CAUSAL CLOSURE AND EMERGENCE: REVISITING THE CONFLICT BETWEEN THEM AND SOME WAY-OUTS

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1. Introduction: -

Emergence, which has been through a revival in the recent times both in science and philosophy, is arguably a suitable candidate for explaining many things which are inexplicable in reductive methodology. The matters in which emergence presents itself as a promising alternative include consciousness, a highly debated arena, among other topics. Though the weak version of emergence has been preferred by many philosophers for being comparatively unproblematic, it is the strong version which has been invoked often to account for the efficacy of emergent phenomena, especially in case of mental causation. However, the notion of strong emergence is inevitably tied with the concept of downward causation and verily this concept is what poses a threat to the prospect of emergence itself. Because, apparently downward causation violates the principle of causal closure which is thought to be an indispensable part of the physicalist worldview. Here we shall see to what extent the principle is supportable & what does that bear on emergence. For that purpose, this paper will be divided into four sections after the introduction; the first section will deal with how does this problem arise in the context of emergence i.e., the background of the problem; the second section will deal with the motivations and formulations of the principle of causal closure, the third section will discuss in what ways some thinkers try to avoid conflict with this principle, and the fourth section will deal with our concluding remarks on the prospect of emergence.

2. Background of the problem: Emergence & downward causation: -

Emergence, as is commonly held, of a phenomenon happens when it arises from & depend on some more basic phenomena, but at the same time it is autonomous from

that base. Emergence is generally divided into two types- weak & strong. A phenomenon is said to be weakly emergent when it arises from a lower-level domain, but truths concerning the former are unexpected from the principles governing the domain of the latter; whereas a phenomenon is said to be strongly emergent when the truths concerning it are not deducible even in principle from that of the lower-level domain (Chalmers 2006). The strong emergence is held to have more radical consequences than the weak version because the weakly emergent phenomena, though *unexpected,* is deducible from the physicalist fundamental facts, but the strongly emergent phenomena which are not so, need new fundamental laws to accommodate them. This incompleteness of physical laws suggested by the strong version, says (Chalmers 2006), involves a sort of downward causation which denotes exertion of causal efficacy upon the lower-level phenomena by the higher-level phenomena besides being irreducible from the lower one. This division of weak & strong corresponds more or less with another classification of emergence, viz., epistemological & ontological emergence respectively. This is clearly shown in Silberstein &McGreever's (1999, 186) explanation: "A property of an object or system is epistemologically emergent if the property is reducible to or determined by the intrinsic properties of the ultimate constituents of the object or system, while at the same time it is very difficult for us to explain, predict or derive the property on the basis of the ultimate constituents. Epistemologically emergent properties are novel only at a level of description... Ontologically emergent features are neither reducible to nor determined by more basic features. Ontologically emergent features are features of systems or wholes that possess causal capacities not reducible to any of the intrinsic causal capacities of the parts nor to any of the (reducible) relations between the parts."

So, as can be seen, an important point of difference between the strong/ ontological emergence and the weak/ epistemological emergence is that the former one involves an irreducible feature, downward causation. Philosophers like Kim (2006) has referred to it as a central component of emergence. The notion of downward causation is what is compatible with the common-sense view that our mind/ consciousness, which according to emergentism is emergent from physical processes, affects our actions, or

have causal effect upon our body. If this would not be the case, then our mind/ consciousness would have been merely epiphenomenon, dangling around without having any determining power over our bodily effects. This would clash with our commonsensical view, as well as leading to a conflict with the matters like free will, moral responsibility etc. However, accepting downward causation is not an easy one. The much-discussed Exclusion argument mentioned by Kim (2006) shows how the acceptance of downward causation leads to overdetermination of physical effects. Besides, there is another related problem, comparatively less discussed, that stems out from accepting it. Higher level phenomenon, like mind, exerting causal efficacy on lower-level phenomena, like the physical base or body, would be problematic for the principle of causal closure which is thought to not allow the violation of the closure principle that gets supposedly infringed during psycho-physical causation.

