

Francesco Maria Ferrari* and Mark H. Bickhard
On Emergence, Again

<https://doi.org/10.1515/mp-2023-0017>

Received April 18, 2023; accepted July 24, 2023

published online August 17, 2023

Abstract: The aim of the present paper is twofold. First, we are interested in assessing the validity of one version of Kim’s argument against genuine higher level causation. Second, we discuss Wilson’s proposal to consider a weaker notion of emergence as genuinely metaphysical and compatible with Non-Reductive Physicalism. Our conclusion is that both proposals fail: the first in preempting genuine (strong) emergent causation, whereas the second in ensuring a genuinely metaphysical status to weak emergence. After all, Wilson’s proposal strongly depends on the success of Kim’s, not only because it takes it as valid but, also, because in pursuing its own weaker model it shares the presuppositions that led Kim’s to failure. At the end of the day, Wilson’s conception of genuine weak emergence either breaks causal closure or is merely stipulative, namely confined at the descriptive level.

Keywords: causal closure; genuine emergence; non-reductive physicalism; ontological physicalism; supervenience argument; weak emergence

1 Introduction

The discussion about the metaphysical import of emergence has been regimented and framed by J. Kim in several works that have become classics (Kim 1998; Kim 1999; Kim 2005).¹ The metaphysics of emergence seems to be that of a “hybrid” monistic substance materialism that might be identified with what Horgan calls

¹ For an overview on the topic of emergence, see (Van Gulick 2001).

***Corresponding author: Francesco Maria Ferrari**, Department of Philosophy, Lehigh University (Visiting Research Fellow), 15 University Drive, Bethlehem, PA, 18015, USA; and Center for Logic, Epistemology and History of Science, State University of Campinas, Rua Sérgio Buarque de Holanda, 251, 13083-859, Campinas, SP, Brazil, E-mail: ferrarifram@gmail.com. <https://orcid.org/0000-0002-1648-4180>

Mark H. Bickhard, Henry R. Luce Professor of Cognitive Robotics and the Philosophy of Knowledge, Department of Psychology, Lehigh University, 15 University Drive, Bethlehem, PA, 18015, USA; and Department of Psychology, Lehigh University, 17 Memorial Drive East, Bethlehem, PA, 18015, USA, E-mail: mhb0@lehigh.edu

“a dualistic materialism – a materialism with a stratified, multi-level, property-ontology” (Horgan 1997, p. 166). Yet, within this framework there are problems with a coherent understanding of the emergence relation. According to the received view, in fact, emergent causation entails a peculiar kind of causal relation, one that goes from the higher level into the lower, downward to the fundamental “physical” level. This form of causation is labeled as downward causation – the term was introduced by Campbell (1974) in the ’70s (see also (Campbell D. T. 1990)). Emergence seems to be exposed to the following criticism: if higher causation is emergent causation then it seems to contrast with the intended metaphysical/causal model, the one that is compatible with physicalist requirements. More specifically, that downward causation yields a violation of the “physicalist” scenario insofar this is framed by the *Principle of Causal Closure* (hereafter *Closure*), according to which all those events and actors involved in the process of evolutive construction of the whole universe are connected under physical causation. In other terms, nothing external to the entire universe could be somehow (concurrent) cause of some physical event: natural causation is thus *exclusive* and reality is causally *closed*.

In order to resolve the tension, Kim provides the *Supervenience Argument* (SA). Allegedly, SA successfully preempts emergent or higher properties from being causally efficacious. If emergent (higher-order) properties are causally efficacious, then the causal or metaphysical model is contradicted in terms of the existence of a causal over-determination of the effect. But, the physicalist causal model rules out systematic causal over-determination. The principle of *Causal Exclusion* (*Exclusion*) states: for any event there cannot be two independent and systematically different (sufficient) causes. One of them must be excluded, especially, if one of the two does not belong to the intended physical universe. Therefore, higher or emergent causation and the consequential downward causation are to be ruled out, on pain of contradicting the causal model.

According to Kim, the metaphysical cost of SA is that the only metaphysical picture that appears compatible with the whole causal model and, in particular, with *Closure*, is much more austere than the aforementioned hybrid one. After all, if higher emergent properties are to be metaphysically inert, they might as well be somehow eliminated from the metaphysical scene. Thus, Kim’s *Ontological Physicalism* (OP) endorses a rather rigid and flat monistic substance metaphysics, one that rules out the idea that the stratified property-ontology (Kim 2005) may have genuine causal import. However, unlike the hybrid picture, OP is compatible (by hypothesis) with a reductionist attitude (Kim 1989).

Kim’s argument received strong criticisms concerning its alleged validity and soundness in the years since (see (Bickhard 2004, 2015; Bickhard and Campbell 2000; Campbell and Bickhard 2011; Corry 2013; Ferrari 2023; Seibt 2010)) and, yet, the basic insight that has remained in certain metaphysical circles of physicalist inspiration

is, still, that SA validly preempts or rules out emergent causality (Wilson 2021). Nonetheless, because of the pervasive and intuitive appeal to talk of “emergence” in special or “higher-order” sciences – like chemistry, biology, neuroscience and others – and with the aim of defending the autonomy of their respective fields – with respect to that of the most fundamental physics – attempts to reconsider genuine emergence as somehow compatible with (non-reductive) physicalism have been made. Putting aside all those attempts based on unorthodox metaphysical pictures, so far as we know, the most recent attempt to make genuine emergence compatible with *Closure* in a stratified, multi-level, property-ontology was proposed by Wilson (2021). The approach, although it supposes the validity of Kim’s argument, does not renounce to the hybrid metaphysical picture like Kim himself did. On these bases, Wilson could undertake one path only: weakening the over-determination import of emergent causality and she does it by means of a peculiar metaphysical definition of a weaker version of emergence, now freed from the traditional epistemic or epiphenomenal interpretation due to Kim’s result.

We first provide a new argument for the invalidity of Kim’s SA. Our counter-argument emphasizes (i) the difference between the model *specified* by OP (the specified OP-model; hereafter, SOP) and the *intended* model associated to OP (the intended OP-model; hereafter, IOP), (ii) the fact that the former has priority on the latter, and (iii) that SA is proved valid only within models that are isomorphic to the IOP. The ultimate reason for the invalidity of SA relies, then, on the fact that, although the IOP preserves *Closure*, the SOP cannot – and, so, OP neither. Only then, when devoting our attention to Wilson’s proposal, we will argue that her metaphysical reading of weak emergence suffers from similar problems with respect to that preempted by Kim’s SA. In particular, we will show that either Wilson’s conception of weak emergence is merely stipulative (non-metaphysical) or the picture she has in mind is incompatible with *Closure* as well as SOP is. The ultimate reason is that Wilson’s model presupposes a rather unmotivated deflation of the metaphysical status of the power profiles associated with weakly emergent features.

2 Dualism and Emergence: The Standard View

As Kim writes, “the intuitive idea of an emergent property stems from the thought that a purely physical system, composed exclusively of bits of matter, when it reaches a certain degree of complexity in its structural organization, can begin to exhibit genuinely novel properties not possessed by its simpler constituents” (Kim 2006, p. 548).

The fundamental principle of traditional physicalist metaphysics is the assertion that the physical world encompasses everything that exists – the *Completeness*

of the physical world.² The above quotation makes it clear that, according to Kim's *Ontological Physicalism* (OP) (Kim 2005), structural organizations of aggregates of particulars are not part of the intended purely physical ontology. If so, the question of whether or not distinctive higher properties, i.e., properties of structural organizations, can be causally efficacious and whether or not they are so downward to lower properties and powers would turn into a question about the validity of *Closure*. But, given that according to Kim, *Closure* cannot be invalidated because, otherwise, quantities like energy and momentum wouldn't be conserved, either we eliminate emergent properties or we make them causally innocuous.

