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Diachronic Emergence as Transubstantiation

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Abstract
Diachronic emergence has recently been characterised as transformation. This aims to capture the thought that the entities that emerge are radically new or different. Transformation is hence closely linked with a central (but rarely raised) challenge for all emergentists: how to account for the identity and individuation of entities involved in emergence. With this challenge in view, I develop and probe four interpretations of transformation: addition, replacement, fusion, and transubstantiation. Of those, transubstantiation provides the most plausible response to the challenge about identity. Accordingly, diachronic emergence is a transformative process whereby an individual passes from one primary kind to another.

Keywords Emergence · Novelty · Transformation · Identity · Individuation · Transubstantiation

1 Still The Core Intuition: Novelty

The association of emergence and novelty is watertight. The emergence of anything indicates something unprecedented, 'different' from, or even 'more' than, whatever it emerges from (Anderson, 1972)—whether the emergent (ε) is a property, process, state, law, power, concept, substance or individual.[1] An emergent in some sense

[1] For convenience, simplicity, and ontological flexibility, I will use 'emergent' or 'ε' for the entity that emerges; and likewise 'base' or 'β' for the entity that grounds the emergent. In this sense, ε and β are variables.

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supersedes, or 'transcends' that from which it arises (Kim, 1999); it is qualitatively unlike the base (β), a sort of 'augmentative' and 'transmutative' process (Lovejoy, 1927, 167), and so constitutes a 'creative departure from routine', as Lloyd Morgan puts it (1912, 171). So the focus is firmly on the 'incoming of the new' (Lloyd Morgan, 1923, 1), or the 'budding out' of entities, as Alexander floridly put it (1920, Vol. 2, 65, see also 47, 52). The underlying idea of these expressions furthermore suggests that the emergence relation is 'transformational' (Alexander, 1920, Vol. 2, 370). In short, emergence without novelty remains as good as inconceivable.

Nonetheless, there is a puzzle about novelty: the mainstream approaches since the 1990s—the second wave of interest in emergentism—appear reluctant to make it an explicit *definiens* of emergence, in spite of invoking allusions to 'original', 'creative', or 'radical' novelty generously and suggestively. In this sense, novelty is hard to ignore as in some sense constitutive of emergence, yet also hard to accommodate in its definition.

I suspect this puzzle is fuelled in three ways. First, there pertains a lack of clarity and precision to the notion, which seems vague, tenuous, and 'elusive' (Rueger, 2000, 301). Take the idea that an emergent novelty is 'radically original' (Sellars, 1933, 312), or 'has hitherto not been in being' (Lloyd Morgan, 1923, 112). Since what is original is unprecedented, this is just another way of saying that an emergent novelty is new. Likewise, even though they emphasize the sense of discontinuity associated with emergence, epithets such as 'radical', 'genuine' or 'absolute' tend to be relative to our current state of knowledge after all, and are hence not overly informative (see Bergman 1944, Henle 1942). Even Lloyd Morgan, one of the founders of British emergentism, admits that novelty 'savours in ambiguity' (1933, 31), resting indecisively between epistemic and ontic intuitions. So, secondly, novelty lacks utility: it is potentially redundant for making sense of emergence. For if we define emergence in terms of special features, such as causal powers for instance, then novelty consists in having these powers, and consequently does not add anything to the definition (see Kim 1999)—in which case it becomes discretionary. Finally, there is a potential lack of coherence. Suppose we wished to elucidate novelty by suggesting that 'new' means 'unpredictable' or 'underivable'. Suppose further that we might then be tempted to suggest that the emergent is in principle impossible to predict, or derivable, *because* we have no prior experience of it. And so this would amount to saying that the emergent's unpredictability or underivability is due to its novelty. Similarly, we beg the question by suggesting that the novel is original, since the original is new when it appears for the first time.

These observations constitute a challenge for any approach that aims to explicate emergence with reference to novelty. It is particularly palpable when understanding emergence as transformation, which has written novelty all over it. It is not surprising that transformation has recently received renewed attention as a viable approach to diachronic emergence in the philosophy of mind, physics, and biology (e.g., Ganeri, 2011; Guay & Sartenaer 2016; Humphreys, 2016; Santos, 2015). These discussions reinvigorate and enrich the debate of emergence; yet they do not fully address questions of identity and individuation. These questions, I suppose, are central to conceiving of the emergence relation as transformative. Taking on the challenge to integrate novelty with emergence, I shall try out four ways of thinking about transformation,

mainly in order to show that, and how, considerations about the individuation and identity of emergents become highly relevant. This not only adds further substance to the transformation approach, but it also explicates novelty in a way that is informative, useful, and begs no questions. Or so—informed by the first wave of emergentism—I will argue.

2 Transformation: Changes that Matter

But first, let me motivate and defend further the general idea that diachronic emergence is transformative. Suppose that a property *P* emerges and is had by an individual *a*.[2] Minimally, this means a *P*-instance P_i comes to be instantiated by a particular entity *a* at a time *t*. Following a suggestion by Lowe (2009), we can use the slash '/' to symbolize the instantiation relation. So,

$$\sim (a/P\,at\,time\,t)\ \&\,a/P\,at\,time\,t + (and\,t < t+)\,, \tag{1}$$

which says that *a* does not instantiate *P* at a certain time, but does so at a certain later time. This somewhat anaemic way of putting it avoids the dubious temptation that *P* or its instance is itself generated by—emerges 'from'—some base, as if somehow being oozed into existence. So, the locution '*P* emerges' means that *a* at *t* comes to have a previously uninstantiated property, where 'comes to have' refers to the instantiation context of *a*'s having *P*; that is, a context that determines whether *a* has *P* (or P_i) at *t* or not. If *a* never instantiated *P* before (never had P_i), or if *P* was never had by things like *a*, then *P* is new relative to *a*; and if *P* has never been instantiated anywhere before (who knows?), then *P* is 'originally' new. So far, so good.[3]

