Making Sense of Simultaneity: A Reply to Wahlberg

Caio Cézar Silva

Abstract

In this paper I object some of the criticisms Wahlberg wages against Mumford & Anjum's account of simultaneous causation. A brief outlook on Wahlberg's argument in favour of sequential causation is introduced. A first objection is presented and it is shown that sequential causation cannot deal with one of Mumford & Anjum's argument: the possibility of prevention. Then, a second objection argues that the solution Wahlberg puts forward is defective and does not truly explain causation as a metaphysical relation existent in reality. Finally, I retort some concerns Wahlberg stresses about simultaneous causation.

Keywords: simultaneous causation; sequential causation; causal process; instantaneity; simultaneity.

1 Introduction

Recently Wahlberg (2017) offered some criticisms against Mumford & Anjum's conception of simultaneous causation on their work, *Getting Causes from Powers*. Regardless of how exotic their theory might be in some respects which need to be properly addressed,[1] their case in favour of simultaneity is not one from them. I object some of the criticisms Wahlberg wages against Mumford & Anjum.

On Section 2 I introduce Wahlberg's objection to Mumford and Anjum's simultaneous causation approach and contextualize the discussion. Then, I discuss Wahlberg's half-open time interval solution,

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[1] The rejection of necessity and the *sui generis* modality between possibility and necessity are probably the most distinct aspects of their theory compared to other causal realists.

especially given the attention it attracted in the recent literature (*e.g.*, Chakravartty 2005, Maslen 2018 and Pemberton 2022). Furthermore, if this argument is defused, sequential causation is then in no better place than simultaneous causation. However, I aim to show that this objection only affects sequential causation precisely because of its structure: cause and effect need to be ordered as a sequence and effect can only happen after the cause have taken place. It follows that some objections need to be addressed if the theory wants to present itself as a viable theory to causal production. When simultaneous causation faces the same objections, the theory faces no difficulties.

On Section 3 I address another objection which follows from sequential causation appeal to time intervals. Although it might seem to be a reasonable solution from a formal aspect, I argue that it exhibits severe difficulties when the formalism is brought to reality.

On Section 4 I explore Wahlberg's concerns against simultaneous causation from a powers causation perspective. These concerns are centred on the structure of simultaneous causation and how the view is insufficient to account for the grounding of the arrow of time, the persistence of powers and their ability to produce non-negligible change over the same instant they exist instantiated in an object. I proceed to answer the concerns highlighting how simultaneous causation is able to deliver a coherent solution to them.

2 The Return of the Possibility of Prevention

Wahlberg's first objection is concerned with Mumford & Anjum's presupposition that there must be something *extra* after the assemblage of the putative causes that ultimately produces the effect: on their understanding, if there was a gap between the cause and the effect, one should explain what exactly produced the effect. Wahlberg takes it to be question-begging since the denial of simultaneous causation involves precisely the claim that cause and effect do not ensue at the same time.

Wahlberg believes the dichotomy relies on Russell's reasoning (1913) about the nature of time: if time is dense and there is no overlap in time, cause and effect must be separated by a positive time interval. If this is the case, it is possible to add a third, a fourth or infinite instants between any two instants of time until the point the cause ceases to be at t, the effect would still not exist at some later instant t^*. However, Wahlberg contests that Russell should've considered *open* (t, t^*) and *half-open* ((t, t^*] or [t, t^*)) time intervals, "intervals that contain all of the instants between t and t^* but lack either t or t^* ((t, t^*] or [t, t^*) or both (t, t^*))" (Wahlberg 2017, 109-110). On this line, it is asserted that:

(i) while cause exists through a closed interval [t, t^*], the effect exists through the half-open interval (t^*, t^{**}]; and

(ii) in the case of overlap, cause and effect can still be non-simultaneous if understood as not beginning to exist at strictly the same time, even if there is no positive time interval separating their "onsets", where the cause may exist over the closed interval [t, t^*] and the effect over the half-closed, overlapping interval (t, t^*]. (Id.)