3. Causal Closure: What does it mean?

Causal Closure is thought to be a cornerstone in our scientific, especially physicalist worldview. Taking the closure principle for granted, scientists embark on their attempt to explain everything. Roughly speaking, the principle states that the world/nature is causally closed; so, anything happening must have a cause. Coupling this with a physicalist outlook, it takes the form of – every physical event must have a physical cause. Now as we know, emergence, especially the stronger version, which has seen a revival in contemporary philosophy and science alike, holds that the emergent phenomenon, though irreducible to & dependent upon the base, exerts downward causal influence on it. This novel causal power, i.e., downward causation is what makes strong emergence stand apart as a unique contender in the topic of consciousness, and its related problems like mental causation, psychophysical causation etc. But verily this notion of downward causation puts the concept of strong emergence, and its prospect as a plausible theory in danger. The reason of this can be found in Kim's (1998, 40) words "If you pick any physical event and trace out its causal ancestry or posterity, that will never take you outside the physical domain. That is, no causal chain will ever cross the boundary between the physical and the nonphysical." But if consciousness/mind is emergent in the

strong sense, then it will be supposed to exert downward causation on physical events (bodily events/brain events), if it is not to be rendered epiphenomenal. However, the physical events will have physical causes, following the causal closure principle, as well as mental causes too, due to the emergent mental phenomena exerting causal efficacy on them. This will lead to causal overdetermination. This is how the plausibility of emergent mental phenomena has been challenged, by identifying them ultimately with physical events. Sophie Gibb (2019) articulates this problem through the following argument-

i) Relevance: Some mental events are causally relevant to physical effects.

ii) Closure: All physical effects have sufficient physical causes.

iii) Exclusion: There is no systematic causal overdetermination.

Therefore, mental events (that are causally relevant to physical effects) are identical with physical events.

There is also variety in formulating the principle itself, e.g.-

Smith & Jones (1986, 66) define it as "No physical effect has a non-physical cause"; Papineau defines it as: "All physical effects have complete physical causes ('complete' in the sense that those causes on their own suffice by physical law to fix the chances of those effects) [1993, 22], "All physical effects have sufficient physical causes" (1998, 375), "All physical effects are fully determined by law by prior physical events" (2000); Crane (2001, 45) defines it as "Every physical event has a physical cause which is enough to bring it about, given the laws of physics"; Marcus (2005) defines it as "Nothing non-physical can affect the physical"; Kim (2005, 15) defines it as "If a physical event has a cause at t, then it has a physical cause at t"; Bishop (2006) defines it as "All physical effects are fully determined by fundamental laws and prior physical events". However, as Gibb (2019) has pointed out, not all of these formulations are of the required strength, some being too weak and some being too strong.

Some have made a distinction between the causal closure principle from similar principles. E.g., Jones (2008) mentions that Marcus (2005) and Montero (2003)

differentiates between *causal completeness* and *causal closure*, where the first one claims that we don't need to go beyond physical explanations to explain physical events, and the latter one claims that we are necessarily wrong in doing otherwise. So, the first one is moderate view than closure principle in implying that non-physical causation is not to be ruled out, but we can have always a complete physical explanation for physical effects. Kim (2005) makes a distinction between the closure principle and physical determinism by holding that the latter's claim is that every physical event has a physical cause, whereas the previous one would make sense even if some physical events don't have causes.

There are some opinions regarding what entities are allowed to exist according to the closure principle. Kim (2005, 16) opines that entities and events outside the physical domain e.g., immaterial souls may exist and even causal relations between those nonphysical things may hold. So causal closure, according to him, doesn't rule out mind-body dualism, or substance dualism in general, because the closure principle inhibits only the causal influence of those nonphysical things with the physical things. In his words, "…they cannot meddle with physical events—that is, there can be no causal influences injected into the physical domain from outside." So, unlike Descartes' interactionist dualism, Leibniz's mind-body parallelism, Spinoza's double aspect theory is compatible with closure principle. Kim also mentions that mental and biological domains are not causally closed, unlike the physical domain. Something similar is held by Gamper (2017), according to whom, there may be *universe* or domain of mental objects aside the universe or domain of physical objects, but any two universes cannot causally interact. However, philosophers like Jones (2008, 181) holds that causal closure leads us to physicalism and so, causal closure rules out dualism, immanent theism etc. Anyway, philosophers unanimously agree at least this much that causal closure precludes causal interaction between psycho-physical domains, irrespective of the existence of such domains.