But what does *P* do? What is its point? And why do we even notice? Emergentists might say that it makes a significant difference, or is a distinctive feature that makes *a* stand out. By having *P* now, *a* alters in a relevant way, or is thus something new, or perhaps converts into something else. Shoring this up, we could say that *P* provides a new identity criterion for *a* (or its successor), which is also why we pick it out differently. The thought is that *a*'s change piggybacks on *P*, and its appearance. This entails a relevant epistemic or cognitive aspect: we may now think of *a* differently, pick it out in terms of predicate 'P', which we might use to explain its behaviour, and so on. Anticipating a little, we could hence with Broad regard *P* as an 'ultimate' or 'supreme' property, because it captures an entity's nature, and delineates 'orders' or domains, according to which things are kindred (1925, 78, see also Broad 1933, 271–3). Given this, it seems also right to say that *P* provides a new sortal criterion, or a principle of individuation that provides *a* with unity.

These ideas can be found in early emergentism. Here is Alexander:

[2] Possible reasons for prioritizing substances will become evident later.

[3] Perhaps the same ideas could be put without assuming that properties are universals, so that P_i becomes a new addition to the bundle that is *a*—or, better, *was a*.

> New orders of finites come into existence in Time; the world actually or historically *develops* from its first or elementary condition of Space-Time, which possesses no quality except what we agreed to call the spatio-temporal quality of motion. But as *in the course of Time* new complexity of motions comes into existence, a new quality emerges, that is, a new complex possesses as a matter of observed empirical fact a new or emergent quality. The case which we are using as a clue is the emergence of the quality of consciousness from a lower level of complexity which is vital. The emergence of a new quality from any level of existence means that at that level there comes into being a certain constellation or collocation of the motions belonging to that level, and *possessing the quality appropriate to it*, and this collocation possesses a *new quality distinctive* of the higher complex. (1920, Vol. 2, 45, my emphases)

As I read this, Alexander's central point in this passage is that emergence concerns the diachronic appearance of categorical differences.[4] The emergent qualities determine the identity of new kinds of thing, and thereby introduce distinctive new ontological and nomological realms (see also Alexander 1920, Vol. 2, 46–7, 70; Alexander 1922, 612). The things in these domains are clustered in virtue of having the qualities distinctive of their domains: they are individuated by those qualities. Hence there is a non-trivial difference between the pre-emergent and post-emergent entity: what is true of it now, was not true of it then. (And what is not true of it now, perhaps was true of it then.)

The key idea here is that entities involved in emergence acquire a new identity, which is what it means for them to transform. This is why epistemic and ontological significance matters. Otherwise, a case where I break my leg, say, and so come to instantiate an unprecedented property, as (1) above minimally suggests, would *ipso facto* be a case of emergence. So, not all change is transformative. What I have in mind is more along the lines of this: when a piece of matter that begins to metabolize and self-replicate, it becomes a living organism; or when a human being acquires the capacity for reflective or self-involving thought, it becomes a person.[5]

Thinking about emergence along these lines thus has epistemic utility, insofar as it potentially affords new explanatory narratives in perhaps simpler, or more adequate, terms (Batterman, 2002). The emergent brings about a 'perspective shift' (Guay & Sartenaer, 2016, 303), or a gestalt switch, in virtue of which we begin to conceive of the emergent phenomenon in significantly different ways (Rohrlich, 1997). This matters, since any approach to emergence ought to comply with a minimal epistemic demand:

[4] We can overlook the first sentence, and so Alexander's claim that entities are condensates of Space-Time, and as such more or less complex dynamical configurations of what he regards as basic stuff (for details, see 1920, Vol. 1, 30, 341, 347, and Vol. 2, 48–50). My main focus is on identity here.

[5] These examples may look controversial. I agree; and as I select them for their illustrative power in regard to identity conditions, I also concede that they beg the question in favour of approaching emergence in terms of identity and individuation. Other views of emergence suggest different examples. No example in the emergence literature is independent of the version of emergentism that is promoted there, and so all of them are more or less tendentious.

(*ED*) The claim 'ε emerges from β' ought to be epistemically informative.

Accordingly, when we say that ε emerges from β, this ought to be an epistemic, or perhaps even an explanatory, achievement. For instance, the claim that consciousness emerges from a brain process should evoke more than complicit nods and sighs of elation. Emergence-claims ought to deepen our understanding of some phenomenon; at least, they ought to make intelligible certain features (such as novelty) associated with emergence (for discussion, see Wyss, 2018). In fact, emergentists face both an epistemic and an ontological challenge: they need not only to show how the notion of (diachronic) emergence can be explanatory, rather than merely descriptive, but they also need to account for questions about (diachronic) identity, persistence, and individuation. In this way, emergence is more akin to a problem, or a challenge, rather than a solution for anything.

To sum up so far: the significance of an emergent property lies in its contribution to a relevant identity-change of a particular entity. It is in its virtue that we identify an entity as a being of a certain (novel) kind. Adding a temporal perspective, the presence of *P* affords a break in *a*'s diachronic identity, and instigates a categorical difference. Emergence is hence a case of 'discontinuous individuality', as Gotshalk nicely (if somewhat paradoxically) puts it (1942, 398). For that reason, emergence, novelty, and identity interlock: *P* is the property that signifies the appearance of a new thing, or a new kind of thing that it qualifies; and, as Lloyd Morgan clearly saw, an entity involved in emergence 'is no longer what it was' (1929, 36). So it seems right to say that the emergent's role is to engender transformation; or, in short, that emergence is transformation.