Wahlberg's clever solution appears to avoid Russell's temporal contiguity objection. Unfortunately, I believe some other objections may be hinged to this alternative. First, I introduce an argument I believe is quite familiar to Wahlberg: Mumford & Anjum's possibility of prevention argument.[2] According to the theorists, causation does not seem to have any kind of necessity because "*something can always go wrong*" and prevent the causes from producing the effect (Mumford and Anjum 2011, 47). Consider a complex of causes c_1-c_n which act together to produce a certain effect. If one or more of these causes suffered a

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[2] Despite Mumford & Anjum talking of 'possibility of interference', I take 'possibility of prevention' to be preferrable. Their argument against causal necessitarianism relies on the notion of a *late preventer*, not of interference. Interference just produces a qualitative alteration on a causal process.

qualitative alteration due to causal contribution of an additive factor, the causal process would've been *interfered*. On the other hand, if one (or all) of these causes were neutralized due to the causal contribution of an additive or subtractive factor, then the causal process would've been *prevented*.

On prevention, there's a factor alien to the causal process which whenever added to process stops it from producing the effect. However, a distinction must be considered: if a causal process is prevented by the action of a *subtractive preventer* – a factor that interacts with the causal process before its beginning and neutralizes one of the causes of the process – it wouldn't be appropriate to talk about prevention on the relevant sense insofar as the causal process haven't yet begun; and couldn't even began as one (or all) of its causes was removed by the interaction of a subtractive preventer with them. On the other hand, if the causal process has begun and during its course interacts with an *additive preventer* – a factor that interacts with the causal process after its beginning and neutralizes one of the causes of the process – then the causal process has started but the production of the effect was precluded because of this particular interaction.

Even though Mumford & Anjum deployed this argument against causal necessitarianism, the argument is not as effective as they may think for their intended purpose. However, the argument can be quite effective if converted in an objection to non-simultaneous causation whereas it shows the fragility of such accounts. Now, to fully appreciate the consequences of this argument, allow me to introduce some representations of causal relations, the first one being a case of sequential causation and the latter one a case of simultaneous causation.

Sequential Causation
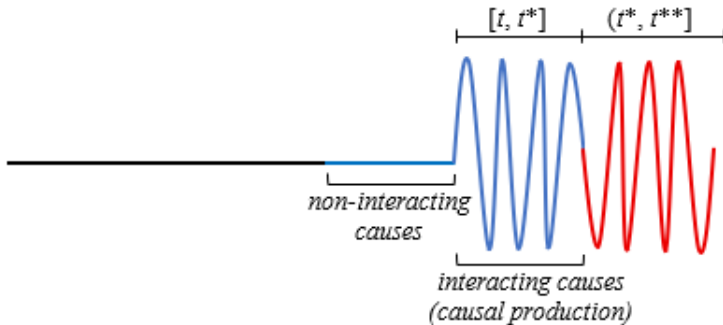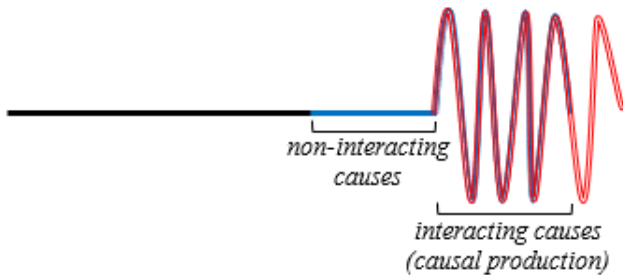

Simultaneous Causation

Figure 1: Representation of Sequential Causation and Simultaneous Causation.