The motivations from which the causal closure principle stems can be traced to the no-gap argument and as an expression of the laws of conservation. Roughly saying, the

no gap argument states that scientists have been successful in finding out the complete & immediate causes of various physical events, and there are many physical events still awaiting explanation, although the scientists don't need to fill these gaps by mental causes, just as they didn't need to do so either in the past. In Jones' (2008, 181) words, "We say that (*causality is strictly physical*) because we have observed past objects to behave in such a way that we can expect the same in the future (Uniformity of Nature/ Induction) and because we have never scientifically observed a nonphysical cause to cause anything physical, we conclude the Causal Closure of Physics". Although having various formulations, the law of conservation, expressed explicitly in the first and second laws of thermodynamics, roughly states that every physical system is conservative or is part of a larger system that is conservative (where a system is conservative if its total amount of energy and linear momentum can be redistributed, but not altered in amount, by changes that happen within it).

So, to save emergence, there can be two ways-- either to reformulate the principle of causal closure or its indicative conservation laws so as to accommodate causally efficient mental phenomena, or to deny the causal closure principle. Let's see how the two alternatives have been approached in the next section.

4. **Avoiding conflict with the principle: -**

The first alternative has been followed by Lowe (2008). He mentions various formulations of the causal closure principle and remarks that for ruling out psychophysical causation, the formulation should be neither too weak so as to be rendered invalid in the closure argument, nor should be too strong so as to not have empirical support and render the non-overdetermination premise of the argument invalid. He then gives weak and strong formulation of the principle and shows that psychophysical causation is compatible with both of them. In case of weak formulation (2008, 46), the principle stands as –

Every physical event which has a cause has a sufficient physical cause.

Here, by sufficient cause he means a non-empty set of physical events, each of which is a cause of the given event and all of which jointly causally necessitate the occurrence of the given event. However, in such case, mental events might serve to render certain physical events non-coincidental which, from a purely physical perspective, might appear to be coincidental.

He (2008, 53) gives a strong formulation too, as following-

Every physical event contains only other physical events in its transitive causal closure.

Here, by the 'transitive causal closure' he means "the set of events consisting of the immediate causes of P, the immediate causes of those causes, the immediate causes of those causes ... and so on: in short, the set which includes every event which stands in the ancestral of the 'immediate cause' relation to P." and the implication of this formulation is that the immediate causes of all physical events are always and only other physical events. However, distinguishing between event causation and fact causation, he suggests that it is possible for a mental event to be the cause of a physical fact. So, Lowe's account suggests that mind exerting causal power on physical is compatible with the principle of causal closure, irrespective of how the principle is formulated. In fact, he even goes on to claim that it would not be unreasonable to posit mind as exerting causal powers on the physical, though remaining invisible, in the sense that "no 'gaps' would be apparent in the causal relations between physical events and all physical events would seem to have wholly physical causal explanations" (2008, 58).

We find another alternative for emergent mental events' having downward causal efficacy without any violation to the causal closure of the physical world from the account of Murphy (2006). She claims that 'emergence' has to be defined in terms of the denial of causal reductionism, and this causal anti-reductionism leads to the affirmation of downward causation. For an account of top-down causation, i.e., downward causation besides the bottom-up causation, we need to accept i) the distinction between lower-level laws and the initial and boundary conditions within which they operate, ii) the distinction between structuring and triggering causes, and iii) a definition of downward causation

in terms of selection among lower-level conditions, structures, or causal processes. Following Van Gulick, she claims that physical outcomes are determined by the laws of physics together with initial and boundary conditions. The patterns of boundary conditions picked out by special sciences have downward causal efficacy in the sense that they can affect which causal powers of their constituents are activated or likely to be activated. So according to her, downward causation can be held compatibly within the causally closed physical world if it is defined in terms of the selection among lower-level causal processes on the basis of their higher-level properties. Thus mental properties can be held to be causally effective in the sense that neural processes become subject to the selective pressures of the environment in virtue of the mental properties.