3 Four Views on Transformation

With transformation, however, worries about identity raise their head. For saying that *a* significantly changes suggests that *a* cannot be re-identified as *a*, and so it cannot be *a* that persists through this change of identity. There seems no sense in which *a* remain itself, now that it has, or also has, *P*. Given the significant difference between its pre- and post-emergent nature, *a* could not remain what it is. One might also wonder in what sense a 'discontinuous individual' is an individual at all; or whether there even is a sense in which by giving rise to *P*, the individual is in a way superseded, or indeed ceases to be. If emergence is indeed transformative, then this suggests more than some qualitative change in a numerically identical entity.

It is difficult to think this through in ways that do not look contentious. If we say that the entity *in* which an emergent property comes about ceases to be what it was pre-emergence, we presume that entity's persistence, and hence appear to beg the question against novelty or distinctness. And if we say that the entity *from* which ε comes about ceases to be what it was pre-emergence, we appear inclined to the non-identity of pre- and post-emergent entity, and hence appear to beg the question against the continuity and dependence intuitions.

This is reason to remain ontologically as neutral as possible, and to refrain from committing, say, to a power ontology, or to the existence of substances. Of course,

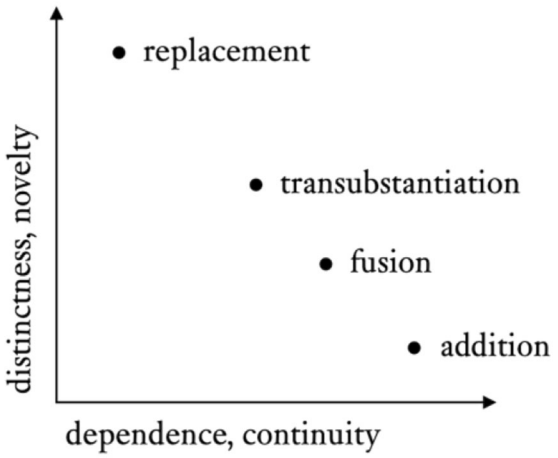

Fig. 1 The four views of transformation as a function of distinctness and dependence. For visualization purposes only.

it is evident from the following discussion that some ontological commitments are unavoidable. But these should be taken mainly for the sake of clarity, not for the sake of promoting a certain new version of emergentism. Hence my discussion of emergence here plays out at the level of general metaphysics, and in an ecumenical or impartial attitude. I hope this is conducive to curbing the further fragmentation of emergentist approaches.

There are at least four ways of making sense of transformation, which revolve around addition, replacement, fusion, and transubstantiation. Let me discuss them in turn.

3.1 The Addition View

According to the additive idea, transformation is cumulative and conservative: the emergent ε is like a layer that complements β with something novel and interesting; while β, which brings ε about or causes its occurrence, remains present as it is.[6] On the face of it, however, this does not look much like a transformation. At a certain time the emergent merely joins a base that is already there.

This criticism is perhaps too quick. First we need to clarify what sort of entity is added. An obvious suggestion is that ε is a property, which bestows a certain new state, or a disposition, or a power, on the entity involved in emergence. In virtue of certain 'emergence-engendering' conditions (Shoemaker, 2002), ε appears in that entity, which however continues as before. Alexander expresses something akin to this view of transformation.

> Finites of a lower order are combined to produce a complex which carries a quality of a higher order. Thus, physiological complexes of a sufficient complexity carry mind or consciousness. They may be said to be *transformed* in the

[6] A view roughly along these lines can be found in O'Connor (2000).

> consciousness they carry. This is the empirical fact. But in the complex which thus acquires a new quality the parts *retain their proper character and are not altered*. The physiological elements remain physiological. (1920, Vol. 2, 370, my emphases)

This looks both right and wrong. An entity's previous processes do not just cease when it transforms in emergence: an organism in which mind arises, say, does not cease to be an organism. If it did, there would be no continuity (dependence). The transforming entity needs to keep instantiating biological or physical properties, even if the complex as a whole now also is mental. As Alexander writes in the same passage, while the parts 'produce something different from them and transcending them, […] used up as they are, they are not altered or superseded but subserve' (1920, Vol. 2, 370). This gels with the dependence intuition in two ways. First, β has something to do with ε's appearance, such as 'making it' come about, or providing an opportunity of inherence (if ε is a property). Secondly, β persists during ε's appearance and presence, since the latter existentially depends on the former. (This thought is most tangible in synchronic emergentisms.)

Nonetheless, it looks wrong too. Does the entity involved in emergence continue as before, even if it is transformed by a new quality? Does the base retain its identity and continue to be what it is, and perhaps do what it does, even when ε has arisen: does ε simply align itself to β? Given the suggestion that the emergent property marks out as new the transforming entity, whose diachronic identity conditions thus change, it seems incongruent also to maintain that β remains identical across time. We cannot say that β is the same pre- and post-emergence, as if it had the same properties at these different times. The very point is that it has not. So, if β is the same in spite of having different properties, then the additive view is incoherent, or at least odd. For it suggests that a significant change to an entity makes no difference to its identity.

Yet, we could suppose that the transformed individual has *two* post-emergent natures: it is both a β and an ε. After all, objects often fall under several kinds. But the trouble here is that β is, and is not, the same: for falling under a sortal concept that is 'more' after emergence suggests that β falls under significantly different sortal concepts pre- and post-emergence. And given the further idea that different sortal concepts provide distinct identity criteria, this implies either that it does not remain the object that it was, or that it lacks a determinate identity, and thus might not be an individual object at all (or has ceased to be one). Even if it is the compound entity that falls under a new sortal concept post-emergence, and satisfies different identity criteria as a whole, there is a sense in which β is superseded. And this again jeopardizes the continuity of the base's identity.

