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CAUSAL CLOSURE OF PHYSICS AND THE FORMULATION OF PHYSICALISM

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Abstract. *Physicalism is an ontological doctrine according to which everything in the world is physical in the last instance. This is usually interpreted as a claim that every non-physical, most notably every mental property can either be reduced to some physical property or shown to supervene on it. The main obstacle in an attempt to formulate physicalism properly is Hempel's dilemma, and the most promising strategy of taking this dilemma is based on the argument from causal closure of physics. After analyzing the strengths and weaknesses of this approach, I argue that it is highly controversial and thus unable to support a strong ontological commitment*.

Key words: *causal closure, physicalism, supervenience, conservation laws*

1. INTRODUCTION

The level of confidence of both general public and the scientific community in the ability of physical science to adequately explain and even predict the future course of various phenomena in its domain has been exceptionally high in the past couple of centuries. That confidence stems from incontrovertible successes of theoretical physics, but it is mainly boosted by the unprecedented rise of the ensuing technologies. There was little doubt in the minds of the majority of scientists in the best part of the twentieth century that methodological naturalism, as the core method of physical sciences, according to which all scientific hypotheses and results should be interpreted and explained by referring to natural causes and events, will eventually lead to the complete theoretical description of the world.

At the same time, rising evidence in the realms of natural, as well as cognitive sciences, apparently indicates that there are no irreducible mental (psychological), biological, social or other entities (Papineau, 2001). In other words, they can seemingly all be ultimately reduced to some physical entities and processes. As a consequence, a radical form of ontological monism, which became known as physicalism, has gained strength. It basically claims that

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there is nothing over and above physical in the world (Dowel, 2006), meaning that everything is physical in the last instance. This claim relies on the view that all natural causes can in principle be brought down to some underlying physical causes. The proposition that if a physical event has a cause, that cause must be physical, became known as the causal closure principle. It is hard to imagine how the thesis of physicalism can be defended without invoking this principle, despite the fact that there are some isolated claims to the contrary (Stoljar, 2014). The inherent ambiguity of the phrase "over and above" in the formulation of physicalism, however, clearly calls for some further explication, which confronts the proponents of physicalism with serious difficulties. The discussion of these difficulties and of various attempts to overcome them by relying on causal closure principle constitutes the main aim of this paper. I will try to show that these attempts fell short of the mark and that the argument from causal closure of physics in itself is not capable of supporting a radical metaphysical claim like physicalism.

It should be noted that some authors identify physicalism with materialism, which cannot be considered wrong, but is not common in recent times, since the classical materialist picture of the world involves ideas such as impenetrability of matter, or interaction between bodies only upon contact. The term "physicalism" thus highlights the fact that contemporary notion of matter incorporates properties unknown to traditional materialism, such as physical fields, forces acting at a distance, quantum-mechanical objects which exhibit the properties of both particles and waves etc.

The paper is organized as follows. After a brief review of some of the most important attempts to formulate physicalism and the difficulties which they come upon, the argument for physicalism from causal closure of physics will be presented in the third section. This argument, based on the causal closure principle, is widely considered the strongest support to physicalist thesis and the main reason for believing in it. In the fourth section some objections to this argument are given and shown to support the view that current attempts to formulate physicalism by inferring to causal closure principle are unfounded. The conclusion is presented in the final section.

2. THE FORMULATION OF PHYSICALISM

In contemporary philosophy physicalism is closely connected with the problem of understanding the nature of the relationship between mind and matter, or the mind-body problem. An attempt to solve this problem by reducing all instantiations of mental properties to some physical properties (Feigl, 1958; Smart, 1959) led to the formulation of the *type physicalism*. It is the generalization of the identity theory, whose essence is captured by the famous remark of J. J. C. Smart that sensations are nothing "over and above" the brain processes (Smart, 1959), which means that mental processes should be identified with the neurological processes in the brain. More strictly, type physicalism claims that for every instantiation of mental property M at time *t* there is some physical property P such that M is identical to P at *t*. The main difficulty of this approach is its inability to solve the problem of multiple realizability – namely, it implies that the same mental phenomenon can be realized by many different neurological processes.