Starting with sequential causation, the first thing seen is a black line. The back line does not have any particular meaning; its sole purpose is to contrast with the blue straight line named *non-interacting powers*. The blue line is representing a duration, a moment in time where the objects and their powers which will engage in a causal interaction are not interacting yet. As no activity is taking place, the line is simply straight. Then, there's a blue smooth curved line which describes the cause from a causal relation followed by a red but equally smooth curved line also describing the effect. It is possible to make and effort and imagine that the red line starts on the interval following the open half of the second interval – '(t^*' – which is absent from the cause's interval, allowing a perfect sequence without cause and effect being separated by a positive

time interval and without temporal overlapping. The representation depicts sequential causation according to Wahlberg, a relation where cause and effect are ordered in sequences and effect can only happen after the cause have not only occurred but exhausted its causal role.[3]

On simultaneous causation, right after the non-interacting powers there's an overlapping blue and red smooth curved line which aims to represents that, as causes take place, they interact between themselves; from the very start of the interaction, the causes simultaneously and progressively produce the effect. When the process comes to an end, only the effect persists, as the single red smooth curved line indicates. The representation portrays simultaneous causation as a causal process where the causes bring about the effects through – and at the same time of – their interactions.[4]

Now, let me return to the possibility of prevention. I argued above that if an additive preventer, a factor that interacts with the causal process after its beginning and neutralizes one of the causes of the process. As such, the additive preventer interacts with a causal process, then the production of the effect is precluded due to the additive preventer. Consider sequential causation according to the above representation. When the powers start to interact, the cause is obtained on the closed interval $[t, t^*]$. Such cause is non-instantaneous as

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[3] It should be noted that Wahlberg is not necessarily committing himself to the thesis that all causation is sequential (non-simultaneous, as he speaks), albeit he believes a theory of causation should leave room for some sequential causation at least for the "putative powers" of meso-level objects.

[4] The reader may find it weird that I'm changing between singular and plural uses of the terms 'cause' and 'effect' back and forth. I'm not sure if Wahlberg understands the causes on a total cause perspective or if he's just following Russell's use of the term as he's concerned with his objection, I prefer to let the singular use to not misrepresent his approach. When I talk about causation according to a causal process approach, I'll talk about 'causes' and 'effects'.

Wahlberg himself stresses out (Wahlberg 2017, 110).[5] However, recall that the effect will only be obtained on the half-open interval (t^*, t^{**}]. Until then, we have active causes and no effect. If this is the case, a reasonable question should be asked: is there anything which allows to get rid of the additive preventer on the sequential approach? I don't think so, and for a good reason: although sequential causation prevents the gap between the cause and effect, given the *alleged* continuous nature of time,[6] if the cause is separated from the effect and the effect can only be brought about after the cause ceased to exist, any positive time instant inside the cause's time interval allows the existence of an additive preventer. If the additive preventer interacts with the cause, the effect won't be obtained. In fact, just as the uncountably many instants of the continuum, it is possible to obtain uncountably many additive preventers.

What about the overlapping sequential causation where the cause exists over [t, t^*] and the effect over the overlapping interval (t, t^*]? Despite how peculiar it may look like, once again we have causes at one time and the effect on the other. The result is the same: from the moment the causes are obtained until the instant t^*, the causes can be prevented by the action of additive preventers.

Maybe one should agree with Chakravartty's suggestion (2005) on how the demarcation of the relata is quite arbitrary, give a step further and just don't mind with it.[7] In fact, sequential causation can be

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[5] Even though Wahlberg's arguments in favour of sequential causation require that causation itself is not instantaneous, Wahlberg is merely arguing for an alternative to the one defended by Mumford and Anjum. As the theorists postulate non-instantaneous causation, Wahlberg does the same. On the other hand, there are moments where Wahlberg seems to suggest that causation is constituted by a plurality of instantaneous events. I can't state this for sure since Wahlberg does not clearly present his view.

[6] I will briefly digress about it in the upcoming section.

[7] Chakravartty appears to be quite sympathetic to the idea when discussing it. It should be no surprise considering he also sees simultaneous causation as controversial.

articulated without resorting to time intervals. The point is: does it allow to deal with the objection? It doesn't seem to be the case. Besides the appeal to the positive interval to express the objection, it is only required that the cause take place at one time and the effect on the other. The only way to get rid of it is giving up of sequential causation.