The best way to eliminate higher properties is that of providing a general and conclusive proof of their reduction to lower ones, downward to the fundamental bases, without any residual. This is a general proof of the mutual identity of the higher and the lower. Unfortunately, a proof of this sort cannot be provided. As Kim recognises, "even if you are ready for reductionism, it doesn't necessarily mean that you can have it. For reductionism may not be true" (Kim 2005, p. 22). Alternatively, it may be given a proof that the theory can completely eliminate any commitments to higher-order entities, like the structural organizations Kim is talking about, by confining the ontology of the physicalistically adequate theory to the bottom level of fundamental particulars, e.g. individual objects or, even, tropes (Campbell 1990; Seibt 2002). After all, if no entities, then no properties and powers. However, this approach appears to be untenable, as recent studies have indicated (Ferrari 2022a; Ferrari 2022b). So, in one way or in another, higher commitments are still there.

The other option at hand consists, instead, in (i) accepting the commitments with higher entities and, only then, (ii) arguing how such commitments cannot be metaphysically or causally efficacious. In other words, friends of monistic physicalist metaphysics must ensure that although higher entities are part of the ontology and perhaps automatically generated by the model, they are nonetheless metaphysically inert or causally innocuous. In order to claim the metaphysical innocence for higher properties, OP-ists endorse the Supervenience Argument according to which higher supervenient properties cannot introduce additional causation(s) to the intended 'physical' causal model, on pain of contradiction. The SA makes an essential use of the (*supervenience*) claim, according to which emergent properties and powers are supervenient properties and powers. Thus, the (*supervenience*) claim now counts for OP-ists as a free posit of non-dualism because, according to the SA, higher causation is in contradiction with the causal model. Higher properties, if any, are to be interpreted non-ontologically: epistemically or as epiphenomena.

² Note that *Closure* does not entail *Completeness* (Gibbs 2010).

According to Kim (2005), Kim (2006), the physicalist causal model is (supposedly) framed by two main principles. The principle of *Closure* according to which every physical event must have at least one physical sufficient cause and that of *Exclusion* that affirms that any event must have at most one sufficient cause.³ As a matter of fact, friends of OP argue that the existence of higher supervenient causation implies either a contradiction with one of those principles or a contradiction with the other. After all, they say, if some irreducible higher causation is concurring with that at the physical level, then the breaking down of *Exclusion* automatically implies a contradiction with *Closure*, and vice versa.⁴

Accordingly, this should be enough for ensuring that higher properties and powers *cannot* take part in the metaphysical construction of the world. The argument, *if* valid, clearly motivates the endorsement of non-dualist metaphysics like OP and as those whose model is complete and *unique*.

In what follows, we are going to introduce the naturalist project against emergence as it has been supported by Kim in several works, such as (Kim 1989; Kim 2005; Kim 2006) with a detailed outline of (a version of) of Kim's SA. Yet, before doing that, we want to spend a few more words about the standard notions of emergence and supervenience that Kim assumes to hold in his argument. Kim's works fix the standard analysis of emergence in terms of supervenience and irreducibility. Despite appearances, supervenience and irreducibility are "necessary but not sufficient" conditions for emergence, i.e., "negative" conditions (Kim 2006, p. 557).

Supervenience is a (schematic) relation intended to convey two properties: the (full) ontological dependence (OD) of the emergent to the fundamental and the *covariant determination* (CD) of the former. (i) If emergent/supervenient properties M are realized by an entity then also basal (or physical) properties P_i are realized and such that if a given collection of P_i is realized, then (by nomological necessity) M is realized too; (ii) If $M^* \neq M$ then $P_i^* \neq P_i$. Kim himself recognizes objective difficulties in turning supervenience into a "positive" relation of dependence. First, because of its schematic character: many "non-homogeneous" dependence relations may satisfy the same dependence schema. In the end, "the only thing in common" is that supervenient properties "covary in a certain way with naturalistic properties" (Kim 2006, p. 557). In other words, the supervenience claim ends only registering the fact that if systems are P -indiscernible (congruent), then they

³ I changed the terminology a little from standard discussions. See (Campbell and Bickard 2011; Corry 2013; Wilson 2021) for further detail.

⁴ Note that from these two principles alone it cannot be derivatively obtained the *Completeness* of the physical domain (Gibbs 2010).

are also M -indiscernible.⁵ If things are so, Kim continues, then “that a family of properties supervenes on another does not tell us much” (p. 556). In other words, the supervenience claim just states “that there is an in-principle unexplainable covariation between the putatively emergent properties and their base properties” (p. 556). Supervenience is thus a rather metaphysically vacuous relation.

On the other hand, in the lack of a general proof for reduction, if one accepts emergent/supervenient causation s/he is also committed with emergent/supervenient properties being systematically different from all the naturalistic properties at the base. If they are cannot be reduced, then they are at least not identical and, thus, they are at least “weakly” irreducible, i.e., $M \neq P_i (\forall i \in \mathbb{N})$. In other words, emerging/supervenient properties being (weakly) irreducible may not be properties of higher entities but, instead, they may plausibly be further properties of first-order entities.⁶ However, weak irreducibility is, of course, a negative statement because it is non-informative about the relation between the properties at issue (Kim 2006, p. 556). Indeed, it registers just the fact that we do not have access to what makes those properties be systematically distinct and to what extent they are so. However, it is noteworthy that, despite being unspecified, there is always “something” that makes M (weakly) irreducible to P_i .⁷

2.1 Preempting Genuine Emergence

Kim provided many versions of the SA (cf (Campbell and Bickard 2011; Corry 2013) for a detailed introduction and discussion).⁸ I am now proposing the version that Corry labels “from *Closure*” in order to generate the inconsistency emergent causation yields with *Exclusion*.

The Supervenience Argument (Kim 2006) Suppose that some higher causation from property M to property M^* . By (OD), if M^* is realized then some supervenience-base, say P^* , exists too. Then, by *Exclusion*, P^* must have one (sufficient) cause. Downward-causation from M to P^* may fit into the model – recall that the supervenience relation between P^* and M^* is not a sort of causation. So, if M is the cause of M^* , then M causes M^* by causing P^* . Yet, by *Closure*, P^* , must have at least one *physical* cause, P , and such that $P \neq M$, by hypothesis. Thus, P and M are each independent and sufficient causes of P^* : the former is cause of P^* by *Closure*,

⁵ This allows for multiple realizability (though Kim does not accept standard conclusions from it). Notice that multiple realizability violates the inverse of the condition stated here – it would be quite possible for something to be P -discernible but not M -discernible.

⁶ As we will see, this fact will be crucial for our present purposes.

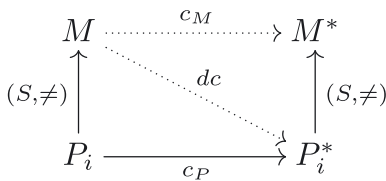
⁷ We are not intending to enter into the discussion here about the appropriateness of his approach. See (Campbell and Bickard 2011; Marras) for some further detail and discussion.

⁸ In particular, Corry (2013) provides a detailed analysis of the evolution of Kim’s many versions of SA across his own works.

while the latter is (downward-)cause P^* by *Exclusion*. Accordingly, then, P^* has two distinct (and sufficient) causes. This is a case of genuine over-determination, namely there are more causes than how many the model allows to have by *Exclusion*: causal over-determination contradicts *Exclusion*. Therefore one of the premises cannot be true. By *Closure*, downward-causation from M to P^* must be dropped, leaving P as the sole sufficient physical cause of P^* . But it is the assumption of some higher causality from M to M^* that leads to that and, thus, to the violation of *Exclusion*. Hence, there cannot be any higher causation from M to M^* .

Following Kim, there are two reasons why *Exclusion* cannot be dropped off by *reductio* as the false assumption. First, SA already makes use of it when drawing (downward-)causation from M to P^* . So, if false, then even the reason why the contradiction is generated falls out. *Exclusion* is to be supposed to be an analytic – i.e., a necessarily *a priori* – truth, at least with regard to SA.⁹ Second, and more in general, because the contradiction must be prevented in some way, and this way picks up the alternative option of higher causation. Indeed, given the formality of the argument, it is not possible to arbitrarily “choose” one among M and P and to eliminate the causation that involves one of them as cause: the contradiction must be avoidable in principle. So, either it is possible to drop one among P and M by means of the assumptions already at hand, or they must coincide. This latter option cannot be pursued by hypothesis and, moreover, because if it was the case that $M = P$, then the whole issue would have been uninteresting from the start. Rather, it is the former option that gives Kim a chance to conclude the *reductio* by appealing, one more time, to one of the basic assumptions that is also framing the reference model: *Closure*. *Closure* is thus used a second time to designate and pick up the consistent causal interactions.