Another statement of physicalism that is often found in the literature is *token physicalism*. It claims that for every object, event or process *x* there is some physical object,

event or process *y* such that *x* = *y*. Here the notion "event" designates an instantiation of a property at a time. This is obviously a form of nonreductive physicalism, since its formulation doesn't eliminate the possibility that some physical entities possess irreducible mental, biological, social or other non-physical properties. Thus, it doesn't capture the requirement of minimal physicalism – the minimum commitment of all physicalist positions. Moreover, token physicalism insists that *every* mental, biological, moral or social particular must have a physical equivalent, which is clearly an unsustainable requirement. For example, it is hard to find physical entities identical to notions such as "goodness" or "concept".

Since type and token physicalism were unable to cope with important objections, most of the advocators of physicalism nowadays uphold some form of *supervenient physicalism*. It is a form of nonreductive physicalism according to which all psychological, moral, social and other properties supervene on physical properties without identifying with them, somewhat similar to the way the picture on the TV screen emerges from, or supervenes on the pattern of dots without reducing to them. Since the main goal of any physicalism is to prevent the possibility of mind-body dualism, supervenience thesis primarily points out that every mental property M has a physical supervenience base – a physical property P. More strictly, supervenience thesis claims that physicalism is true at our world if and only if any world which is physically identical to it must be identical to it in all respects. It is a contingent thesis which clearly captures the requirement of minimal physicalism, avoiding at the same time the pitfalls which have already proven fatal for type and token physicalism (Stoljar, 2014; Smart, 1959; Kim, 1993; Kim, 2005).

All is not well, however, for the proponents of physicalism, because some pretty strong arguments have been presented in the philosophy of mind against any form of physicalism, including the supervenient one. There is yet to be proposed a strong enough response to the *argument from knowledge*, also known as the argument of Mary's room, or the whole family of *conceivability arguments* (Jackson, 1993; Chalmers, 1996).

From the point of view of the philosophy of science, an extremely difficult problem arose quite unexpectedly, concerning the indeterminacy of the notion of "physical" in the definition of physicalism. Any formulation of physicalism is useless unless we define precisely what we mean by *physical* property. We can do it by tying the notion of a physical property to the notion of either a physical object or a physical theory.

The object conception assumes that it is possible to make a list of paradigmatic physical objects, such as rocks, planets or electrons, and then define physical property as the property which characterizes the intrinsic nature of such objects. This conception is unsatisfactory, primarily because it a priori dismisses the possibility that future science may uncover some novel, say biological or psychological properties of paradigmatic objects in question. There is no reason to believe that some of those discoveries won't be able to radically change our understanding of the "physical".

The theory-based conception is seemingly better founded. It tells us that the property is physical if it is a part of the vocabulary of a physical theory, or else it logically supervenes on such a property. This way, we can categorize as physical not only the obvious properties of objects around us, like mass or thermal conductivity of a stone or a metal rod, but also more exotic properties of objects which exist far from our experiential realm – like spin of elementary particles, or flavour of quarks. The main objection against this conception is known as Hempel's dilemma (Hempel, 1969, 1980) and can be formulated in the following way:

1. If we interpret the notion "physical" as something that contemporary physics claims exists, than physicalism is false because contemporary physics most certainly isn't complete, therefore it must be false.
2. If the notion "physical" is interpreted as something that a future, ideal and complete physics contains, than physicalism is an empty, or even a trivial thesis, because we don't know what kind of entities some future physics will postulate. Its content may include some biological or psychological items, in a way we can't even try to imagine at present.

Chomsky, for example, came to the conclusion that it is quite possible that the future physics will have to include some irreducible mental properties in its basic repertoire [Chomsky, 1995]. Although it would certainly render physicalism trivial, Chomsky regarded the investigation of the physical basis of mental states necessary. His suggestion is in line with famous pessimistic metainduction argument (Laudan, 1981), which undermines the epistemic optimism by assuming that our current theories are by no means true, since the history of science teaches us that every scientific theory is sooner or later proven false and therefore abandoned. Melnyk (Melnyk, 2003) was one of the authors who attempted to counter this argument, and at the same time take the first horn of Hempel's dilemma, by asserting that we have a good enough reason to believe in the actual physical theories: namely, they are more successful than their rivals. He then goes on to conclude that contemporary science offers rich empirical support to the monistic claims of physicalism, and none whatsoever to dualism as its most important rival. Although this approach seems to be convincing to some extent, it does not quite succeed in refuting the challenge posed by the pessimistic meta-induction argument and thus supporting the theory-based conception of the physical property.