Finally, one could insist this need not be the case since we don't expect causation to always happen. Everyday experience presents us with many cases where things seem to have been prevented to follow its natural course. As such, cases where causation doesn't take place can be explained by the presence of the additive interferer. Despite having no reason to disagree with the everyday experience part, the same cannot be said about the remaining. If causation is to be understood as a productive relation, an explanation on how to secure that the effect follows from the cause is owed. Otherwise, the possibility of prevention can always defeat the hypothetical causal process. Hence, we have:

(1) Effect happens sequentially after its cause (Sequential Causation).

(2) Cause happens without its effect taking place together (From 1).

(3) Cause happens without its effect (From 1, 2).

(4) Cause can happen without its effect (Possibility from Actuality on 3)

(5) Cause can be prevented without the obtaining of the effect (Possibility of Prevention).

(6) If a cause happens without its effect, this cause can be prevented without the obtaining of the effect (From 4, 5).

(7) For any cause, if a cause happens without its effect, this cause can be prevented without the obtaining of the effect (Generalization on 6).

As it seems, sequential causation is flawed. Does simultaneous causation do any better? I believe so. (3) is not obtained because, as the powers start to interact, the effect is produced simultaneously as a result of this interaction. By its turn, (5) doesn't follow too given there is no gap between the causes and the effect which allow the additive preventer to stop this interaction. Therefore, simultaneous causation cannot be prevented albeit sequential causation can.

3 The Temporal Structure of Sequential Causation

In his attempt to render sequential causation coherent, Wahlberg introduces a peculiar solution when discussing about his time interval approach: on the case where cause exist over the closed interval $[t, t^*]$ and the effect over the half-open interval $(t^*, t^{**}]$, it is stated that "*there is no first time of the effect's existence*, although there is a last time of its non-existence" Wahlberg 2017, 110, emphasis added). There seems to be a disturbing problem about this solution: the idea of a causal relation where the effect does not even have a first moment when it comes to existence through the interaction of causes. If the effect does not have a first moment of its existence, how and when exactly the effect is produced by the causal interaction? When bringing the representation to reality should it be also represented with the initial portion of the effect lacking? It would be strange to say the least if this could be treated with such triviality the mere possibility of an effect that does not have beginning whilst arguing that this effect is produced by a cause. It would be even stranger if sequential causation is presented this way but just ignored when causation is brought to reality apart from the mathematical formalism, as a truly *ad-hoc* adjustment. Unsurprisingly, the overlapping sequential causation where the cause exists over the interval $[t, t^*]$ and the effect over the interval $(t, t^*]$ does no better since the effect still doesn't have a first moment of its existence

It should be noted that a different order on the combination of time-intervals won't be of any help. Just as causes at $[t, t^*]$ and effect at

(t^*, t^{**}] is problematic given the lack of effect's first time in his coming to be, causes at [t, t^*) and effect at [t^*, t^{**}] would just pass the problem to the causes instead of the effect. Now, the problem would be causes that don't have a last moment of its existence together with effect. As such, how could the causes produce the effect if they do not cease to exist? Remember that sequential causation demands the effect to happen after the causes, even if one concedes the absence of temporal gap between cause and effect. However, how can even be said the effect happens after the cause when the effect doesn't even have a first moment in their causal history?

All this talk about time intervals and half-open intervals is an attempt to resort to the mathematical notion of continuity as appropriate to explain the nature of physical continuity. It would be unreasonable to deny that time has a continuous nature. However, it is not so clear if we can really assert that time is continuous in the same sense the arithmetical continuity defines it: as isomorphic to a set of real numbers. Notwithstanding the commitment to set theory to make sense of the continuity of time, there are considerable differences between the physical world and abstract objects, particularly the fact that mathematical continuity only demands ordered relations and sequence, not needing to worry about change. Not only that, on the section above I showed how the mathematical continuity does not help sequential causation to get rid of the possibility of prevention.[8] Once again, sequential causation is facing another problem. How to even make sense of this idea when metaphysical causation is all about explaining how causes bring about their effects? One should really wonder if from the mere possibility we can interpret something through mathematical formalism we should understand it as such. I take this to be a good reason to make anyone reconsider this idea.