The following diagram may help to “see” the argument.¹⁰



⁹ This issue, in its generality, is disputed by (Corry 2013), but for the present discussion the analysis of *Exclusion* and of causation is irrelevant.

¹⁰ Where horizontal arrows indicates causal relations (c_M, c_P) at the respective emergent and physical level; the diagonal arrow indicates the downward causation (dc), while vertical arrows the Emergence relation in terms of Supervenience (S) and Weak Irreducibility (\neq). Dotted arrows are the form of causation the argument is supposed to rule out. Furthermore, for the sake of argument, P_i is made to coincide with the supervenience base of M . This is not necessary by logic, namely properties OD and CD are not sufficient to state this point. However, these bases can incidentally coincide.

Kim's conclusion is twofold: either the intervention of *Closure* makes the assumption of a causation from M to M^* irrelevant for explaining M^* , or the assumption of some emergent causation simply leads to a contradiction. Either way, according to Kim, genuine higher causation is inconsistent. We now want to double check whether or not SA is a valid argument.

3 SA is Invalid

Kim's argument is commonly accepted as succeeding in preempting genuine higher causality. We now dispute this widespread opinion.

SA makes a crucial use of the notion of *weak irreducibility*: an emergent property systematically different from (not identifiable with) physical properties: $M \neq P_i$ ($\forall i \in \mathbb{N}$).¹¹ However, under this reading emergent properties may be first-order properties, namely, properties of particulars. This is in agreement with the intuition we have of Non-Reductive Physicalism (NRP) as a “dualistic materialism – a materialism with a stratified, multi-level, property-ontology” (Horgan 1997, p. 166). The point is that according to NRP, it is presumed that particulars x are certainly physical particulars, i.e., characterized by P -properties, and also M -characterized. What SA argues is that the hybrid picture cannot be taken seriously as supported by the causal model: as Corry writes, “[s]trictly speaking, what the Argument from Closure shows is that non-reductive physicalism is incompatible with the conjunction of Closure and Exclusion” (Corry 2013, p. 41).¹² In other words, according to Kim, SA concludes that NRP breaks the *Completeness* of the physical world.

The reason is simply stated. Once NRP fixes P_i as the *intended* “physical” properties, then $\forall x P_i(x)$ ($\exists i \in \mathbb{N}$) is a trivial theorem of the theory – whether NRP or OP. In other words, it is a NRP-tautology that all particulars of the intended domain of physical entities do have physical properties. Yet, if NRP also assumes M -properties to be ontologically or systematically different from P -properties, then there cannot be any certainty that $M(x)$ holds to $\forall x P_i(x)$: if it is the case that $P_i(x)$, $M \neq P$, and $M(y)$, then it may be the case that $y \neq x$ – and, thus, that $\neg M(x)$, for any x that is P . This is, because P -properties do characterize what is the physical and, thus, what is the domain of physical particulars – namely, what belongs to the *intended* NRP-model, whereas M -properties are intended as non-physical properties and, so, they may not hold of physical entities, like those that are characterized by means of P -properties, on pain of contradiction. As Kim writes, “to reject the closure principle

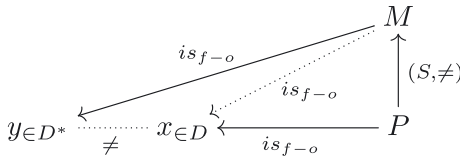
¹¹ Genuinely higher-order properties, in the sense of distinctive properties of genuinely higher entities, are a particular case of properties that surely satisfy that condition.

¹² Wilson (2021) is of a different opinion.

is to embrace irreducible nonphysical causes of physical phenomena” (Kim 1989, p. 47). So, if something not physical does exist, then Completeness cannot hold.¹³

M-properties, thus, specify non-physical particulars belonging to domains that differ from the intended physical domain of NRP. As a consequence, after all, if particulars interact through their distinctive causal powers, then, if non-physical particulars are allowed to interact with the physical ones then *Closure* is broken as well as *Completeness*.

Yet, if the domain defined by *P*(*x*) and that defined by *M*(*y*) do not coincide, NRP is, by assumption, based on a non-monistic first-order ontology, one that cannot be consistent with *Closure*. After all, non-standard entities that are still particulars do exist in many branches of (even formal) science. So, what prevents these standard and non-standard particulars from interacting? The next diagram may give the some insight into the difficulty the non-reductive picture seems to encounter to maintain ontological *Closure* and the Completeness of the intended domain of the physical:¹⁴



So far so good. Kim perhaps would have accepted this rendering of the incompatibility between NRP and *Closure*. However, Kim would have accepted it, only if he had not realized that the argument rests solely on the hypothesis of the weak irreducibility of *M*-properties to *P*-properties. Indeed, precisely because weak irreducibility is essential for SA, then it is possible to argue that SA is not valid. The point is that the irreducibility condition is a *negative* condition (Kim 2006) and, as such, is defined in terms of *negation*. The symptom of that, and even the core of the invalidity of SA, is the fact that SA is an argument by *reductio* (cf (Corry 2013)).¹⁵

¹³ Namely, that the implication “if $\forall i \in N M \neq P_i$ then $\forall x (P_{i \in N}(x) \rightarrow \wedge M(x))$ ” cannot be valid in the theory.

¹⁴ Where particulars x, y are first-order entities belonging to the first-order domain D and its expansion $D' = D \cup \{y\}$ respectively, and ‘ is_{f-o} ’ indicates the first-order predication or attribution of a first-order property, say P , to particulars. Properties P, M are “systematically” different by hypothesis, and so is, therefore, their domain of interpretation: if $P(x)$ holds with $x \in D$ and D is the domain of what is “physical”, then it is possible to argue *a priori* that systematically “non-physical” properties like M can be properties of a systematically different particular, one different from any $x \in D$. In this case, M can be interpreted over $D' = D \cup \{y\}$, because if $\exists y M(y)$ then it is possible that $\exists y \forall x y \neq x$.

¹⁵ This, in turn, is a symptom of the fact that a constructive proof of (functional) reduction is impossible.

Arguments by *reductio* prove the reference model – namely the model in which the argument is evaluated – is consistent with an hypothesis, by proving the inconsistency of its *negation* with the reference model. Leaving apart technical and logical considerations, this means that the premise of SA about the existence of higher causation from M to M^* (hereafter [H]) is, actually, a negation of a formula compatible with the causal model and, then, with *Closure*.¹⁶ So, [H] is actually in contradiction with the reference model from the outset. Namely, [H] is assumed to be true just *for sake of argument*. That is, [H] is not supported by the reference model and/or, again, [H] is false and cannot be true according to the model. So, the reference model on which Kim is modeling and assessing SA cannot accept emergent/supervenience causation, because otherwise the model would support [H] and allow for higher or non-standard properties being causally efficacious. Furthermore, according to SA, if [H] were true (valid) in the model, then the model would have been in contradiction with the intended physical model and/or with *Closure*.

The reason why SA is generally *invalid* is thus the following. To make the contradiction following from [H] with necessity, Kim must interpret *Closure* in a way that is incompatible with genuine emergent causation. But, in order to do that, one must already know what physical causation is and, thus, already have at hand the complete class of properties that fix the well-defined domain of physical particulars. Indeed, SA implicitly takes “physical” and “emergent” as defined in a mutually exclusive, as “non-emergent” the physical and as “non-physical” the emergent. However, to do this, it is equivalent to assume the intended model of OP (IOP) as the reference model of SA with the additional clause that this is the unique model – i.e., and that this is isomorphic to the intended model of NRP. But – and this is the problem concerning the invalidity of SA – is OP strong enough to specify the condition for picking up a well-defined and unique model?

Even without appealing to systematically different properties, like we did in the case of NRP, it is possible to prove something analogous from the resources of OP. In particular, it is possible to prove that the model specified by OP (SOP) cannot be restricted to IOP. Unfortunately, IOP is no longer sufficient for assessing the validity of SA because SA requires SOP as its reference model.