Following a different line of thought, Galen Strawson advocates the idea of panpsychism, according to which at least some of the fundamental constituents of reality must be intrinsically empirical (Strawson, 2006), because empirical phenomena cannot arise from entirely non-empirical ones. This obviously implies that everything is at least partially conscious. Although this idea – a bit surprisingly – appears to be consistent with most of the formulations of physicalism, it remains untenable for the vast majority of physicalists, the way it was untenable for the proponents of the old materialism. This is understandable, because exclusion of mental properties from basic vocabulary of physics is the primary intuition behind any formulation of physicalism. Dowell names this intuition t*he conceptual continuity constraint* and considers it among the most important criteria for a successful minimal definition of physicalism. In his words, "the content of the notion of the physical must retain sufficient overlap with our pre-theoretical notion as it figures in our intuitive formulation of physicalism" (Dowel, 2006).

In recent years, significant number of philosophers made an attempt to bypass the conundrum of Hempel's dilemma by defining the notion of a physical property without tying it to any particular physical theory (Crook and Gillett, 2001; Montero and Papineau, 2005; Wilson, 2006; Worley, 2006). According to their *via negativa* argument, a property P is physical if and only if P is non-mental. Consequently, physicalism can easily be formulated as the reductivist claim that all the entities in the world are fundamentally physical, which by definition means that they are non-mental. At first, this approach seems promising because it avoids not only Hempel's dilemma, but also the unpleasant possibility that some form of panpsychism satisfies the definition of physicalism. At

closer inspection, however, some serious flaws of *via negativa* become transparent. First of all, this approach a priori prevents the existence of properties which are neither physical nor mental. But one cannot a priori dismiss the possibility that future science will include, for example, properties compatible with biological emergentism or vitalism. Secondly, *via negativa* eliminates the possibility that some properties are both physical *and* mental. Many reductive physicalists are not ready to accept such a constraint, because it would eliminate the theory of identity. To use just one famous example, it would become impossible to identify the feeling of pain with c-fibers firing. Finally, it is not certain that we are able to define mental properties more successfully than physical properties. Therefore, in order to formulate physicalism as an ontological doctrine one should be able to say something positive about what it means for a property or an event to be physical.

3. The Argument from Causal Closure of Physics

Arguably the most convincing argument for physicalism at the moment is *the argument from causal closure*, or *the argument from completeness of physics*, recently advanced by Papineau (Papineau, 2001) and Kim (Kim, 2005), among others. It consists of three premises:

1. *The causal closure principle*:
   If a physical effect has a cause, then it has a sufficient physical cause.
2. *Mental causation*:
   Every mental event has a physical effect.
3. *The causal exclusion principle*:
   If a physical event *x* has a sufficient cause *y*, than no other event can be the cause of *y* at the same time, unless it is supervenient on *x*.

The conclusion of the argument is that all mental occurrences must be either identical to physical occurrences, or supervene on them.

Let us examine the argument in more detail. The first premise – the causal closure principle – effectively claims that while construing a causal chain in order to explain a physical event we never need to leave the domain of the physical. In other words, every event in a causal chain leading to a physical effect must also be physical. Note that the proposed formulation of the causal closure principle allows the possibility that some physical effects do not have causes and in that respect it is different to the deterministic claim that *every* physical effect has a physical cause. The second premise, mental causation, acknowledges the fact that mental occurrences, such as our decisions, lead to physical consequences – thus explaining, for example, the chain of events starting with my feeling of headache and finishing with me taking a pill. This premise is necessary for the formulation of the argument because the causal closure in itself doesn't exclude mind-body dualism – the view that our world consists of two entirely and irreducibly distinct kinds of entities, mental and physical. The causal exclusion principle, finally, accounts for the fact that physical effects of mental causes are not all overdetermined. This means that while particular instances of physical properties may be caused by multiple mental occurrences acting simultaneously, the possibility that *every* instance of that physical property is in the same way overdetermined can be rejected. Accepting these premises entails accepting the conclusion that the physicalist thesis is true.