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[8] For an interesting treatment of the mathematical continuity and of an Aristotelian inspired alternative, see Hudry 2006.

4 The Structure of Simultaneous Causation

Despite not sharing Mumford and Anjum's understanding of causation, there are some aspects I believe the theorists promote an interesting and appropriate treatment of causation and of them is, at least partially, their approach to simultaneous causation. Thereby, I'll offer a response to the concerns Wahlberg expresses some concerns regarding simultaneous causation:

(a) temporal directedness of causation: Mumford and Anjum would be taking the arrow of time for granted as they throw away temporal asymmetry between cause and effect to accommodate simultaneous causation in their theory. The best alternative for reducing the arrow of time to causal phenomena is by invoking a sequential causal arrow (Wahlberg 2017, 119-120).

(b) causal configuration: how distinct times come to have the specific contents they have if they the lack of temporal asymmetry? the development of causation through time, the moment causation takes place and what accounts for what happens between the ending of a causal process and the beginning of a new, later process cannot be explained without temporal asymmetry (Ibid., 120-121).

(c) non-negligible change and time: the manifestation of a power involves the ability to cause some kind of non-negligible change – at least partially – in the subject. In this line of reasoning, if a sugar cube has the power of being water-soluble at t_1, and is capable of manifest this power at t_1, it needs to have a power to change non-negligibly at t_1; nonetheless, if t_1 is an instant, nothing could manifest such power at t_1. Therefore, it is false that the sugar cube is water-soluble at t_1. Unless the sugar cube's water-solubility is somewhat related to sequential causation, powers' manifestation becomes powerless (Ibid., 122-123).

I believe the objections may be partially effective against Mumford and Anjum's theory, but not against simultaneous causation. Let me explain: the theorists emphasize through their work how crucial powers are. Unfortunately, very few is said about the nature of the particulars which possess these properties except for the first chapter, the same place where the authors clearly accept the possibility of events and facts playing a role on causation. It follows that facts and events require some commitments like perdurance, instants and are not well suited for a causal realist approach, a point that is exploited by Wahlberg.[9]

Despite that, there is some irony on the fact that Wahlberg points it out because his objections only make sense if assumed a Kim-style event ontology for causal process. This becomes obvious when Wahlberg introduces (c) on the form of a sugar cube having a power at a certain instant and the change is to be explained with this same relation of particular-power-instant. Given time instants is one of the properties exemplified by a Kim-style event, it's understandable why someone would care so much about it. Even so, I believe the objection can be solved by focusing on a not-so-distant metaphysical debate: the possibility of prevention suggested by Mumford and Anjum that I introduced section 3.[10] The key to defuse the argument is to analyse if the causal process has started or not: if a causal process has begun, the causes have interacted with each other. However, if a causal process does not take place, it means the causes did not interact with each other. As such, if the interaction hasn't happened because something has neutralized one of the causes, this neutralized cause was not able to participate of the causal process and interact with the remaining causes.

[9] A criticism on events and their role on causation is beyond my actual purposes. See Harré & Madden 1975, Emmet 1984, 1992, Chakravartty 2005 and Ingthorsson 2021.
[10] On Mumford and Anjum's example, the additive preventer acts like a mask and allegedly prevents causation.

If this is so, it's not possible to treat it like a causal process because the causal process hasn't even taken place: the interaction demands the sum of all its causes to be produced; on the absence of one of them, there is no causation. On the other hand, if an interaction took place and then something interacts with one of the causes after the interaction, the causal process has occurred. The effect being different in its qualitative dimension is nothing more than the result of the object which interacts with the process.[11]

Back to (c) after this brief contextualization. Although I don't believe the causal process theorist should be so worried with such littleness given the productive nature of causation,[12] it may be said that the exact instant an interaction takes to produce a change in causal process – or the instant an object's power takes to manifest itself – is the instant we have simultaneity; simultaneity operates only when the objects interact with each other through their powers. Until there, if there isn't an interaction occurring, we can't talk about a causal process because it does not exist yet, and the same follows for the power manifestation. When interaction is obtained, in this precise moment we have simultaneity and change is produced, even if it's partial.