Indeed, because OP, as well as NRP, is a first-order theory of particulars, it makes use of the resources of first-order logic with first-order identity. However, from these and from the quite natural assumption that the interpretative structure of the theory is at least denumerably infinite, it is possible to show that for any associated (intended) domain D of particulars d , like physical particulars, there

¹⁶ OP is clearly based on classical logic according to which the double negation rule/law holds. Accordingly, [H] is equivalent to its double negation $[\neg\neg H]$, with the formula $[\neg H]$ being, thus, consistent with the reference model and with *Closure*.

exist a denumerably infinite multitude of different or non-standard domains $D^*_{i \in \mathbb{N}}$ of non-standard particulars d^* that satisfy all the *non-trivial* theorems of OP (Arenhart, Bueno, and Krause 2019). For example, if OP-ists fix the specification of D in terms of $P, D = \{d: P_i(d), \exists i \in \mathbb{N}\}$, such that $\forall x \exists i \in \mathbb{N} P_i(d)$ holds, then for any $d^* \in D^* P_i(d^*)$ cannot hold.¹⁷ Accordingly, these model are *non-isomorphic* and, then, OP cannot have $D = \text{IOP}$ as its unique model. As a consequence, OP allows for the existence of genuinely non-physical entities because it cannot specify a single domain. So, why shouldn't these entities (non-trivially) interact with the “physical” ones through some non-standard causal powers?

As a matter of fact, then, the act of assuming [H] and testing its validity is not merely arbitrary. The hypothetical truthfulness of [H] depends on the commitment OP has with non-physical entities and thus with their possibly distinctive properties. Hence, [H] is not true just “for sake of argument”. Therefore, if SOP *must* involve non-physical domains by necessity, then the distinction between what is “physical” and what is not is not clear or well defined and, *a fortiori*, it cannot be mutually exclusive or defined by the appeal of negation. Therefore, *Closure* should have been interpreted in a way that is plainly compatible with genuine emergent causality. As a matter of logical necessity, as we now proved, *Closure* would have not led [H] to contradiction with *Exclusion*, and the reason is that *Closure* and *Exclusion* jointly do not and cannot entail the *Completeness* of the physical domain (cf (Gibbs 2010)) – unlike what Kim presupposes. To say that all genuine causality is physical leaves what constitutes being physical undetermined.

4 Genuinely Metaphysical Weak Emergence

Although Kim's argument does not succeed in preempting emergent causality, even some of the most recent proposals on the topic, like Wilson (2021), still assumes that it succeeds: if some genuinely new powers are in place, then *Closure* (and/or *Exclusion*) cannot be preserved. On the other hand, however, Wilson believes that Kim's verdict against NRP can be somehow reversed. If true, this would be certainly a good news for all those physicalists that appeal to the explicative power of “emergence” talk in special “higher-order” sciences – like chemistry, biology, neuroscience and others – and defend them as irreducible languages/theories whose respective fields are genuinely or ontologically autonomous – mutually and from the most “fundamental” physics. It seems that, on the one hand, no one can

¹⁷ This is equivalent to defining $P_i(x)$ as $x = x$. Indeed, any model D is trivially defined in terms of identity: $D = \{x: x = x\}$. It is not a matter of chances that non-standard models are constructed by recursion appealing to negation, disjunction, and identity: $D^* = \{x: x \neq d_1 \vee \dots \vee x \neq d_n \vee x \neq d_{n+1}\}$.

renounce physicalism while, on the other, no one wants to renounce emergence. Thus, the real questions are: Might *Closure* be preserved in non-reductive contexts? And, if so, is emergence genuine emergence? The only certain thing is that Wilson's emergence is not what Kim is thinking of.

The current discussion involves a redefinition of a standard distinction between “weak” and “strong” emergence. The distinction is standardly due to Kim's verdict against NRP. According to that, friends of NRP are usually forced to interpret higher-level properties as epiphenomenal, meaning to give them a rather non-ontological but epistemic reading (Heil 2023). This epistemic interpretation of emergence assures that higher-order properties can preserve their genuine distinctiveness at the cost of being ontologically inert: weak irreducibility does not imply autonomy at the ontic level. Weak irreducibility provides a basis for having (fundamental) causal consequences. This contributes to some autonomy at the explanatory level. Causal consequences, unlike causal powers, may be new and emergent because consequences are inferred from the regularities that are described by higher laws of special sciences. Yet, the causal powers involved are just those at the base and, so, in the absence of new distinctive causal powers, causal consequences of causal regularities are said to *weakly* emerge from the fundamental causal powers. Thus, if Kim's SA runs against “strong” emergence, the conflation between weak emergence and epistemic emergence is often supposed to come for free.

Wilson (2021), instead, proposes and defends the rather unorthodox idea that weak emergence can be provided with a genuinely ontological interpretation, although not involving new fundamental powers. Wilson's picture seems then to be compelling for three related reasons: (a) it accepts the idea that “strong” emergence is in contradiction with physicalism, i.e., the validity of SA; (b) it accepts the idea that, if there are no new fundamental (physical) powers, then *Closure* is preserved, i.e. the *Completeness* of the physical world; (c) it supports the idea of the ontological autonomy of special (higher-order) sciences, i.e., the characteristic thesis of NRP.

But, if it is true that SA poses the limits of the discussion about a consistent and genuine import of emergence, it is also true that Wilson's attention must be directed toward the question of how to gain ontological autonomy from *Completeness*. In order to do that she defines weak emergence in such a way to make things work the right way:

Definition 4.1. (Weak emergence). What it is for token feature *S* to be Weakly metaphysically emergent from token feature *P* on a given occasion is for it to be the case, on that occasion, (i) that *S* cotermporally materially depends on *P*, and (ii) that *S* has a non-empty proper subset of the token powers had by *P*. (Wilson 2021, p. 72)

Notice that condition (i) characterizes both “weak” and “strong” emergence; (i) states a *schematic* dependence condition that, as such, is supposed to be validly substituted by whatever (coherent) ontological dependence relation one has in mind – whether primitive or not – of the emergent on the micro-physical basis. The dependence relation is, thus, clearly near to the supervenience one of the standard views and so are the criticisms to it. As Heil comments along the line of Kim’s criticism to supervenience, the schematic view of ontological dependence is rather odd (Heil 2023, p. 158).

However, that shouldn’t be surprising. The risk of being less schematic and more committed is too high. To see the difficulty from a very general but still genuinely metaphysical viewpoint, think of the following. Within the intended “physical substance monism” (Wilson 2021, p. 9) endorsed by Kim, as well as Wilson, material substances are the fundamental (particular or local) objects accepted in the model. Accordingly, all that is ‘over and above’, like holistic organizational and configurational entities with their properties, cannot introduce new powers. Inasmuch objects have properties, fundamental properties are what bestow all the powers. Thus, to be “materially dependent” seems to mean here just the trivial fact that property *S* – which by (ii) shares with *P* some of the fundamental powers – engage some relation with *P* with respect to the powers that are not shared. However, to have dependence at all, powers should be somehow ordered in some (ontic) hierarchy. The point is that the point wise inequality among the shared powers cannot help for that because it is not an ordering relation. Perhaps, the relation of “having less cardinality of” or that of “less than” with respect to the number of powers could help. But, then, a natural candidate for this interpretation would rather be the proper subset relation between the extensions of *S* and *P* (ii). However it be, these are not relations between features but a relations between their cardinalities and, in the end, between powers. Thus, if one wants a dependence relation, it is not clear what is to be taken as the second term of the relation. And it cannot be clear.