Gamper (2017) has posited an interface between universes to show a loophole in causal closure whereby it doesn't rule out interaction between them. He follows Steinhart (2009) in defining causal closure as "[a] universe is causally closed iff all causes of events in the universe are in the universe, and all effects of events in the universe are in the universe", and improves this definition by considering the possibility of a multitude of universes, since the causal closure principle is regarding *one* universe instead of *only one* universe. So, considering a multiverse view, we can alter '*the* universe' of the definition to '*a/the same* universe' and the improved causal closure principle stands as "All causes of events in a universe are in the *same* universe". However, to answer the question of what could be the cause of the first event in a universe, he posits an interface between universes. Then we can see that the cause of the first event of a universe comes from the interface between that universe and another one, and thus the rule that no cause of another universe causes an event in our universe is not violated. Thus, he upholds the principle of causal closure by pointing out a possible loophole in it via positing interface.

Ellis (2020) has presented a view which claims that causal closure holds side by side strong emergence. Considering real world contexts like engineering systems and biology, where strong emergence occurs due to the combination of upward emergence and downward causation, causal closure holds in these cases as strictly limited in terms of spatial interactions and effective spatial causal closure can be violated by Black Swan

events. Moreover, he also shows, using example from engineering & biology, that causal closure is strictly an interlevel affair which encompasses all levels from social level to particle physics level in the hierarchy of emergence. He contends, contrary to reductive physicalist approach, that the bottom-most physics level is not by itself causally complete, and causal closure is by nature contextual. He also mentions that the unpredictability of outcomes in quantum level due to the uncertainty principle of Heisenberg and in classical level due to chaotic dynamics (butterfly effect), together with the impossibility of specifying initial data to infinite accuracy undermines the possibility of physics per se being causally closed.

Chakrabarty (2020, 306) has pointed out another remarkable way to avoid conflict with this principle, as found in the analyses of various thinkers. Referring to the textbook formulation (Averill & Keating, 1981; Goldstein, 1950) of the first and second law of thermodynamics and the analyses of the same, she shows that those laws, along with the law of conservation of energy & linear momentum is not against consciousness or its exertion of causal influence upon physical things, as nowhere in the laws a change in the energy is presupposed, nor is the source of the force is held to be physical. In Averill & Keating's paper (1981), we see they hold physical force to be a force whose source is a physical object, and then they show that Cornman's (1978) attack against Broad's (1951) proposed interactionism is stronger than necessity and question begging. According to Goldstein's Classical Mechanics (1950), the law of conservation of linear momentum for a system of particles is: "If the total external force is zero, the total linear momentum is conserved". They point out that this law is applicable to all kinds of forces, irrespective of their sources, and not just the physical forces mentioned by Cornman. Besides, a case of change of the total linear momentum of the brain due to a mental force is not a counter-example to the law, as in that case the antecedent of the law is false. The first law of thermodynamics also has no implication about the source of the working force, nor does it imply that there is a change in the energy in the source of the force, nor that the source of the force is part of a physical system, and so it does not imply Broad and Cornman's common error of holding "If X exerts force F on a physical system S, and the total energy

of S is changed due to F, then X is physical." So, deeming consciousness as a force like thing is an alternative which don't violate the physical laws behind the causal closure principle.

Some emergentists (Polanyi 1962, Stapp 2004) construe mind/ consciousness as the function of exercising discrimination, which means that mental activity doesn't need addition of energy to a system. Thus, their view may provide a way of preserving the law of conservation of energy, as noted by Clayton (2006, 17).

However, some have opted for the second option of the two ways to deal with it, viz. to deny the principle of causal closure. This has been suggested in many ways: -

If the universe is held to be an open system, there will be no problem in accepting emergence which incorporates downward causation. Because the principle of causal closure forms the basis of scientific approach when it is a closed system. As Chakrabarty (2020, 304) points out following Davies (2006), "the system as a whole would then be determined partially by micro-level dynamics and partially by the constraints imposed by the external, global principles- principles which may 'soak up' the causal slack left by the openness".

This kind of approach can be found in Popper's (1977) writings also. In Popperian literature, his contention is that though there is causality, it does not entitle us to posit causal closure (2012). He redefines causality and shows that despite our inclination towards a deterministic explanation of everything, causality does not mean determinism. Its explication can be found in his distinction of various kinds of determinism, among which we can plausibly suppose one kind to hold good while another does not. Positing the world as philosophically deterministic, but physically indeterministic serves the purpose of accommodating our freewill and agency (1995). This indeterministic nature i.e., the open nature of the universe is reflected in his proposal of the three world ontology where the worlds are mutually open to each other. So Popperian stance in this regard is that there is no causal closure of the physical, and organisms, arisen through

emergent evolution, are open systems where mind exerts downward causation upon body.