A variety of anti-physicalist responses to all three premises of the argument can be found in the literature. Particularly powerful are the epiphenomenalist attacks on mental causation, based on the claim that mental properties can be viewed as mere "nomological danglers" with respect to causal behavior: they can be caused by physical events, yet they are causally idle. The discussion is also in order concerning the causal closure principle – the central claim of the argument and consequently the main pillar of both reductive and supervenient physicalist positions.

The argument from causal closure of physics is extremely sensitive to the way in which the notion of causality is understood. A number of prominent authors, like Russell (Russell, 1917) and Heisenberg (Heisenberg, 1961), even maintained that there is no place for causation in the contemporary science. A similar position has recently been defended by Norton (Norton, 2007), who has argued that there is no causality in science at a fundamental level, but that it can be retained in the scientific vocabulary as an auxiliary notion, in the same way as we can retain the notion of caloric while explaining thermal conductivity. Other authors, on the other hand, while accepting causality, argued that the causal closure principle cannot be used in defense of physicalism (Bishop, 2006; Dupre, 2001; Dimitrijević, 2014).

This much is certain, however: in an attempt to use the argument from causal closure of physics to support physicalism one must not take causal dependency of one event upon another merely as a counterfactual dependency. As is always the case in physics, the complete mechanism of interaction between the two events must be described, including the flow of energy or the electric charge, the action of forces, the transfer of momentum and so forth. This important requirement has been met by different authors with varying success. Probably the most explicit strategy in that sense is the one formulated by Vincente (Vincente, 2011). His approach is worth considering in detail if for no other reason than because it is arguably the most explicit account of the causal closure principle applied to the formulation of physicalism. It contains virtually all the elements that can generally be found in various related arguments, which will provide us with the opportunity to analyze them severally. This in turn will give us a clearer picture of severe limitations that the attempts of formulating physicalist thesis are confronted with.

Vincente assumes the current approach: he takes the first horn of Hempel's dilemma by postulating that some crucial features of current physics will not be overcome by some future, ideal and complete physics. He identifies the main conservation laws as such features. No future physics, according to Vincente, is possible without the laws of conservation of energy, charge, momentum, and probably a limited number of other fundamental quantities possessed by bodies. Moreover, he defines bodies – or, more general, the entities – as bearers, or aggregates of conserved quantities, and caused physical changes as variations in some conserved quantity. On this account all the events or effects the causal closure principle refers to come down to changes of conserved quantities possessed by bodies. Vincente goes on to explain causes of physical changes in terms of forces acting on bodies. The list of forces which bring about variations of conserved quantities includes various manifestations of four fundamental physical interactions: strong, electromagnetic, weak and gravitational; however, Vincente perceives the danger of falling victim to the second horn of Hempel's dilemma by closing the list of forces at any particular time, since the future physics may easily include some newly discovered forces in that list. He tries to evade this danger by only requiring that physical quantities are conserved "in a relevant

class of local interactions when the system considered is the whole universe", where this relevant class includes "all the local interactions in which space-time is not involved as a putative bearer of energy". He believes that this maneuver abolishes the need to specify the list of forces responsible for distribution and exchange of physical quantities, because any kind of non-physical force typically postulated by mind-body dualists fails to satisfy these requirements. The conclusion of Vincente's argument is that all physical changes have sufficient physical causes, which confirms the causal closure principle and, via the argument of causal closure of physics, verifies physicalism.

Vincente's construal highlights an intention which is common to the majority of contemporary physicalists: to define current physics minimally. A successful completion of this programme would not only make the formulation of physicalism possible; it would achieve an equally significant epistemic breakthrough by seriously weakening the pessimistic meta-induction argument. It would do so simply by proving that today's physics rests on the firm ground and that at least its fundamental assertions will remain intact over time. I believe that the following discussion will show that these ambitious aspirations are unfounded.