Imagine the relation is defined over fundamental powers only, then how can we consistently understand the dependence relation, if some of the fundamental powers depend on some other fundamental powers? What is fundamental and what is dependent, if the fundamental is also dependent on something else? Is there something even “more” fundamental? It would certainly be odd, especially because what is fundamental is fixed once and for all, on pain of contradiction with the very notion of weak emergence, as one implying the claim that there cannot be hierarchies of fundamental powers. On the other hand, if the material dependence was a relation among fundamental powers and configurational interactions at any weakly emergent stage, then how can we consistently understand such interactions? If they are powers, either they are fundamental or they are not. The first

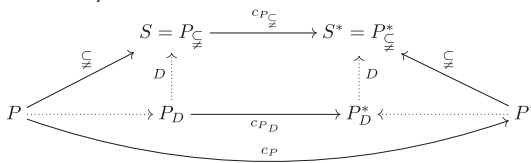
case has been questioned above. The second case demands for a proof of reduction, on pain of contradiction. But non-fundamental powers are emergent powers and so they should be irreducible by hypothesis, and that's a big problem. Alternatively, interactions are to be taken at face value: interactions among powers. But also this move does not help so much because, in this case, interaction should be taken seriously, namely as something having the effect of making powers to interact and, so, to make them efficacious. If so, though, interactions should possess some power on their own, i.e., interactive powers. But this goes against the inverse of *Completeness* (by *modus tollendo tollens*: if *Closure* holds then there are no new (fundamental) powers. Now, NRP takes the inverse of *Completeness* to incontrovertibly hold. The reason is that NRP takes SA to be valid and so it takes double negation and contraposition to be part of its logical structure.

Therefore, problems seem to be around the corner and, hence, a proof of consistency for the definition of emergence and of a genuinely metaphysical relation of “material dependence” is strongly required – but still not provided.¹⁸ In other terms, until a consistency proof of a metaphysical notion of dependence is given within the designated metaphysical monistic model, the relation of ontological dependence cannot be bought as a trivial relation, i.e., a relation trivially consistent within the intended model and, then, as an innocuous “schematic” relation. Rather, it should be taken as a necessary additional assumption of the theory with all the due and appropriate metaphysical specifications. And yet, even its introduction among the basic assumptions of the model should be substantively motivated.

However, what seems to differentiate Wilson's formulations of genuine emergence is condition (ii) (cf (Heil 2023, p. 158)). Condition (ii) seems to guarantee the distinctiveness of the macro over the micro. (ii) claims the existence of a “proper non-empty sub-set of powers” (PSP) while, in the ‘strong’ case, the condition places

¹⁸ Not to mention that the burden of such a proof is on who is proposing the account. More in general, providing such a proof is mandatory, especially in monistic contexts. At the fundamental level, material substances with their properties and powers are taken as fundamental, as well as mutually independent. But when interactions among fundamental powers are introduced, as in the case of configuration of powers, genuine relations are introduced in the model. Yet, to account for genuine relations in substance monism is problematic, especially if relations among substances are taken to not have a genuine metaphysical status, like in the case in which interactions among fundamental powers are supposed to have no distinctive new powers. Indeed, once substances are assumed, relations among them are always emergent, if they are relations at all. Indeed, what is a *material* relation? At the quantum level, for example, the discovery of entangled systems allowed for physical but not material interactions as what characterizes and what makes a quantum system *non-local*. But this should mean that interactions have new irreducible powers. But then, to flank particles and interactions (genuine relations) means to have dualism, if both have their distinctive kind of powers. And this contradicts Wilson's monistic model.

something like a proper super-set of powers where a “fundamentally novel” power explains the causal but non-physical autonomy of the strongly emergent (Wilson 2021, p. 53). PSP registers a split between the metaphysical roles of the fundamental powers: between some of those powers that are metaphysically (and causally) relevant for the macro-physical effects per sé, and all the others that anchor the ontology of the weakly emergent phenomenon to the basal micro-physical level and that are metaphysically (and causally) relevant at the lower level:¹⁹ if only $S = P_{\underline{C}}$ bestows causally efficacious powers at the emergent level, then problems with systematic over-determination no longer occur in causing S^*P^* . P causes P^* by causing $S^* = P_{\underline{C}}$ and P_D^* as independent and non-interactive effects of $S = P_{\underline{C}}$ and P_D respectively. In the diagram below the import of PSP and of the dependence relation is denoted by “ \underline{C} ” and “ D ” respectively.



As one may see, physical causality c_P is split between the micro-physical c_{P_D} and the weakly emergent $c_{P_{\underline{C}}}$ that now are no longer problematically concurrent (cf (Heil 2023) for an alternative representation). The reason for choosing this option should be clear enough.²⁰

Yet, the genuine metaphysical import of weak emergence does not and cannot come from its very definition only – Heil is of a different opinion (Heil 2023, p. 158). Indeed, a definition is a mere stipulation here.²¹ Emergence, instead, if genuine, cannot be a matter of stipulation but, rather, it must be a deep metaphysical fact that is due to the model and that affects the whole model. The definition, on the contrary, only specifies the formal constraints that fix the compatibility of NRP with *Completeness*.

Wilson, who is aware of that, is keen to leave clear that the ontological autonomy of higher features S come from a third actor: from the powers profiles associated to each distinctive set or group of fundamental powers characterizing features

¹⁹ Perhaps PSP gives “content” to the dependence relation.

²⁰ According to Wilson, the PSP condition is essential in order to deflate the over-determination problem that allegedly emerges when the properties of the base and the properties at the higher level are left to concur in producing some phenomena. The distinction between the dependence condition and PSP is a way of insisting on the fact that weakly emergent phenomena do not involve two competitive forms of causality, one at the base and one emergent, as it happens in the standard account.

²¹ Especially in frameworks that endorse classical logic.

S and whose causal autonomy is, in turn, ensured by the higher laws that govern their physical behavior. These laws, indeed, are what in Wilson's model is supposed to be *functionally independent* or causally autonomous.

The key suggestion operative in the nonreductive physicalist's approach is that *there are two ways for a higher-level feature to be distinctively efficacious* with respect to the lower-level feature(s) upon which it depends. One way, emphasized by Kim and others, is for the higher-level feature to be associated with a new power to produce the effect; here the distinctive efficacy (characteristic of accounts of Strong emergence) is located in the having of a distinctive (fundamentally novel) power. Another way – that at issue in the powers-based subset strategy, and characteristic of accounts of nonreductive physicalism/Weak emergence – is for the higher-level feature to be associated with a *distinctive subset of powers* that are relevantly proportional to the effect, in the ways indicated by difference making considerations and comparatively abstract special-science laws or (more generally) causal joints. In short: distinctive efficacy may reflect either the having of a distinctive *power* or the having of a distinctive *power profile*, and it is the latter variety of efficacy that is at issue in accounts of physical realization. (Wilson 2021, p. 69)

If power profiles of Ss are “nonfundamentally novel”, it cannot be so just because of PSP. If it were so, a rather trivial meaning of “novel” would be indeed ensured. Because of PSP no new powers are involved in the associated set of fundamental powers which, in turn, are always distinctly identified – by the *Leibniz Law*.²² However, once a set is defined, all other entities are excluded from it by definition and all its subsets are differentiated that way. It is the ontological status of power profiles that should ensure their own distinctive ontological relevance genuinely novel – and, thus, the genuine import of weak emergence.

Unfortunately, although power profiles and fundamental powers are different ‘things’, power profiles are not things at all, and their difference reflects “a merely aggregative difference between powers of a configuration and powers of components of the configuration” (Wilson 2021, p. 54). Thus, power profiles are neither powers of sets of fundamental powers nor powers of powers. So what are they? After all, to claim that power profiles themselves are not identical to new (fundamental) powers is clearly not enough. Especially because this is the crucial point around which gravitates the consistency of the whole model. So, in order to assess whether or not weak emergence is genuine, one must assess whether or not power profiles do not have powers on their own but still introduce some novelty in the metaphysical model.

