.”

## 4.1 Quantum Indeterminacy

It has been proposed that Eddington<sup>32</sup> was the first to speculate that the mind may influence the body by affecting quantum events within the brain through an influence on the probability of their occurrence.<sup>33</sup> Margenau has suggested that the mind is related to the body, but it does not necessarily have to be “required to contain energy in order [for it] to account for all known phenomena in which mind interacts with brain.” She goes on:

“In very complicated physical systems such as the brain, the neurons and the sense organs, whose constituents are small enough to be governed by probabilistic quantum laws, the physical organ is always poised for a multitude of possible changes, each with a definite probability.”<sup>34</sup>

It is this inherent physical probability or randomness which is the loophole that mind latches itself to and *may* allow it to influence the body in a way that is not of a mind-body causal nature, but rather it is like loading quantum dice.<sup>35</sup> The outcome appears random, but in fact there *is* method behind it. Margenau proposes that there is possibly a superimposition of a probability field on the physically determined probability field.<sup>36</sup> The quantum probabilities appear not to be fully-controlled under physical laws and as such there is a possibility that applying to them mind-influences will be a possible explanation for our intuition that we have freewill and a conscious state that exists immaterially.

---

<sup>32</sup> Eddington (1935)

<sup>33</sup> Mohrhoff (1999:168)

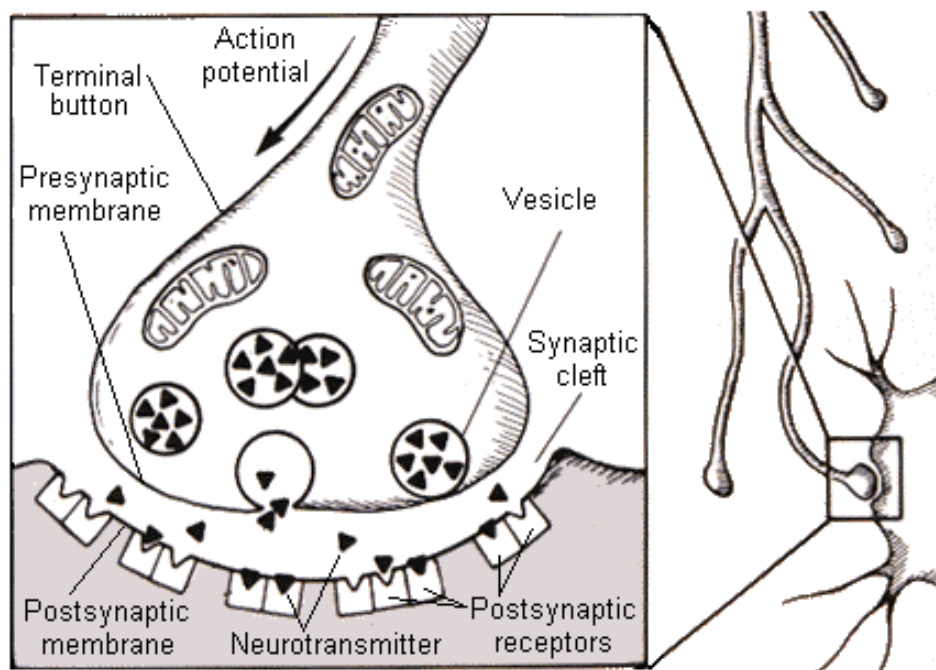
<sup>34</sup> Margenau (1984:97, 96)

<sup>35</sup> Mohrhoff (1999:169)

<sup>36</sup> Ibid.



The most elaborate and specific hypothesis of mind-brain interaction to date is put forward by J.C. Eccles and F. Beck.<sup>37</sup> Their theory is a neurologically complicated one; however I will attempt to explain it in an accessible way. Their belief is that there is a probability ruling over *exocytosis*. Exocytosis is the basic activity of the cerebral cortex. Specifically, it is the emission of a chemical transmitter (or 'neurotransmitter') into the synaptic cleft (the gap) (See Figure 1) between the terminal expansion (or 'bouton')<sup>38</sup> of a nerve fibre and the dendrites which circle the nucleus of another nerve fibre (see Figure 2).