4. Objections to the Argument from Causal Closure of Physics

The most obvious objection to the argument from causal closure of physics is that it can only be applied to non-physical events – particularly mental occurrences – which *do* have physical effects. This is directly implied by the premise of mental causation. Even the most fervent proponents of physicalism, such as Papineau and Kim, admit that this imposes a serious limitation to the generality of the argument, because there are important realms of reality which don't have physical effects. For example, there is no physical object or event that can be identified with mathematical or moral facts. Papineau (Papineau, 2001) considered this to be "a genuine boundary to the proper ambitions of physicalism", which made him adopt considerably weaker understanding of physicalism, according to which only that is physical which interacts causally with the physical world.

Kim (Kim, 2005) has reached similar conclusion while trying to carry his programme of formulating a version of reductionist physicalism through. He was eventually forced to admit that only intentional properties are reducible, while qualitative properties of consciousness, or "qualia", are not. One cannot reduce to physical basis the experience of red colour, for example, or the taste of an apple, or the feeling of pain. Kim concluded that global physicalism was untenable, which means that "there is a possible world identical to ours in all respects except for the fact that in that world qualia are distributed differently".

This is an important conclusion. Although Kim is convinced, much like Papineau, that a weakened physicalism can still be defended, the fact remains that it is incapable of addressing one of the main questions of philosophy, known as "the hard problem of consciousness" – the problem of giving an account of the phenomenal consciousness. Now, Kim went to great lengths to eliminate mental-to-mental causation, because he could find no mechanism which could explain how one mental occurrence can directly cause another. Moreover, he also excluded the possibility of "downward" mental-to-physical causation for the same reason. Effectively, he denied that mental properties have any kind of causal power. One way they can influence physical world is by assuming that they are non-

causally connected with physical properties they supervene on; they in turn cause other physical properties, which are the bases of other mental properties. This is the position of supervenient physicalism. The other way is to postulate that mental properties are identical to their base physical properties and accordingly reduce mental-to-mental causation to ordinary physical causation, which is the position of Kim's reductive physicalism. *Both* positions are weakened, however, by the conclusion that qualia are casually impotent, because it renders the physicalist worldview incoherent and opens the space for various epiphenomenalist interpretations, such as the one proposed by Chalmers (Chalmers, 1996). Moreover, I believe that the physicalist position is even weaker than writers like Papineau and Kim make it look. For as long as the hard problem of consciousness remains unresolved, the possibility that at least some phenomenal properties make an integral part of causal chains leading to physical effects cannot be ruled out. There is a possibility, for example, that phenomenal properties create a mental disposition which enhances the probability of the occurrence of one or the other intentional property. However unlikely, this cannot be excluded in principle. Therefore, by following backwards a causal chain leading to a physical effect, we might end up with a mental, phenomenal property which ultimately set the chain of events in motion. As the consequence, the first premise of the argument from causal closure of physics, the causal closure principle, would be false. Thus, the conclusion of the argument would also be false, as would be the physicalist claim.

In order to bring the conundrum into sharper focus, let us turn our discussion to Vincente's strategy, which was expounded in the previous section. A host of questions can be asked about the possibility of singularly identifying a physical body, as the bearer of a set of conserved quantities, in the light of Heisenberg's uncertainty relations. A lot can also be said about the generality and long-term tenability of some of the conservation laws, bearing in mind that the majority of them have been discovered relatively recently. Space-time substantivists even question the validity of the assumption that space-time itself cannot be a bearer of energy; they argue that it can even capture energy and give it back. These are the topics of continuing discussion in literature, but I cannot get involved in them here. I will assume instead that the first part of Vincente's construal is uncontroversial – that we can unequivocally identify a physical body as an aggregate of certain conserved properties, such as energy, momentum and charge, and caused physical changes as variations in some of those conserved quantities. Every physicist will also agree that these changes are brought about by some external forces. Herein lies the major difficulty, though, because the very notion of force, as well as its utilization in physics and philosophy, has always been the subject of some controversy. The main source of this controversy is the gap that lies between nomological and metaphysical explanations of forces. Namely, it is one thing to find a law which describes the relevant features of a force, and a completely different proposition to understand its innermost nature. For example, our nomological description of gravitational interaction is rather thorough, but our understanding of its metaphysical essence is highly unsatisfying.