Following Wilson, the intuition that precedes and inspires this understanding of the causal autonomy of power profiles comes from the (empirical) observation

²² “By Leibniz’s Law, of course, entities with different features (at the same time, at least) are distinct” (Wilson 2021, p. 4).

that complex and macroscopic systems (like even “ordinary objects”) are generally behaving according to the laws of higher sciences that are characterized by a “less number of degrees of freedom” (Wilson 2021, p. 194) than the ones possessed by the laws governing the respective micro-physical basis in non-emergent conditions. Here, Wilson’s words,

That certain law-governed features of rigid bodies can be specified using strictly fewer degrees of freedom than are required to specify the associated law-governed features of their underlying quantum-mechanical micro-configurations *suggests* that the former are ontologically autonomous with respect to the latter. (Wilson 2021, p. 5; italics ours)

Some of the degrees of freedom that, as independent parameters for the formulation of causal laws, are characteristic of and relevant for the description of the micro-physical system are not to be counted as characteristic of the higher laws that describe weakly emergent phenomena. For example, as Wilson holds, the information about the spin of the subatomic particles is “irrelevant” in formulation of the laws that govern a macroscopic system (p. 194).²³

[T]hat the specification of special science entities and features does not include quantum-level information means that even though these entities and features are metaphysical consequences of physical laws, it is not appropriate to place them at the physical level: the quantum laws wouldn’t know what to do with them. (Wilson 2021, p. 90)

The metaphysical role of special higher laws is, then, that of giving us the *physical* information about the *aggregative* difference between power profiles and fundamental powers. For example, the power profiles could be conceived as the result of the aggregation of certain fundamental powers at any emergent step that is mirrored by the ‘mechanism’ of elimination of some of the degrees of freedom occurring in the relatively lower law.²⁴

However, this move has a cost: it necessitates providing a compelling argument that explains why higher laws should play some metaphysical role. This is

²³ Doubts on this conclusion may be raised, we believe. For example, Wilson leaves not clear in what sense some degrees of freedom are “irrelevant” and in virtue of what mechanism they become so. This will be a particularly relevant problem for Wilson’s account and the like, as we argue in the next section.

²⁴ This is a law-based mechanism to break the *symmetry* among those mutually independent degrees of freedom that are all equally relevant for the causal regularities of the previous emergence-stage (downward to the bottom micro-physical level) – independence, at the fundamental level, is a symmetric relation, while dependence may be in general be asymmetric – and to carry out a selection, among them, resulting in a mechanism of *phase transition* to the next emergent law-based stage. Phase transitions are transitions through physically distinct spaces of the states describing different dynamical energy regimes in which the evolving system can go.

like demanding higher laws to give the sufficient information to account for the appropriate elimination of certain and not other degrees that took place from the lower. Certainly, this would correspond to an explanation of the appropriate aggregation of fundamental powers that characterize each specific power profile. Not accounting for that risks rendering evanescent the metaphysical consistency of the proposal.

Rightly, Wilson does not attribute the source of the causal autonomy of power profiles to this characterization of special laws. As we reported above, special higher laws with a lower number of degrees of freedom simply *suggest* genuinely emergent phenomena. This view not only is legitimate but it is, above all, obvious. Otherwise, all the efforts of the reductionists like Kim would be rather pragmatically unintelligible.

Another thing, however, is to argue that these characterizations of the laws are in themselves sufficient to establish that the emergence of associated power profiles is genuine emergence. On the other hand, Wilson is aware that laws, although capable of differentiating the causal effectiveness of a physical system, account for it from the perspective of their merely physical realization. Unfortunately, however, we are looking for the metaphysical reasons for the causal autonomy of power profiles, and this cannot be ascribed by us from physical considerations only: causal autonomy must be ascribed to power profiles by means of the metaphysical model itself.

5 Is Weak Emergence Genuinely Metaphysical?

Wilson's project endorses an ontologically 'minimal' or maximally neutral characterization of laws. Laws are regularities. This is an old view, one that is usually ascribed to contemporary (neo-)Humean accounts (Wilson 2021, p. 33) and that provide laws with a rather descriptive role. Ultimately, higher laws describe macroscopic facts about the microscopic causal dance at the base. What laws describe are either states or transitions from states to states of a system. Laws describe such states by means of the degrees of freedom that tells us the number of elements that freely interact within the system. Transitions from the micro to macro are thus detected when the degrees of freedom decrease. When, in other words, the behavior of some of the elements of the system is now bounded to the behavior of others. Such elements behave as one and the many become one. However, descriptive laws can account for the transition from the sole input-output perspective, namely without providing the information relative to the deep (complex) mechanism that governs the transition itself as a whole process.

It does not matter how, but we get an elimination of the degrees of freedom. According to Wilson, higher laws describe facts about the (ir)relevance of some

micro-physical degrees of freedom at a certain higher energy scale.²⁵ The meta-physical significance of laws is rather superficial, though. Laws alone cannot do the ontological job. Thus, Wilson herself *associates* higher laws encoding causal regularities to power profiles (Wilson 2021, p. 4). The aim seems to be that of providing the appropriate ontological support to them and thus, also to her model of weak emergence.

Power profiles are what matters for genuine weak emergence. Power profiles are associated to sets or groups of *token* powers that are associated with a given *token* feature *S*. The PSP condition registers a split of the original domain of micro-physical token powers into (i) those that are involved in the weakly emerging phenomena at the weakly emergent stage and (ii) those that are not, and that supposedly fix part of the meaning of the dependence relation, grounding higher features to the fundamental base.

The PSP condition works as the metaphysical correlate of the elimination of degrees of freedom. After all, Wilson's weak emergence stipulates that for having emergence some of the token powers (at least one) is not among those associated with the emerging feature *S*. This is a kind of elimination. Yet, no explanation of the transition from the original set of all equally fundamental token powers, that is associated to "physical" feature *P*, to a proper subset of that is given. And yet, an explanation of how powers are gathered together in a specific proper subset of fundamental powers must be provided.²⁶ And it must be provided for, at least, two reasons. First, it must be provided because, given an original set of (at least two)²⁷ items, all the (proper non-empty) subsets are given for free from the outset. If we accept this as a metaphysical posit, then the act of gathering powers in a group is merely arbitrary: the appropriate PSP is one among all the possible subsets. But then we have to explain why the power profile is associated to that set and not to another. Second, because the triangle of association power profile – token feature – token powers cannot be arbitrary/random by hypothesis: powers and features are tokens and not types. Accordingly, they are particulars, localized and so specific *must* also be the procedure of picking up *that* token power instead of another as

²⁵ Laws are not normative or predictive about which degrees of freedom are to be eliminated or how they were.

²⁶ And, simultaneously, it must be provided also an explanation of the selection mechanism that leaves some of the fundamental token powers on the ground.

²⁷ In case there was only one item in the original set, or we renounce Wilson's weak emergence or the PSP condition is redefined in terms of non-empty proper subsets. However, in this latter case, the fundamental item would depend on itself and weak emergence would turn trivial in the model. But fundamental items are not supposed to weakly emerge: the PSP condition enforces the irreflexivity of the dependence relation.

part of the characterization of the token feature *S* associated to the power profile. Otherwise, the nature of the association itself would be metaphysically vacuous.

However, Wilson seems to be at least partially aware of that and, indeed, the choice of conferring a distinctive “aggregative” character to power profiles is certainly a good attempt to overcome problems. After all, although laws are not informative about the rise of the specific *interactions* among token powers that constraints and allows for the elimination of some degrees of freedom at the lower energy scale, the introduction of power profiles suggest their existence as an essential factor of the weakly emergent phenomena. On the metaphysical side, power profiles are what informs us about the specific existence of an *interactive* behavior among the fundamental powers.

At a closer look, however, although *ipso facto* distinct from fundamental powers, power profiles have no genuinely metaphysical role. And, therefore, the configurations and interactions among powers neither. In Wilson’s model the restriction to the sole metaphysics of fundamental powers is what preserves the emergence model from metaphysical dualism. Yet, as we now argue, insofar we confine the model to the sole metaphysics of fundamental powers, the model itself cannot account for those interactions that give metaphysical content to the PSP condition and, so, to weak emergence. We agree with Heil about the idea that macro systems “have the macro-characteristics they have owing to the highly interactive natures of the parts that make them up” (Heil 2023, p. 164). And so, it seems to us, does Wilson. Nonetheless, we dispute to both of them the idea that the sole ontology of fundamental token powers can account for the interactions among them *within* the resources of a materialist and substantialist monistic model.