Now I turn my attention to (a) and (b). Both concerns assert that only sequential causation can explain some significant notions to causation like grounding of the arrow of time on (a) and development of causal production on (b). Initially, it could be supposed this has something to do with Mumford and Anjum's commitment to events: since the theorists are not talking only about powers, but events which exemplify powers, given the short-lived and temporally sliced nature of

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[11] Fischer (2018) develops a similar account about the impossibility of preventing causal processes.

[12] A causal process is by its very nature a plurality of ever flowing changes through time sustained by substances. I doubt one would really think we need to know the exact moment where each of these changes happen if we want to postulate this particular account.

events one could argue it is difficult to see how a power can be directed towards its manifestation in this picture. But Wahlberg is quite explicit by saying that if a power existing at t_1 is for the whole process, including instants after t_1, then the power at t_1 involves sequential causation extending beyond t_1 (Wahlberg 2017, n. 24). I must confess that it doesn't sound plausible, but I'll try to contend why it's not the case for the following reason: causation always extends beyond its actuality since is a productive process of change through time. It means that as causation takes place through interactions, changes will keep occurring until the causal process is completed or something interacts with it and stops its course. *Mutatis mutandis*, the same can be said about powers as it's only by mutual manifestation they manage to interact with reality.

Inasmuch as Wahlberg would hardly be convinced by this modest comment, something more must be told. Thus, I argue that: both causation and powers always extend beyond themselves because they are sustained by substances. Substances here can be understood as continuants, entities wholly present without temporal parts continuously existing through time.[13-14] Although causation – at least on a realist approach – would be enough to demand the commitment to endurance, this conception of substance also demands such commitment: perdurance does not allow to explain change since there are only temporal slices through time and change is no more than a mere discontinuous jump from one slice to another. On the standard

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[13] The definition is influenced by W. E. Johnson (1924). Despite the fact I favour a more Aristotelian approach, I believe the commitments the definition take are enough to my actual purposes in this work.

[14] Some like Pemberton (2022) would disagree with me and argue that substances *qua* persisting entities are mereological unities of its potential temporal parts. The entity, however, is ontologically prior to its temporal parts. I can't say I agree or disagree with this view as I'm still reflecting on its plausibility. Nevertheless, either endurance or lasting seem to be the available options for anyone who advocates for a substance metaphysics.

perdurantist approach with events, events are regarded as having a given instant they take place. If this is the case, how can one event which takes place on a certain time influence another event that's beyond their existence? Wahlberg's use of time intervals tries circumventing this difficulty – one most of the perdurantists don't even think about given their belief that the difference between one temporal slice and another is enough to express change; nonetheless, it fails.[15] On the other hand, endurance allows a consistent explanation of change. Consider that the same substance which exists through time takes part in causal processes. As productive interactions, these causal processes not only bring things into reality but modify and even annihilate particulars. Despite that, none of these interactions could happen if they could not be sustained by substances and change precisely the same substances which allow for their causal role.

Fine, but how do substances refute Wahlberg's perspective? Since substances are enduring entities, it is part of their identity *qua* substances to continue to be in virtue of their existential independence: substances just keep existing by itself through time indefinitely as its existence has no specific limitation and it's not dependent on anything, contrary to the properties they instantiate and require something to extend their existence through time. Despite that, substances are not static; even when a particular substance ceases to exist, it only does so through causal processes' interactions - with other substances or by the action of some internal process the substance sustain. Hence, the way a substance continues and ceases to exist is through causal processes. If causal processes are always in companion with each of the substances' interactions and substances are ever changing, it wouldn't be extravagant to posit that causation 'inherits' substance's capacity to

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[15] My understanding on simultaneous causation is hugely indebted to Ingthorsson (2021) and Emmet (1984). Ingthorsson exposes similar criticisms to those I posited. Haslanger (1989) goes even further and asserts endurance commits one to a neo-Humean view on causation.

extend beyond an actual instant exactly because causation occurs in substances. One could even say that substances play a substantial role on causation.

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