What transforms when the base remains what it is? Not the added entity, for it is new. Not the persistent one either, for it arguably remains what it is. The only other option is to say that the β–ε complex is the unit of transformation. This seems a way forward with the addition view: the old becomes part of the new, and is so added to the new emergent part. Hence emergent entities become layered or stratified. (I shall return to this in §§ 3.3 and 3.4.) With a view to my earlier illustration, and using Alexander's memorable idiom, we could say that a living thing is not 'merely' an organism, but 'also' a piece of matter; and a thinking thing is not 'merely' a person,

but 'also' an organism (1920, Vol. 1, 6–8). This also means that the emergent property constitutes a potential criterion that marks out the β–ε unit as distinct, identifiable, or countable, and so is a plausible principle of individuation for the complex. If so, the emergent property needs to be such as to warrant the re-classification of the compound individual as falling under a new kind. If the complex is individuated as new, or falling under a new kind, then it may well be irrelevant if β itself retains its identity. The central thought behind the addition view is thus that a numerically identical individual acquires a new sortal identity in virtue of instantiating an unprecedented property. Yet, depending on certain epistemic needs, the transformed entity could also be identified by its pre-emergent nature, rather than 'merely' its post-emergent one.

3.2 The Replacement View

The replacement view is radical transformation: the base simply becomes the emergent. In giving rise to ε, the pre-emergent entity is superseded by some post-emergence successor. Hence, either β ceases to be altogether, or it turns into something else. The discontinuity is total, and so is novelty. If the *emergendum* were in this case a property, then it would at least be the property that either terminates β or makes it cease to be what it is.

On the face of it, replacement is inconsistent with the widely accepted idea that emergence is relational. It seems peculiar to call this replacement 'emergence', or even 'emergence from', when β just ceases to be when ε comes around, as if it had nothing to do with it. It is hardly a transformation when the entity involved in it does not give rise to the new but rather gives way to it. If in emergence the individual gets replaced, there is neither anything that could transform nor provide a relation between the old and the new. If replacement were the right view of transformation, change would be impossible. For change presupposes a transforming entity. But there is nothing persistent that could turn into anything else. So, we might have transformation without change. And this is odd.

So, perhaps we should distinguish between hard and soft replacement. As just seen, the hard conception has a problem with identity and re-identification. An object that transforms ought to be identifiable at two different times, first when it was an instance of kind κ, and subsequently as an instance of a different kind κ*. But an object that has been replaced could not be identified or re-identified, as it is no more. Hence we cannot say that the transformed thing replaces the pre-emergent object, or that the new thing succeeds it. This is because the 'it' in question has ceased to be at the time when the new object is, and therefore could not be identified. What seems required is some minimal relation between the 'two' entities, such as a sort of temporal overlap, in order to plausibly claim a replacement relation between β and ε. But the more we insist on the persistence of the transforming entity, the more replacement turns into addition: at *t*, *a* is a κ-thing; at *t*+, *a* is both a κ-thing and a κ*-thing.

This points to the softer version, according to which β does not cease to be, i.e. is not strictly replaced, but merely ceases to be what it was, i.e. gets its identity replaced. The suggestion is that β turns into ε, in the sense that post-emergence what *was* β, now *is* ε, a different phase of one entity. There really is one entity that transforms, not one that transforms into another. Take Lloyd Morgan's phrase that the

individual 'is no longer what it was' (see § 2): this would be incoherent under the hard view, because insofar as 'it' could not be the emergent, for that 'was' not yet in existence. Yet under the softer view, continuity (and so a sense of dependence) is retained if we do not regard the entity as the item of replacement, but the principle of individuation under which it falls. So, one numerically identical entity fell under kind κ, and now falls under kind κ* (or 'also' under κ*). What is replaced is hence the identity criterion for the entity involved in emergence.

Each view so far appeals to the founding emergentist intuition is its own way: while addition looks plausible in regard to continuity, replacement usefully reminds us of the radical nature of identity change in emergence—the break, or the shift, that pertains to cases of emergence.

3.3 The Fusion View

The next two views of transformation take up and develop these views, and in particular the idea that ε's emergence from β changes the nature of the β–ε complex. The most refined version of this appeals to a fusion mechanism (Humphreys, 1996, 1997, 2016, 2021; see also Guay & Sartenaer 2016).

Assume that P and Q are (different) properties, x and y are the entities that instantiate these properties, respectively, so that Px and Qy are the property instances.[7] The fusion operator (.*.) is a dynamic dyadic process that merges, and hence transforms, property instances. It takes the property instances Px and Qy, and welds the properties P and Q together, thereby producing the fused property $P*Q$ that is had by the aggregate entity $x+y$. Hence, the fusion mechanism takes two, or perhaps more, instantiated properties and generates a new property that is then had by the combined bearers x and y of the pre-fusion properties. The property instances Px and Qy are lost in this fusion, while the property bearers are not: they sum, or compose, and jointly instantiate the fused property, i.e. $P*Q(x+y)$. While fusion yields new properties and new instances, it does not produce new property bearers, for properties fuse and bearers aggregate.

Of course, fusion could be more complex. For instance, it is quite likely that x and y have properties that do not fuse, and hence continue to be instantiated by them, or perhaps cease to be had by the entity on fusion (i.e. they 'submerge'). Another possibility is that the objects themselves fuse ($x*y$), thereby creating new entities, rather than new properties (see Humphreys 1997, 9). I shall return to this idea in § 3.4.