On the other hand, we certainly do not want to solve the problems of Wilson’s emergent model by relying again on metaphysical dualism with all its ontological hierarchies. And for obvious reasons. Unfortunately, however, neither can we agree with those who assume that the interactions between the parts of a system come together with these and for free, if these parts are particulars (cf (Heil 2023, p. 164)). The same holds, of course, of interactions between powers, if the powers are particulars like token powers. If it is true, as we argue together with Heil, that “The molecules that make up the collections are massively interactive, and, in the course of the interaction, they can inflict changes on each other”, and if it is also true that “[m]olecules in a collection behave differently behave in new ways – ways they would not behave outside of collections” (Heil 2023, p. 164), it is then also true that the interactions between fundamental powers are what make powers such. The particulars, whether parts or powers, that is, are strengthened individually, of course, but only insofar as they are in interaction.

But then, can this interactive nature be introduced at one time and at the same time be left metaphysically inert within the same metaphysical model?

So, in our opinion it is urgent to make a choice: either we accept the causal role of interactions or we contradict the substantialist metaphysical monism. Yes, because interactions are relations and whenever we combine particular entities with relations, especially if these are essential for the model, we cannot reduce relations to the objects they relate. In the formal sciences this is an established truth.²⁸ In formal theories of particulars, for example, if we attempt to rule out the possibility of any further domains of existence, we have to reduce the relations that are essential for the definition and specification of the model to the objects that populate it. Yet, this is impossible (Ferrari 2022a; Ferrari 2022b).

Consequently, if interactions, as well as configurations, are interactions and configurations between token powers, as power profiles seem to refer too, and if these prove to be essential for specifying and characterizing the emergentist model, then we must assume them as entities that are part of the model itself and, therefore, we must also attribute causal powers to them. But then, the particularist model will no longer be monist but, rather, dualist, because new fundamental powers have been added, inserting them, into the model: those of interactions – without which the fundamental powers cannot interact and form specific power profiles. Power profiles are powers of fundamental powers.

The way out from dualism, we are convinced, is to provide powers with an *already* interactive nature because they are powers of interactive entities. Waves, for example, are interactive in nature – e.g., interference. But in this case, the metaphysical model is no longer that of the monistic material substance. Entities like waves are not particulars. Rather, they are processes (Bickhard 2009; Bickhard 2011; Seibt 2010).

And the reason why Wilson's emergentist model is inadequate is simple. By assumption, indeed, no one of the fundamental powers is an interactive power. Fundamental powers are token powers, and as such they are particular just as particular are the entities of the materialist monist model. Further evidence of their particularity and mutual independence comes from the possibility of satisfaction of the PSP condition. How can we unequivocally say whether a power belongs or not to a set or group, if any power is essentially interactive? If so, indeed, powers would be *essentially dependent* on other powers. But, according to Wilson's emergent model, this is not the case. Not all powers are dependent. Some of them are just

²⁸ Think of the case of set theories: these models require relations to play the relevant “aggregative” role. The primitive membership relation is what allows for an object to be aggregated with others, if any, as elements of a set. The set theoretical fact that the primitive membership relation cannot be a set itself does not mean that this relation has no metaphysical role. It does not mean, even, that this metaphysical role is not genuinely fundamental. Indeed, the metaphysical role of the relation is ‘over and above’ the one played by the objects of the theory.

fundamental. More critically, having powers unequivocally belonging or not belonging to a set or group requires precise boundaries among powers. Fundamental powers are token powers and as such they have boundaries – i.e., they are unequivocally localized in space and time.

Certainly fundamental powers can participate in relations, interactions or even configurations, but this does not make powers essentially interactive. An evidence is that if token powers do participate in interactions *and* if their nature as powers relies essentially from that participation, then those relations, interactions, and configurations must be somehow metaphysically empowered. After all, the reason why power profiles were introduced in Wilson’s model was the impossibility of accounting for genuine emergence without them.²⁹ Heil, for his part, is certainly right in saying that

If the wholes in question are, as I am suggesting, highly interactive assemblages of parts, then, in invoking the wholes, this is what is being invoked. You have downward causal explanation, but not downward causation. To say that the particles making up a wheel moved as they did because the wheel rolled, is to call upon the wheel’s complex interactive nature all at once, not to invoke an exciting new—downward, whole-to-part—species of causation. (Heil 2023, p. 165)

And yet, if we don’t change the metaphysical model, that is, if we don’t stop assuming a set of token powers that are more fundamental than others, the interactions between them will always be necessary to give a metaphysical meaning to emergence, even if “weak”. But, at the same time, the ontological hierarchies of metaphysical dualism will be an inevitable consequence. Thus, in order to account for the genuinely metaphysical interactive nature of power profiles and still preserving metaphysical monism, one should dismiss the supposition “that all substance is physical substance, and that what this comes to is that the compositionally basic entities are physical” (Wilson 2021, p. 9). If, alternatively, relations among fundamental powers are epistemically interpreted, then it is hard to see how distinctive power profiles could support genuine emergence.

However, here are two cases: either we give metaphysical role to power profiles, conceived as the result of the interaction of fundamental powers, or we suffocate the causal role of interactions themselves. In the first case, within the particularist model in the background, we are led to introduce new powers, so to break

²⁹ Our point relies on the idea that material entities (material substances) with their token powers don’t stand in relation to each other. They can participate in relations. Yet, relations are always elusive with respect to the objects they relate. This is the reason why relational entities like configurations, structural organizations, or interactions are what systematically “emerge” and “re-emerge” again from particular objects and tokens of any sort.

down *Closure* and the inverse of *Completeness*. In the latter case, the definition of weak emergence becomes merely stipulative, because nothing new is arguably being attributed to power profiles, neither by the model nor by higher laws. In this case *Closure* and the inverse of *Completeness* are preserved.

To sum up, Wilson's weak emergence does nothing but characterize the conditions according to which, from *Completeness*, its inverse is automatically (logically) obtained: if *Closure* holds, then there are no new fundamental (physical) powers. However, this result was already given by Kim. Because Wilson is assuming the validity of SA, she feels entitled to derive from *Completeness* its inverse. But, as previously noticed, if *Completeness* holds, then its inverse holds too *only if* the *Double Negation rule* and, thus, *Contraposition Law* are among the available logical tools. But they are not. As Gibbs (2010) proved, from *Closure* and *Exclusion* one cannot obtain *Completeness* without some additional theoretical condition.

As a matter of fact, hence, if Wilson's emergentist model is equivalent to the model that validates SA, Wilson's account of weak emergence cannot go so far from the standard epistemic view enforced by Kim's verdict. In a few words, from the perspective of monistic substance metaphysics, emergence cannot be genuinely metaphysical, otherwise the model is, actually, dualistic.

6 On the Way to Genuinely Naturalistic Emergence

Emergence³⁰ is a kind of phenomena that is realized in relationalisms of dynamic organization or, perhaps, configuration. Particularistic Physicalism, whether reductive or not, is intrinsically non-relational – material substances as particulars (e.g., presumed particular particles) are metaphysically independent, autonomous, nominalistic. There is, thus, a straightforward incompatibility between Physicalism and emergence. But both positions are, with some frequency, held to somehow be correct.

Kim attempted to resolve this issue by moving relations out of his micro-macro base into the macro level, thus rendering the causal regularities of the interactions within the base as “emergent” in the configurations – which are “now”, by stipulation, no longer in the base, but instead are in the macro-level (Kim 2006). And, thus, “emergent” in that macro level. But this is a move of stipulative semantics,³¹ not a metaphysical model or discovery. The proof of that is the invalidity of SA.

³⁰ Metaphysical emergence, but not “British” emergence.

³¹ Stipulations of what counts as micro or macro – of where relations are to be ‘located’.

Wilson (2021) introduces further layers of consideration – of powers and degrees of freedom – but the problems concerning relationalism and emergence are not avoided. If there is no relationalism at the base, and there cannot be if the base is assumed to be constituted in terms particulars with their token powers, then there cannot be emergence – unless a relationalism is somehow introduced as an ad hoc addition to the particularistic base. But such an ad hoc addition cannot model emergence as a metaphysically real kind of phenomena. It is ad hoc, not metaphysical.