**Figure 1: Structure of the Synaptic Cleft**<sup>39</sup>

<sup>37</sup> Beck and Eccles (1992); Eccles (1994).

<sup>38</sup> Eccles (1994) calls it a 'bouton'; however I have come across various contemporary sources calling them 'buttons.' I shall continue to call them 'boutons' for consistency.

<sup>39</sup> [ww2.coastal.edu/kingw/psyc415/html/detail\\_synapse\\_white\\_bg.gif](http://ww2.coastal.edu/kingw/psyc415/html/detail_synapse_white_bg.gif)

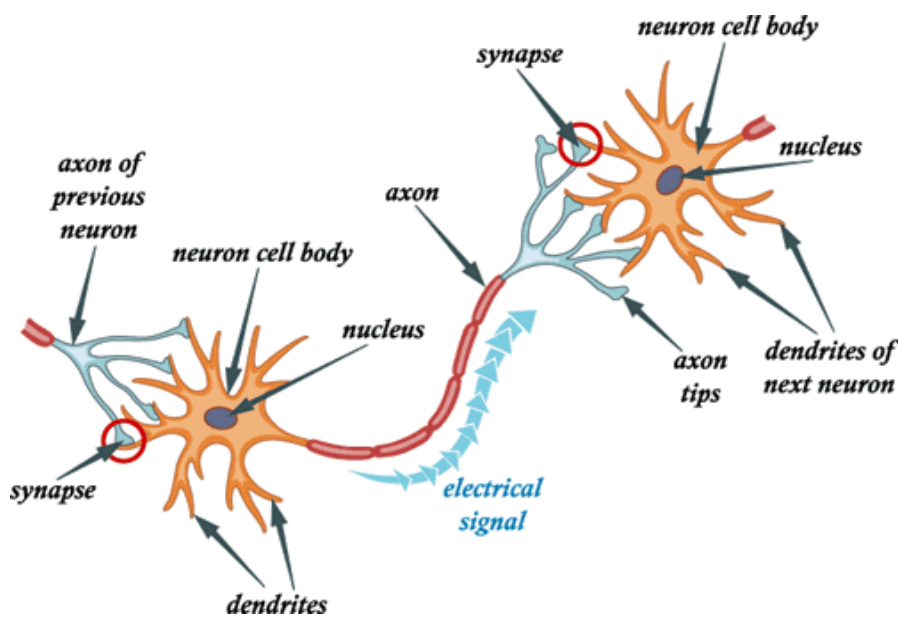


Figure 2: Structure of Neuron & Neuronal Connection <sup>40</sup>

Eccles and Beck claim that this all-or-nothing chemical transmission from an activated button (by a nerve impulse) is only successful one-quarter to one-third of the time. They assume this probability to be of quantum mechanical origin.<sup>41</sup> They cite increasing evidence that quantum transitions may take place between transient molecular states and have created models which they believe may told the timeframe, a matter of femtoseconds,<sup>42</sup> in which the probability is influenced.<sup>43</sup>

<sup>40</sup> [www.benchprep.com/blog/ap-biology-animal-systems-vi-nervous-system-part-1/](http://www.benchprep.com/blog/ap-biology-animal-systems-vi-nervous-system-part-1/)

<sup>41</sup> Mohrhoff (1999:169)

<sup>42</sup> “One quadrillionth of a second” (Merriam-webster.com/dictionary/femtosecond)

<sup>43</sup> Mohrhoff (1999:169)

One may argue that this is on such a minute level that there would not be sufficient modification to patterns of neuronal activity to be of significance. However, Eccles and Beck argue that mental intention becomes neurally effective by momentarily increasing the probabilities for exocytosis *in the hundreds of thousands of boutons in a whole dendron* (or ‘dendrite’). Eccles summarises his position, saying:

“[I]t can be stated that it is sufficient for the dualist-interactionist hypothesis to be able to account for the ability of a non-material mental event to effect a changed probability of the [chemical] emission from a single bouton on a cortical pyramidal cell [(the principle type of neuron of the cerebral cortex)]. If that can occur for one, it could occur for a multitude of the boutons on that neuron, and all else follows in accord with the neuroscience of motor control.”<sup>44</sup>

So, bringing it back to the ACE, we still have premise 4, that ‘there are bilateral causal relations between the mental and the physical.’ What we have argued is that the nature of the causal relation between the mental and physical is contradictory in some way.