Like the previous explications of transformation, fusion faces puzzles with identity, which I would like to highlight in two ways. Like Alexander (§ 3.1), Humphreys suggests that x and y 'retain their identities' in the composite property bearer ($x+y$) (1997, 9; see also Humphreys 1996, 60). But this creates a tension. For on the one hand, the fused property instance $(P*Q)(x+y)$ is 'a unified whole' (1997, 10), whose unity stems from the fact that the 'concatenation' of x and y ($x+y$) instantiates the newly fused property ($P*Q$); while on the other hand, the property instances are 'used up' (1996, 61; 1997, 10). Suppose that before fusion P individuates x, and Q individuates y. So, to say that x and y retain their identities implies that P and Q continue to be

[7] For ease of presentation, I dispense with indexing names and variables.

instantiated. But it seems they do not: for on fusing, the bearers aggregate to instantiate the emergent property, whereby the *Px* and *Qy* instances 'go out of existence' (1997, 10). That is, *x* and *y* cease to instantiate *P* and *Q*, respectively. With *P* and *Q* gone, however, *x* and *y* could not 'retain their identities', since their individuating properties are now fused, and having ceased to be instantiated separately could not individuate them post-fusion.

Perhaps this supposition is not quite right, though. For it is plausible to assume that the fusing properties are themselves part of a constellation of properties (perhaps relational ones); that is, there are properties other than *P* and *Q* whose continued presence provide identity criteria for *x* and *y*. Assume that *S* is such an individuating property, and that *x* has both properties *P* and *S*, so that *PSx* is the complex property instance that is about to fuse with *Qy*. In this case, there are two options. If only *P* fuses, it appears as if the *PSx* instance is, and is not, 'used up' in fusion. The part that remains underwrites *x*'s identity; the part that joins *y* underwrites the entity's novelty. If both *P* and *S* fuse, it looks as if *S* is carried up, as it were: for *x* instantiates *S* as part of the instance that also has the fused property, i.e. the $x+y$ compound instantiates not only P^*Q, but *S* as well. But it is not clear whether *S* hence continues to identify *x* alone. As a *part* of the aggregate that instantiates the emergent property, *x* is a *S*-thing, yet as part of the *aggregate* it is a P^*Q-thing, individuated by the emergent. This suggests that *x* has a sort of dual or hybrid nature, which (as mentioned in § 3.1) is perhaps not problematic as such; but it is inconsistent with the idea that fusion is unifying. Hence, the first puzzle with identity persists.

Here is the second puzzle. One of the central motivations for fusion is to solve the problem of downward causation. Part of this is the suggestion that fusion takes *i*-level items and generates $i+1$-level items. While the pre-fusion property instances *Px* and *Qy* are *i*-level entities, the fused property instance $(P^*Q)(x+y)$ is an $i+1$-level entity. Now, according to Humphreys, the fused property instance $P^i{}^*Q^i(x^i+y^i)$ is identical with an emergent property instance $R^{i+1}(z^{i+1})$, where the superscripts indicate levels, R^{i+1} denotes ε at the higher $i+1$ level, and z^{i+1} is the sum of *x* and *y* (1997, 2, see also 1996, 60). The suggestion is that the post-fusion aggregate is at a higher level in virtue of instantiating the fused (emergent) property. But given that the aggregated bearer and the individual bearers of the fused property are identical, this implies that the same entity resides at different levels. But to belong to a new level entails that the bearer acquires the identity associated with that level (this is the point of the first Alexander passage); and since it is R^{i+1} that (arguably) individuates instances at that level, the bearer's identity depends on this fused (emergent) property. So again it is difficult to see how *x* and *y* could retain their identities.

It is important to keep in mind that P^*Q is the product of fusion, not the process. Since the fused property is at a higher level by definition, the identification of the *i*-level aggregate $P^i{}^*Q^i(x^i+y^i)$ with the $i+1$ level fusion result $R^{i+1}(z^{i+1})$ merely gives the wrong impression. For if both levels were characterized by the same property, they would (with Leibniz's helping hand) go flat. My criticism is thus not really about levels, which seem gratuitous on the fusion view anyway (see Humphreys 2016, 60, 75). In spite of the long and illustrious history of levels talk, this seems no big loss, not least for a diachronic approach to emergence. For it is hard to conceive of a layered model that is independent of emergence itself, especially when paired

with a customary quasi-mereological approach to emergence, i.e. one that explicates it in terms of parts and wholes (for discussion, see Kim 2002; Oppenheim & Putnam, 1958).

However, the problem is that it remains unclear what individuates what. Humphreys wishes to bring out that what is *different* is the fusion product (= ε), and what is the *same* are the bearers, the objects that have the new properties. Hence if the aggregate of which these objects are part is significantly different, there is a problem with *their* sameness. Perhaps it is clearer to say that *qua* fused, for x and y to 'retain their identities' means that higher-level objects can have lower-level properties. But how can lower-level objects have higher-level properties? If the fused property is individuative of the aggregate object, then it also determines the level at which this object resides. And so fused property instances are stratified: they straddle domains. Individuation thus becomes a concern. For in fusion, x and y sum and instantiate the fused property P^*Q. Yet as concatenation of two objects that do not change, they can be discerned in the fusion instance as x and as y, respectively. As we saw, there must be certain properties, other than P, Q, and P^*Q, that identify them. For P and Q have ceased to be instantiated (by x and y), and hence could not identify anything, and by definition, P^*Q identifies neither x nor y, but only the aggregate $x+y$. This is so because P^*Q signifies the entity's transformation (and, if we like, the level-shift). It now seems that x and y fall under two different, and perhaps incompatible, identity criteria, and this could entail they lack a determinate identity. Since entities without determinate identity are probably impossible, it is dubious whether they continue to exist at all. And if only the aggregate exists after fusion, fusion lapses into replacement. And that is incompatible with the very idea of identity-retention, namely to ensure that β is not simply substituted by ε.