The force can be understood as the push or the pull on a body which tends to change the state of its motion, in accordance with the basic laws of dynamics formulated by Newton and their subsequent generalizations. To say that we know what caused a physical effect usually means that we understand the nature and the law of the force acting on a body or a physical system and changing the velocity of the body or some parts of the system. Interestingly enough, neither Newtonian classical dynamics nor current physics specify the nature of the

causes of forces, nor do they impose any constraint on fundamental forces other than the requirement of them being conservative. On that basis alone the possibility arises that some physical effects can be caused by non-physical, mental forces. The eventuality of a non-physical force being added to the list of fundamental forces of future physics is consistent not only with the second horn of Hempel's dilemma, but more importantly with everything that the history of science teaches us. In fact, there is no reason why this non-physical force wouldn't even be conservative. The idea is far from novel; its origin can be traced back to the works of a number of eighteenth century scientists who postulated the existence of vital and mental forces, such as sensibility and irritability, and debated at length about the relation between them.

Now, the way Vincente deals with this eventuality is highly unsatisfactory. He simply a priory overrules mental causation and states that the inclusion of mental forces is improbable because "it is extremely hard to imagine that physics will develop in such a way", and further still, "whatever such a mental force might explain is already explained by the action of the forces already posited". His conviction clearly leans on the recent development of natural sciences. Like most arguments based on inductive reasoning, however, it lacks generality and stringency.

Papineau, on the other hand, approaches this potential problem in a much more elaborate way. He recognizes two possible types of mental forces, both capable of violating the completeness of physics: non-deterministic and deterministic Newtonian mental forces. The former would manifest themselves by causing spontaneous changes of movement of certain particles of matter, thereby influencing the course of some physical processes. Such forces would cause erratic behavior of systems they act upon, which would have made them easily observed and accounted for. Since this is not the case, we will not engage in the discussion about them in this paper. Deterministic mental forces, on the other hand, would be governed by force laws of strictly deterministic character. We could easily imagine physical systems whose constituents time evolutions would be governed by superposition of all the forces, physical *and* non-physical, operating within the system. The behavior of such systems would be deterministic and predictable, so it is hard to believe that most physicists would lose sleep over the fact the causal closure of physics would be refuted. In fact, the most probable development would involve gradual inclusion of deterministic mental forces in the list of physical forces, which would lead to certain widening of the domain of physics. After all, one of the main goals of any physical research is to predict the future behavior of the system investigated. If the results obtained in relevant measurements are consistent with the predictions of a model which involves deterministic mental forces, even the most fervent physicalist would gladly change perspective. The concession she would have to make consists mainly in accepting the conclusion that the mind cannot be identified with the brain.

The main argument against the possibility of mental forces, frequently used in various forms by those who subscribe to the physicalist views, is the stubborn fact that there is still no evidence of their existence. Papineau, for example, ascribes special significance to the fact that despite huge advances made by physiology, neurophysiology and other related sciences in the bygone century, no manifestation of any special non-physical, particularly mental force causing anomalous accelerations inside living bodies has been observed. The conventional non-physicalist response to this argument is that it may only be a matter of time before we discover the way to detect mental forces which, supposedly, operate inside our brains. The fact that the argument against non-physical forces is

inductively based leaves plenty of space for both sides in the debate to dig their hills in. There is nothing wrong with inductive arguments, of course, as long as we don't lose sight of the fact that they can't be purely logically refuted; that would be possible only if they were analytically performed. For that reason, non-physicalists are often forced to found their argumentation on construing conceivable alternatives to physicalist assertions. My forthcoming suggestion will be along these lines.

Let us ask ourselves: if there *were* Newtonian deterministic mental forces, what would they act upon? How would we measure them? The only conceivable answer to the former question is that they operate by accelerating some particles in brains in a way which cannot be explained by taking known physical forces into account. Their measurement would be difficult since there is no way to measure the force directly. All we can *really* measure are space and time intervals; even the displacement of a pointer on a most sophisticated laboratory instrument is nothing more than a simple kinematic observable. Our conclusions concerning derived, more complex quantities, as well as the way we calibrate our measuring instruments are highly dependent on relevant physical theories. All our techniques of measuring Newtonian forces are thus based on their general definition: we are measuring relevant spatial displacements in corresponding intervals of time, after which we conclude that there is a force $\boldsymbol{F}=m\boldsymbol{a}$ at work. This logic is incontrovertible in all the conventional physical systems, but it is far from certain that it should remain unaltered when mental occurrences are taken into account. In other words, one cannot a priori deny the possibility that there are deterministic *non-Newtonian* mental forces. By definition, the governing law of these hypothetical forces would be different to the one postulated by Newton.