From our discussion I hope it is clear that it does not appear true that we can say that there are causal relations, (being understood to mean physical-physical causations), between the mental and physical. This is clearly contradictory.

---

<sup>44</sup> Eccles (1994:78)

Considering Eccles and Beck's theory of quantum probability influence we have found that there *is* a way that the mental may *influence* the physical by way of the unexplained probabilities of physical occurrence. It must be noted that this does not equate to saying that "there are causal relations between the mental and the physical", for energy does not originate in the mind and affect the body to move it or vice versa; all the energy is contained in the physical world, which is a closed system. Thus the conservation of energy principle is not violated and interactionistic dualism still has a leg, albeit a wobbly one, to stand on.

#### The Counter-Argument to The Argument from the Conservation of Energy

1. Energy is conserved in any closed system.
2. The universe is a closed system.
3. Causation involves the transference of energy.
4. There are NO bilateral causal relations between the mental and the physical.
5. The mental MAY influence the apparent unsystematic probabilities of exocytosis occurring between nerve fibres in the brain.

-----  
Thus: Mental influences MAY lead to physical causal effects.

Thus dualism is not necessarily false and the conservation of energy principle is not violated.

## 4.2 Advantages

The advantages of this theory is that it makes use of an already mysterious physical occurrence in human nerve functioning, the harnessing of which does not violate the conservation of energy principle (or seemingly any other law of physics), because it is using energy which is already in the conservative system. The probability appears to be random and so harnessing that apparent randomness is not theoretically adding or subtracting any energy. It is arguably the closest one could get to creating energy *ex nihilo* in that it is harnessing the power as to *when* energy might sprout or not.

This leads into another advantage of the theory and that is of free will. As Broad notes:

“The fact is that, even in purely physical systems, the Conservation of Energy does not explain *what changes will happen or when they will happen*. It merely imposes a very general limiting condition on the changes that are possible.”<sup>45</sup>

He goes on:

“...the mere fact that the human body and its neighbourhood form a conservative system does not explain any particular bodily movement; it does not explain why I ever move at all, or why I sometimes write, sometimes walk and sometimes swim. To explain the happening of these particular

---

<sup>45</sup> Broad (1925: 108) My italics.

movements at certain times it seems to be essential to take into account the volitions which happen from time to time in my mind.”<sup>46</sup>

This randomness in the brain may be the only situation through which the mind, if it does exist, could affect the body and as such the only way in which free will might be explained.

### 4.3 Criticisms

One concern that I have with this theory is of whether it is capable and justified as having bi-directional influence between mind and body, that is to say that the body can influence the mind as well. From Eccles’ quote above it is apparent he believes that it is. I am not so sure.

If I step on a pin, my brain will be given the message that I have stepped on the pin via my nerve firings. The phenomenal awareness of pain is the reason why one believes, amongst other things, in an interactionistic version of dualism. It is a belief that the body can have some sort of influence on the mind.

Let us consider Eccles and Beck’s theory then from the other side. Could the unsystematic probability of exocytosis, when sending a message of pain to the brain, somehow influence the immaterial mind? Could quantum indeterminacy explain why the mind appears to be informed of such happenings? I believe this is a difficult position to hold without committing *ad hoc* reasoning. We have reason to believe that

---

<sup>46</sup> Broad (1925:108-9)

the mind may influence the probability of the exocytosis in terms of output consequences, but we do not have the same reasoning for body-to-mind direction. We would be assuming that the mind is a *passive receiver* of the goings on in the brain, for the probabilities of exocytosis, that are *antecedent* to the conscious feelings of pain, are of no significance to this body-mind direction.