If my reflections are on the right track, emergents seem almost new in spite, rather than because, of being the products of fusion. It looks as though cross-level identification and identity-retention is inconsistent with what motivates the fusion view of transformation, namely to account for the novelty that results from emergence. However, it looks as though we could say that it is in virtue of instantiating a significantly different property (the fused one) that the combined bearer (the $x+y$ complex) is the transformed thing. If entities are individuated by their properties, as it is reasonable to assume, then this means that the aggregated bearer of the fused property is individuated, in virtue of this very fact, as a different kind of post-emergent entity—and so is non-identical with its pre-fusion predecessor. Fusion is thus as a domain-transcending process, whose products turn out to be instances of a new kind of thing. I take this to be Humphrey's unification: that we should say of the aggregate $(x+y)$ that it is an entity with a different identity, by virtue of instantiating the fused property. As on the additive view, our gaze ought to be on the β–ε complex.

If we take stratification seriously, we could link it to a distinction between primary and secondary identities. The idea would be that either x and y, or their sum $x+y$, have a secondary or derived identity, in the following sense. Before emergence, as the bearers (of non-fused properties), they are primarily P-things and Q-things (if we assume that P and Q are individuative). As summed, though, 'they' remain instances of these kinds merely in a secondary sense. This is because once they are aggregated, x and y are primarily things of the post-fusion kind, and only derivatively 'also'

instances of the pre-fusion kind. What we should say, then, as mentioned before, is that the entities that instantiate the pre-fusion properties cease to be what they are, and acquire the identity of the post-fusion aggregate of which they become part. When the new fused property *P*Q* emerges, the thing that instantiates it *ipso facto* becomes a new kind of thing that satisfies not only new predicates, but also has new identity criteria. So, it seems wrong to say that the object that instantiates the emergent property *P*Q* remains the same: the very idea of emergence is that it does not.

3.4 The Transubstantiation View

This brings me to the final view of transformation, which employs terminology used by Lowe (1997, 1998) to explicate how a substance of one kind changes into a substance of a different kind. Since the relevant objects here are individual substances, Lowe suggests that this is a trans-substantiation. As I use the term here, transubstantiation is the process whereby an entity changes from one kind to another by becoming subject to different identity and persistence criteria. In this sense, emergence is transubstantiation: before emergence, the entity is a κ-thing, after emergence, it is a κ*-thing. With a nod to Aristotle, I minimally understand an individual substance to be a particular object that is the subject of predication, or 'has' qualities, while it is not 'had' by anything (*Cat*. 5, Barnes 1984, 4–5). According to the transubstantiation view, the proper *emergenda* are thus propertied objects, or individuals, rather than either properties or bare particulars.[8]

It should be obvious that transubstantiation has nothing to do with a 'real presence'. When during Eucharist the same red liquid that was the wine now is the divine blood, and the crusty white loaf that was the bread now is the divine body, the accidents remain while the substance is replaced. In contrast, the idea here is that the set of accidents enlarges, or significantly changes, or anyway does not remain the same. Moreover, when bread and wine transubstantiate, the divine blood and body are really present, while the wine and bread *qua* substances are 'really' absent. Again, in contrast, it would be odd to suggest that while ε comes about and really is present, β is absent, as if screened off by ε, even though ε (here taken to be a substance) continues to instantiate β's properties.

So, in transubstantiation, an individual *a* of kind κ ceases to be a κ-thing, and begins to be a κ*-thing. Making use of the slash for instantiation again (§ 2), we could quasi-formally say that,

[8] A referee suggests invoking Aristotle's notion of prime matter instead. Though interesting, this would also be misleading. For Aristotle is quite clear that prime matter is undifferentiated, hence lacks a determinate identity, and therefore could not be a substance (*Met*. VII.3, Barnes 1984, 1624–5; see also *Phys*. I.7, Barnes 1984, 324–6). Therefore, prime matter could not support the point about individuals here. Moreover, prime matter can be understood in terms of an enduring potentiality (*dunamis*) (see, e.g., *Met*. XII.6, Barnes 1984, 1693). But since on Aristotle's view, entities could 'emerge' only if matter becomes in-formed, emergentists would *ipso facto* commit to hylomorphism (and perhaps also to teleology). For some, this might be just fine; but saddling all emergentists with such endorsements is inconsistent with my present attempt to keep ontological commitments minimal. The 'nod' to Aristotle merely aims to exclude a Cartesian view of substances as entities that have independent existence (e.g., *Principles* I § 51 AT VIIIA 24, Cottingham et al., 1985, 210), which would be inconsistent with the dependence intuition.

$$a\,transubstantiates\,if\,and\,only\,if\,(a)\,a/\kappa at\,t, and (b)\,a/\kappa * at\,t + (and \kappa \neq \kappa *, and\,t < t+), \quad (2)$$

where κ and κ* determine the conditions under which *a* counts as an object of the relevant kinds. Consistent with Broad's non-deducibility constraint (1925, 61), this means that these conditions are empirical facts. To satisfy the dependence intuition, there must also be diachronic identity conditions, such as spatio-temporal ones, that determine *a*'s persistence as an individual. The intuitive point is that one substance diachronically falls under two different substantial kinds in virtue of having a new property. (A refinement follows shortly.)