Chakrabarty (2020) points out again, following Davies (2006), another alternative which is also an unorthodox departure from standard physical theory. This alternative opens up if the physical laws functioning in the basic level are thought to be intrinsically imprecise because of limited computational resources of the universe.

Another way out can be found in Davies' (2006) contention. Referring to the problem posed by causal closure as *causal straightjacket,* Davies remarks that it posits an orthodox idealized view of physical laws which is a bedrock assumption of science. However, as he mentions, some thinkers have challenged this idealization of physical laws (Wheeler, 1984; Landauer, 1967, 1986; Bruckner &Zeilinger, 2003). Reversing the relation between law, matter and information, they hold information as the base of physics, from which matter is derived as a concept, and laws are matter's properties that emerge from matter both conceptually and temporarily.

A remarkable alternative is presented by the quantum mechanics. Mixie (1996) argues that the virtual particles & forces provide a counterexample to the causal closure principle of the physical domain, because the explanation of it, especially the phenomenon of nucleon fluctuations offered by physics is inconsistent with the principle of the conservation of energy. Physics cannot, even in principle, thus provide of the above-mentioned phenomena which complies with the causal closure principle.

Kile Jones (2008) has pointed out some arguments against causal closure. He opines that since causal closure implies that immaterial things can't exert causal influence on physical world, so the examples of happening otherwise prove that causal closure is false. He first provides the example of the Big Bang, where the matter of the universe is thought to be compacted into an infinitely dense ball of heat before the explosion, viz. Big Bang. The philosophical problem of singularity, in this context, has been attempted by some scientists who hold creation *ex nihilo*. But this attempt, says Jones, leads us to conclude that something immaterial had causal efficacy on the physical world. He

provides another example against causal closure by stating that laws, by which physics operates, are immaterial in nature. But these immaterial laws are counterfactually causally connected with the physical world. Besides, he mentions that there is indeed connection between mind and physical behaviour and this is pragmatically verified by psychology and sociology. All these show that causal closure is unwarranted.

Sophie Gibb (2019) has argued that the two of the most popular arguments in favour of causal closure principle fail, and as a result the causal closure principle doesn't provide a general argument against emergentism. She also contends that the principle isn't a fact of current science, instead it calls the principle into question. Not only chemistry, but also physics, challenges it, and the probabilistic formulations of the principle too, is in conflict with the holistic nature of quantum systems. Considering the necessary strength of the principle for arguing against emergence and the available arguments for this purpose, she concludes "...if the causal closure argument is the best argument against emergentism, then emergentism is one of the serious contenders in the debate about the ontological status of certain higher-level entities."

Another argument against causal closure principle has been presented by Ravelli (2020). He doesn't agree with arguments claiming the truth of the principle being proven by the exceptionless nature of physics along with science's need for causal closure. He claims that physical law is just as iffy in nature as mental law and that while science needs causal closure our universe does not.

5. Concluding remarks: -

So, as can be seen from the discussion above, both of the alternatives to save emergence from the threat of causal closure has been availed. Philosophers like Lowe, Murphy, Gamper etc. have tried to reform the principle of causal closure in a promising way for emergence; whereas some recent philosophers and physicists like Popper, Mixie etc. have denied the applicability of causal closure. In view of the whole discussion, I think that another way-out, in line with the first type of approach mentioned here, maybe to call into question the very presupposition that causal closure, if it holds at all, involves

the realm of physics only. It may very well be the case that there is causal closure between the physical and the nonphysical things and phenomenon; after all, causal closure requires only that the world is causally closed, i.e., no state or phenomenon of the world is uncaused. Strictly speaking, this requirement in itself doesn't entitle us to claim the causal closure of the physical from merely the causal closure principle, until & unless we associate it with our bias towards a physicalist outlook for our ease of advantage, in cost of ditching a fact. So this too may be an option worth considering in the arena of this conflict; in that case, the only thing we need to look for is the mechanism of affecting the physical by the non-physical and vice versa.

Anyway, the prospect of emergence, especially its strong version looks promising, irrespective of the alternatives taken. So now we may leave the rest on scientists & philosophers to decide which one suits their theorizing most, maintaining correspondence with scientific facts, and for nonproblematic universality as well.

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