The introduction of some sort of relationalism may not be as explicit as it was for Kim; it can easily be a background assumption involved in some other move(s) in a model. Wilson, for example, has to derive or assume some sort of relational interactions among token powers, like power profiles, in order to derive (purported) restrictions on degrees of freedom – and such a (purported) restriction in degrees of freedom, in turn, is required in order to make sense of the emergent specialness of the (proper) sub-set of powers that (supposedly) ground emergence.³² Without such a background assumption of interactive relationalism, there is no effect on the aggregative sub-set collection of powers and degrees of freedom, and certainly no necessary *restriction* on degrees of freedom. So, relationalism has to be introduced or assumed somewhere in the overall model, but this does not render such an assumed relationalism any less *ad hoc*, nor any less in contradiction to the underlying particularism of standard physicalism.

The reason for the necessity of a relationalism is simply stated: Systems are constituted in interactions – both internal to the system and between any system and its environment – and interactions (and their possibilities) are relational. Such relationalisms must be taken into account in any adequate metaphysics. Consider, for one powerful example, processes that are intrinsically far from thermodynamic equilibrium, such as a candle flame: the flame is not at equilibrium internally nor with its environment. If it goes to equilibrium, it ceases to exist. The process relations are not incidental to the flame – they constitute the flame. No result such

³² There are additional problems with this notion of elimination of (or restriction in) degrees of freedom. For example, Wilson cites quantum spin as a degree of freedom that is irrelevant to higher-order laws (p. 194). But spin is itself already relational, not autonomous, and, further, without spin, there is no (emergent) chemistry, and, without chemistry, there is no world as we know it. So spin must be taken into account in any model of the world, and it is rather difficult to see how that account can be in terms of restrictions on degrees of freedom – it would seem that spin, in fact, provides *further* “degrees of freedom” (not restrictions) in terms of relationalisms of, for example, the relational ‘property’ between two electrons of being in the same spin state (or not in the same state). More generally, any nominalistic particularism is limited to purely extensional configurations of the particulars, and, thus, no form of relationalism can be consistently introduced or posited or assumed in contradiction to such extensionalisms.

as modifying a simple aggregation of degrees of freedom (whether decreasing or increasing) can be accounted for without taking into account such relations. In particular, no non-aggregative ‘emergent’ can be accounted for within a model of an independent, non-relational, base.

What is needed is a metaphysical framework that is intrinsically “already” metaphysically relational and interactive. And a process metaphysics provides that (Bickhard 2011, 2015; Bickhard and Campbell 2000; Campbell 2009, 2015; Campbell and Bickhard 2011; Ferrari 2021; Seibt 2009, 2022; Winters 2017).

Research funding: This work was supported by the Fundação de Amparo à Pesquisa do Estado de São Paulo – FAPESP (Postdoctoral Fellowship) grant no (2020/07440-0).

References

- Arenhart, J. R. B., O. Bueno, and D. Krause. 2019. “Making Sense of Non-individuals in Quantum Mechanics.” In *Quantum Worlds. Perspectives on the Ontology of Quantum Mechanics*, Vol. 1, edited by O. Lombardi, S. Fortin, C. López, and F. Holik, 185–204. Cambridge: Cambridge U. P.
- Bickhard, M. H. 2004. “Process and Emergence: Normative Function and Representation.” *Axiomathes* 14: 121–55.
- Bickhard, M. H. 2009. “The Interactivist Model.” *Synthese* 166: 547–91.
- Bickhard, M. 2011. “Some Consequence (And Enablings) of Process Metaphysics.” *Axiomathes* 21: 2–32.
- Bickhard, M. H. 2015. “The metaphysic of Emergence.” *Kairos. Revista de Filosofia & Ciência, Centro de Filosofia das Ciências da Universidade de Lisboa* 12: 7–25.
- Bickhard, M. H., and D. T. Campbell. 2000. “Emergence.” In *Downward Causation*, edited by P. B. Andersen, C. Emmeche, N. O. Finnemann, and P. V. Christiansen, 322–48. Aarhus: University of Aarhus Press.
- Campbell, D. T. 1990. “Levels of Organization, Downward Causation, and the Selection-Theory Approach to Evolutionary Epistemology.” In *Theories of the Evolution of Knowing*, edited by G. Greenberg, and E. Tobach, 1–17. Hillsdale: Lawrence Erlbaum.
- Campbell, K. 1990. *Abstract Particulars*. Cambridge: Blackwell.
- Campbell, D. T. 1974. “Downward Causation in Hierarchically Organised Biological Systems.” In *Studies in the Philosophy of Biology: Reduction and Related Problems*, edited by F. J. Ayala, and T. Dobzhansky, 179–86. London: Macmillan.
- Campbell, R. 2009. “A Process-Based Model for an Interactive Ontology.” *Synthese* 166: 453–77.
- Campbell, R. 2015. *The Metaphysics of Emergence*. New York: Palgrave Macmillan.
- Campbell, R., and M. Bickhard. 2011. “Physicalism, Emergence and Downward Causation.” *Axiomathes* 21: 33–56.
- Corry, R. 2013. “Emerging from the Causal Drain.” *Philosophical Studies* 165: 29–47.
- Ferrari, F. M. 2021. “Process-based Entities Are Relational Structures. From Whitehead to Structuralism.” *Manuscrito* 44: 149–207.
- Ferrari, F. M. 2022a. “An Argument against Nominalism.” *Synthese* 200 (5): 23: 403.
- Ferrari, F. M. 2022b. “Formal Issue of Trope-Only Theories of Universals.” *Erkenntnis*. <https://doi.org/10.1007/s10670-022-00563-5>.

- Ferrari, F. M. 2023. "Substance Metaphysics Is Incompatible with the Causal Closure of the Metaphysical Realm." In *Ética e Filosofia Política, Special Issue: Lógica, Filosofia, História e Metafísica da Ciência*, edited by G. Da Silva Olegário. Juiz de Fora, Federal University of Juiz de Fora — UFJF. Forthcoming.
- Gibbs, S. 2010. "Closure Principles and the Laws of Conservation of Energy and Momentum." *Dialectica* 64 (3): 363–84.
- Heil, J. 2023. "The Last Word on Emergence." *Res Philosophica* 100 (2): 151–69.
- Horgan, T. 1997. "Kim on Mental Causation and Causal Exclusion." *Philosophical Perspectives* 11: 165–84.
- Kim, J. 1989. "The Myth of Nonreductive Materialism." *Proceedings and Addresses of the American Philosophical Association* 63 (3): 31–47.
- Kim, J. 1998. *Mind in a Physical World*. Cambridge: MIT Press.
- Kim, J. 1999. "Making Sense of Emergence." *Philosophical Studies* 95: 3–36.
- Kim, J. 2005. *Physicalism, or Something Near Enough*. Princeton: Princeton University Press.
- Kim, J. 2006. "Emergence: Core Ideas and Issues." *Synthese* 151: 547–59.
- Marras, A. 2006. "Emergence and Reduction: Reply to Kim." *Synthese* 151: 561–9.
- Seibt, J. 2002. "Quanta, Tropes or Processes: Ontologies for QFT beyond the Myth of Substance." In *Ontological Aspects of Quantum Field Theory*, edited by M. Kuhlmann, F. Lyre, and A. A. Wayne, 53–97. Singapore: World Scientific.
- Seibt, J. 2009. "Forms of Emergent Interaction in General Process Theory." *Synthese* 166: 479–512.
- Seibt, J. 2010. "Particulars." In *Theory and Applications of Ontology: Philosophical Perspectives*, edited by R. Poli, and J. Seibt, 23–55. Dordrecht: Springer.
- Seibt, J. 2022. "Process Philosophy." In *The Stanford Encyclopedia of Philosophy (Summer 2022 Edition)*, edited by E. N. Zalta, and U. Nodelman. Stanford.edu. <https://plato.stanford.edu/archives/sum2023/entries/process-philosophy/>.
- Van Gulick, R. 2001. "Reduction, Emergence and Other Recent Options on the Mind/Body Problem: A Philosophic Overview." *Journal of Consciousness Studies* 8 (9–10): 1–34.
- Wilson, J. M. 2021. *Metaphysical Emergence*. Oxford: Oxford University Press.
- Winters, A. N. 2017. *Natural Processes. Understanding Metaphysics without Substances*. New York: Palgrave Macmillan.