Let me gloss this more closely to Lowe's terminology. Instantiation is a primitive relation that holds between kinds and objects, as well as attributes (i.e. properties conceived as universals for Lowe) and modes (i.e. property instances), such that the latter are instances of the former. That is, objects instantiate kinds, and modes instantiate attributes. There is also a relation of 'characterizing': attributes characterize kinds, and modes characterize objects (e.g., Lowe 2009, 10–1; see also Lowe 2006). Now suppose that ε is a property (attribute) that characterizes kind κ*. When the emerging individual comes to be characterized by an instance of ε, let us call it ε_i, the entity now *ipso facto* instantiates κ*, since ε_i instantiates ε, and *ex hypothesi* ε characterizes κ*—of which the emerging individual is an instance. While the individual persists, it acquires a new sortal identity. It transitions from being a κ-thing to being a κ*-thing. Novelty is thus explicated as a break of diachronic identity or an acquisition of a new kind.

There is an obvious tincture of replacement: a new substance comes into existence, one that has not yet existed, and which succeeds the pre-emergent entity. This substance is new because it has unprecedented persistence conditions in virtue of the fact that it falls under a new kind. (Alternatively, we could say that the substance merely instantiates a new kind, which is the real *emergendum*.) 'It' thus has a new identity *as* a post-emergent object, and in this sense it replaces β. Insofar as the identity of the object in which ε obtains is determined by the kind under which it falls post-emergence, there is no sortal continuity. Moreover, a whiff of addition can be made out too. A numerically identical substance transforms from being a κ-thing to being a κ*-thing: it falls under two different kinds before and after emergence. And perhaps, as we will see shortly, there is a trace of fusion in that β*ε constitutes a new whole with its own distinctive qualities.

In light of some earlier comments (§ 3.1), it seems right to say that the base too 'is no longer what it was'; that it does not remain what it is while grounding the emergent. Incidentally, this is consistent with Baylis' (1929) suggestion that properties can also 'submerge' (§ 3.3). When *P* comes about in *a*, say, it may well be that another property of *a*, such as *Q* (*P*≠*Q*) ceases to be instantiated, and perhaps also ceases to be individuative of *a*. The interplay of emergence and submergence lends credence to the idea that it is neither β nor ε, but the β–ε complex, which is newly individuated post-emergence. Hence the claim that the base is in some sense left behind, or transcended, is reconciled with the claim that in grounding the emergent, the base's identity alters too. While keeping some, most, or perhaps all, its pre-emergent properties, the post-emergent entity is now differently individuated because of at least one new property that qualifies it as a thing of a certain kind. Insofar as the emergence of

ε affects, or concerns, the whole individual, the post-emergent individual is stratified, and hence in a sense increasingly complex or determinate.

This is why (2) above seems in need of refinement:

$$a\,transubstantiates\,if\,and\,only\,if\;\;(a)\;a/\kappa\,at\,t,\;(b)\;a/\kappa^{*}\,at\,t^{+},\;(c)\sim a/\kappa^{*}\,at\,t,$$

$$and\;(d)\sim a/\kappa\,at\,t^{+}\;\left(and\,\kappa\neq\kappa^{*},\quad and\,t<t^{+}\right), \tag{3}$$

which states that the individual before emergence is not a κ*-thing (c), but neither is it a κ-thing after emergence (d). It seems to me that emergentists should accept condition (c), which is reminiscent of the 'forbiddenness' condition postulated by Guay & Sartenaer (2016, 303), I am less sure about condition (d). For it seems part of the interplay of intuitions to say that β keeps grounding ε, and so in some sense continues to be, and so must have an identity. The question is which one. Now, the whole point about transubstantiation is that the entity still is, but it does not continue to be the thing from which ε has come about, since it is now a different kind of thing; that is, the transubstantiated and stratified β–ε individual is differently individuated post-emergence. However, given the numerical sameness of the pre- and post-emergent entity, there is both continuity and discontinuity: what is continuous is the fact that the entity survives substantial change, and what is discontinuous is the sortal identity that provides this entity with unity.

Picking up an idea expressed at the end of § 3.3, a more precise description of the stratified emergent is that the base 'inherits' the emergent's kind, and is now 'also', but 'not merely', a κ* thing: it is a derivative instance of κ*. In contrast, the post-emergent entity is κ* essentially, that is, κ* is its 'primary kind', even though, *qua* dependent, it is 'also' a κ-thing, yet too in a derivative way (cf. Baker, 2000, 40). An individual's primary kind is what it is first and foremost; it is as what we individuate it most naturally. Accordingly, transubstantiation is the process by which an entity passes from one primary kind to another. So, the post-emergent individual remains in a secondary sense 'also' an instance of κ in virtue of the fact that it depends, and continues to depend, on the base. Yet the individual is in a primary sense a κ*-thing, since it falls under new identity criteria afforded by ε, which thus are determinative of its primary or 'ultimate' kind.