The retort, I imagine, would be the suggestion that the mind becomes aware of this information explicitly as the neurotransmitters jump the synaptic clefts (Figure 2), due to this, in theory, being the input designation for the probability field.

So even though the mind-to-body direction of influence may be plausible, the opposite suggestion has its own complications which certainly do not help the case for dualistic interactionism.

Another brief, but important related concern has recently arisen in the scientific literature which specifically questions our assumption of free will in regard to neurology. It has been observed that in multiple cases of decision making (but importantly not all), *it is possible to predict what one will decide a matter of seconds before it happens.*<sup>47</sup> This suggests that either our belief that we have made a free choice is an illusion or our consciousness is in some sort of time-lapse, which is again a very *ad hoc* suggestion. If our mind is not what we believe it to be in regard to free will, then perhaps we are very mistaken on other intuitions. On the other hand, in the same way that a bus might be late, one still gets on it and gets to one's destination. I

---

<sup>47</sup> Soon et al. (2008)

do not think it is fatal to the quantum indeterminacy theory, but I think it is certainly something we should be concerned with and warrants a further line of enquiry.

## 5 Summary and Outlook

In this discussion we have been concerned with whether interactionist dualism can hold up to a claim that it violates the conservation of energy principle, a highly regarded law of physics. I laid a foundation, defending interactionistic substance dualism from the outset to give the reader an explanation as to why this theory is being defended in the first place. Specifically then focusing on the area of counterargument that I believed was the most plausible, I explored the notion of energy redistribution again focusing further to specifically the quantum indeterminacy of Eccles and Beck. I believe their theory offers hope for dualism in general *qua* counter argument to the conservation of energy argument. As highlighted, I found the interactionistic aspect of this quantum indeterminacy theory to be an area of uncertainty and concern. However, I believe that the theory's merits and nature are significant enough that the theory's limits should not be overestimated.

The systematic presentation of the conservation of energy argument, and later, its counterargument, have focused critically on premise 4 (regarding ACE) and creatively on premise 5 (the Counter Argument of ACE). My conclusions have been modest in that I argue only for the *plausibility* of interactionistic dualism in light of the conservation of energy argument, rather than with any form of dogmatic certainty. As we have seen, discoveries in neuroscience continue to appear, some of which are surprising and hugely significant for further study. Whether we are getting closer to



understanding the essential nature of the relationship between mind and body in an ultimate sense or not, as shown by this discussion I believe we can confidently say that the conservation of energy principle does not *rule out* interactionistic dualism and that the theory itself presents a significant and respectable plausibility.

### *Acknowledgements*

Firstly I would like to thank my dissertation supervisor Derek Ball for all of his help and guidance throughout the semester. Without him I would not have had this chance and I am very grateful for it. Secondly I would like to thank James Lowe, whose friendship has been invaluable in every sense of the word over these four years. I have become a better philosopher because of our conversations and games of chess and I am sure these will continue for years to come. Third and finally I would like to thank Rachael Cocking whose interdisciplinary conversation is ceaselessly stimulating and greatly valued, and whose encouragement always lifts my eyes up to a hopeful, cloudless summer sky, no matter what the weather.