Now, why would anyone want to suggest such an unusual idea? After all, Newton's conception of the force has endured centuries of rapid development of physics and are usually counted as one of its firmest cornerstones. However, it is hard to ignore the fact that the explanation of phenomenal consciousness along the lines of physics *cannot* be counted among the successes of our science. That's exactly why it is often called "hard problem of consciousness". Let's assume for a moment that mind-body dualists are right in that mental occurrences can neither be reduced to physical effects, nor supervene on them. As far as I can see, there are only two possible explanations of our inability to find any sign of mental forces. It might be that the changes caused by the Newtonian mental forces in the brain are extremely delicate and that perhaps only in the distant future our measuring techniques may become sophisticated enough to detect them. If one is not ready to accept this, the only remaining dualist option would be to suppose that mental forces do not operate in a usual way, by causing mechanical changes and accelerations, but by causing some other changes in the brain. Those changes may not be detectable by our measuring techniques, which are conceived in a way that makes them applicable for measuring only effects caused by Newtonian forces. We may only speculate that mental forces might cause changes of some mental properties, instead of causing changes in velocity, but that is as far as we can go here. I believe that I have done enough to illustrate some of the controversies surrounding any attempt to use the argument from causal closure of physics in order to overcome Hempel's dilemma and thus support physicalist claim.

5. CONCLUSION

Physicalism is a highly influential ontological thesis. Its proponents often point out that in the last fifty or sixty years the majority of physicists have gradually accepted one or the other version of the claim that there is nothing over and above physical. This tendency is understandable given that physics is as successful as one could hope and also that the existence of irreducible mental properties and occurrences is extremely hard to prove.

On the other hand, there are plenty of reasons to resist this doctrine. Some people feel that it would deprive us of our agency and free will, while some maintain that it is unsustainable for purely philosophical reasons – citing, for instance, its inability to give an account of the phenomenal consciousness, or of the realms of mathematics, ethics and values in general.

I believe that physicalist thesis is probably too ambitious because, as our discussion has shown, it is a difficult task to even formulate it properly. The gravest challenge in that respect is known as Hempel's dilemma, and the most promising attempt to resolve this conundrum is the argument from causal closure of physics. In this paper I undertook the task of analyzing this approach and showing that it was ultimately controversial and thus unable to support a strong metaphysical commitment. That means that it is even impossible to judge this ontological thesis as true or false. It turns out that D. H. Mellor was probably right when he characterized physicalism as "the wrong answer to an essentially trivial question" (Mellor, 1995).

Where does it leave the upholders of physicalism? Since it is hardly satisfying as a doctrine after all, they may find it helpful to adopt it as an attitude, as Alyssa Nay has recently proposed (Nay, 2008). If taking an attitude to formulate one's ontology according to the posits of physics can help a researcher or a philosopher in her work, than it could be a useful stance. Whether a convinced physicalist would find this suggestion satisfying or not is, of course, an entirely different matter.

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UZROČNA ZATVORENOST FIZIKE I FORMULISANJE FIZIKALIZMA

Fizikalizam je ontološka doktrina prema kojoj je sve na svetu u poslednjoj instanci fizičko. Ovo se obično interpretira kao tvrdnja da se svako nefizičko, a posebno mentalno svojstvo može redukovati na neko fizičko svojstvo, ili se može pokazati da na njemu supervenira. Glavna prepreka pokušajima da se fizikalizam adekvatno formuliše je Hempelova dilema, a strategija suočavanja sa ovom dilemom, koja najviše obećava, bazirana je na argumentu uzročne zatvorenosti fizike. Nakon analize dobrih i loših strana ovog pristupa, zaključujem da je on jako kontroverzan i da samim tim nije u stanju da podrži snažnu ontološku tezu.

Ključne reči: *uzročna zatvorenost, fizikalizam, supervenijentnost, zakoni održanja*