To illustrate this further, a look at Epicurean metaphysics may be instructive. According to Epicurus, just as atoms are real, so are their configurations as well as their qualities, even if the latter lack independent existence. In particular, qualities exist only insofar as they belong to, or are had by, the things in themselves or their aggregates. Epicurus classifies qualities (*sumbebēkota*, 'that which went together') into those that are separable and those that are inseparable (*achōrista*). The separable ones are *sumptōmata*, and he seems to regard them as accidental properties (i.e. ways or modes). In contrast, he has no settled term for the inseparable or permanent qualities (*aei* or *aidion sumbebēkota*, see *Ep. Hdt.* 71, Usener 1887, 24). These permanent qualities are essential, insofar as anything that lacks them could not exist at all (every atom has weight and shape, say), or could not exist as the thing that it is. Hence the sum of the permanent properties is individuative of the thing

that has them: they make it the thing that it is. They are specific, in the sense that they distinguish and sort entities. Hence Epicurus also calls these features '*idiotēta*', or those that 'peculiarize' things (*Ep. Hdt.* 58, Usener 1887, 17). In other words, *idiotēta* are individuators—they make objects what they are. It is tempting to think that ε has the same role in emergence. In a fragment, Epicurus even uses the notion of 'developments', 'products', or indeed 'departures' (*apogegennēmena*), which can be interpreted as emergents in the sense of transformation: while grounded in atomic states, these products constitute a new domain of existence with their own characteristic features—the *idiotēta*, which are 'proper' to them—and so warrant a novel and distinctive classification (see Sedley 1988). In other words, a specific permanent attribute comes to be instantiated in a complex configuration of atoms, and thereby individuates the configuration as a new kind of thing.

The transubstantiation view of transformation along these lines dovetails with the founding twin-intuitions that in emergence something is 'left behind' or 'transcended', namely, a substantial kind (κ), and yet there is no total discontinuity. An entity ceases to be, not altogether, but only what it was, as it now instantiates a novel kind. Since (diachronic) identity criteria concern the conditions under which things like *a*, as instances of kind κ, are identified and re-identified over time, we could say that while *a* persists, it 'is no longer' the kind of thing that 'it was'—that insofar as we now identify it as an instance of a different kind, *a* undergoes substantial change.

4 Transubstantiation and the Epistemic Demand

Since persistence conditions nomologically determine the (phase) changes that their instances can undergo, have to undergo, or must not undergo, in order to remain instances of that kind, the fact that an individual instantiates a certain kind is nomologically and explanatory significant. In combining several aspects of the other views, the transubstantiation view of diachronic emergence hence provides a plausible explication of novelty, and it satisfies the minimal epistemic demand mentioned in § 2.

Take the widespread idea that emergents are irreducible, which is also what accounts for their novelty. Broad's widely discussed definition of (synchronic) emergence says, roughly, and omitting his allusion to parts and wholes, that the emergent's properties could not follow from maximal knowledge of the base properties alone (1925, 25). Since predicates, rather than properties, are deduced, this means that ε-predicates are not logically entailed by, or derivable from, the β-predicates—and this is why they are irreducible. For it is possible to explain ε's novelty exclusively in terms of its β-predicates (i.e. without inductive bridge laws), only if it is possible to deduce, or derive by merely conceptual means, the ε-predicates from the β-predicates. But since this is exactly what does not work, reductive explanations fail (Nagel, 1961, 367; Rescher & Oppenheim 1955). Likewise for the unpredictability of emergents: if we think of prediction as akin to nomological-deductive explanation, a failure of derivation also amounts to a failure of prediction (Hempel & Oppenheim, 1948). Without laws that connect the β-predicates with the ε-predicates, the derivative procedure fails, and ε is 'absolutely' unpredictable. This is exactly what we

should expect when emergence is associated with substantial change and kind identity: emergents have an underived identity. If we assume that ε is an identity marker, it would be odd to accept its reduction, or reduction-engendering conceptual relations between kinds. For this reduction would jeopardize ε' distinctness and novelty.

Moreover, while the transubstantiation view explains novelty, it does not rely on them for defining emergence. Novelty is not a *definiens*, but a corollary of emergence. And so is unpredictability. For the central idea is non-derivability. An emergent is new, or unpredictable, insofar as its identity does not derive from β (even though its existence does). Novelty thus pertains to an identity-gap between emergent and base, not to some peculiar epistemic predicament. Accentuating that ε's novelty relates to its identity, and that ε's identity is underived (or perhaps underivable), and that its identity does not depend on β's identity, allows us to explain why ε's novelty looks 'original' or 'genuine'. In this way, the transubstantiation view has the potential to alleviate the problems with novelty mentioned in § 1.[9]

Overall, I hope my considerations help raising (further) awareness for the relevance of identity and individuation in the discussion of emergence. Aspiring emergentists ought to think about categorical differences, and how they are possible in their preferred schemes. In this sense I offer neither a solution nor a new variant of emergentism here, but a problem or a challenge (cf. § 2). Still, the minimal positive idea I promote is that emergence is associated with significant changes of (diachronic) identity, and so is a transformative process whereby an individual (substance) passes from one primary kind to another, and hence transubstantiates. Insofar as it involves the nature (or essence) of the entity involved in emergence, this change is significant. It is also relevant in an epistemic sense.

This perspective on emergence aims to be liberal and (largely) ontologically neutral, or at least with few metaphysical commitments, so that it can provide a template consistent with a range of views about the proper items of emergence. For instance, we could assume an ontology of powers, but we need not.[10] Furthermore, it can make emergence more open to epistemic considerations. The approach I take here is also general in that a broad metaphysical outlook has the ecumenical potential for unification and reconciliation, since it focuses on what relates, rather than what distinguishes, the many versions of emergentism. Indeed, pluralism is the prevalent outlook of the current discussion of emergence (Bedau, 2010), and has produced a multitude of intricate and fascinating approaches. Nevertheless, what these different emergentisms have in common, what marks them out as versions of a coherent doctrine, and so what affords the coherence of emergentism, remain legitimate questions. And this is where thinking about identity and individuation comes into play.

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[9] For further discussion, see Wyss (2012, 2018).

[10] For instance, Marmodoro (2017) discusses similar aspects of emergence from a view she calls 'power structuralism'.

Statements and Declarations

Conflict of Interest The author declares there are no conflicts of interest.

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