## ***Bibliography***

### *Texts and Articles*

- Aristotle** 1987. *De Anima* (Penguin Classics, Reissue edition)
- Beck, F. & Eccles, J.C.** 1992. "Quantum aspects of brain activity and the role of consciousness" *Proc. Natl. Acad. Sci. U.S.A.*, 89, p.11357.
- Broad, C. D.** 1925. *The Mind and its Place in Nature* (London: Kegan Paul, Trench, Trubner & Co.).
- Campbell, K.** 1970/1980. *Body and Mind* (Chicago, IL: Notre Dame Press)
- Caston, V.** 1997. "Epiphenomenalists, Ancient and Modern", *Philosophical Review*, 106: 309-63.
- Collins, R.** 2008. "Modern Physics and the Energy-Conservation Objection to Mind-Body Dualism" *American Philosophical Quarterly*, Vol. 45, No. 1, pp. 31-42
- Crane, T & Patterson, S.** 2001. *History of the Mind-Body Problem* (Routledge)
- Dennett, D.** 1991. *Consciousness Explained* (Boston: Little, Brown and Co.).
- Descartes, R.** 1996. *Meditations in First Philosophy*. Revised ed. (1641) (Cambridge University Press).
- Descartes, R.** 1969. *The Philosophical Works of Descartes: Vol. I & II*. Trans.: Haldane & Ross (Cambridge: Cambridge University Press, 1911, reprinted 1969)
- Ducasse, C.J.** 1951. *Nature, Mind, and Death* (La Salle, Ill.: Open Court).
- Eccles, J.C.** 1994. *How the Self Controls Its Brain* (Berlin: Springer)
- Eddington, A.** 1935. *The Nature of the Physical World* (London: Dent)
- Fodor, J.** 1994. "The Mind-Body Problem," in *The Mind-Body Problem*, ed. R. Warner and T. Szubka (Oxford: Blackwell)
- Hart, W.D.** 1996. *A Companion to the Philosophy of Mind*, ed. Samuel Guttenplan, (Oxford: Blackwell).
- Leibniz, G.W.** 2012. *Discourse on Metaphysics and Other Writings*, ed. Peter Loftson (Broadview Press).
- Lowe, E.J.** 2006. "Non-Cartesian Substance Dualism and the Problem of Mental Causation" *Erkenntnis* (1975- ), Vol. 65, No. 1, Prospects for Dualism: Interdisciplinary Perspectives, pp. 5-23.
- Margenau, H.** 1984. *The Miracle of Existence* (Woodbridge, CT: Ox Bow)

- Mohrhoff, U.** 1999. "The Physics of Interactionism" *Journal of Consciousness Studies*, 6, No. 8-9, pp. 165-84
- Montero, B.** 2006. "What does the Conservation of Energy Have to Do with Physicalism?" *Dialectica* Vol. 60, No. 4, pp. 383-396
- Owen, F.** 1991. *The Science of the Mind*, 2nd ed. (Cambridge, Mass.: MIT Press)
- Plato** 2002. *Five Dialogues: Euthyphro, Apology, Crito, Meno, Phaedo*. Tr. Grube, (Hackett Publishing)
- Putnam, H.** 1999. *The Threefold Cord: Mind, Body, and World* (New York: Columbia University Press)
- Roelof, H.D.** 1955. "A Case for Dualism and Interaction" *Phenomenological Research*, Vol. 15, No. 4, pp. 451-476
- Searle, J.** 2004. *Mind: A Brief Introduction* (Oxford: Oxford University Press)
- Soon, C.S. et al.** 2008. "Unconscious determinants of free decisions in the human brain" *Nature Neuroscience* Vol. 11, No. 5, May 2008. (Nature Publish Group)
- van Inwagen, P.** 2002. *Metaphysics* (Boulder, CO: Westview Press)
- Williams, B.** 1990. *Descartes: The Project of Pure Enquiry* (Penguin Books)
- Wilson, M.D.** 1978. *Descartes* (Routledge & Kegan Paul)

#### Websites

- benchprep.com** <https://benchprep.com/blog/ap-biology-animal-systems-vi-nervous-system-part-1/>
- coastal.edu** [https://ww2.coastal.edu/kingw/psyc415/html/detail\\_synapse\\_white\\_bg.gif](https://ww2.coastal.edu/kingw/psyc415/html/detail_synapse_white_bg.gif)
- Chalmers, D.J.** 1990. "How Cartesian Dualism Might Have Been True" (*David Chalmers' Website*: <http://consc.net/notes/dualism.html>)
- Howard, R.** 2003. "Dualism", *The Stanford Encyclopaedia of Philosophy* ed. Edward N. Zalta, (<http://plato.stanford.edu/archives/fall2003/entries/dualism>)
- merriam-webster.com** <https://www.merriam-webster.com/dictionary/femtosecond>