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Process Metaphysics: Coherences and Consequences

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Abstract: Process metaphysics is both internally coherent and coherent with what we know about the basic 'what there is' of the world, whereas a particle-as-particular metaphysics is neither. One consequence of a process metaphysics is that metaphysical emergence becomes explicable, and, in turn, normative emergence. This point is developed with models of the emergence of normative function and of representation. These are steps toward an integrated naturalistic understanding of the world.

Introduction

This discussion proceeds in two phases: The first is an argument for process metaphysics over a particle (or substance) metaphysics. The second phase is a development of some important enabled consequences of a process metaphysics — in particular, models of emergence, of *normative* emergence, and of two fundamental forms of normative emergence. The two forms are of normative (biological) function, and of representing.

Much of Western thought has been dominated by substance and particle metaphysics, descendent from Empedoclean earth, air, fire, and water, and, especially, from Aristotelean earth, air, fire, water, substance, matter and form.[1] These have constituted a powerful and productive framework, but have also yielded aporetic problems in multiple cases in which process has proven to be necessary. For example, fire is not a substance (e.g., phlogiston), but is a process of combustion; heat is not a substance (e.g., caloric), but a randomized kinetic process; magnetism is not a substance (e.g., magnetic fluid), but a field process; and life is not a substance (e.g, vital fluid), but a special kind of far from thermodynamic equilibrium process. These shifts from substance to process constitute a primary theme of 'recent' science and philosophy (Hull, 1974). A major hold-

[1] As should be expected, the exegetical details are complex and fascinating, but this discussion will pick up only on a few historically descendent themes. For a brief discussion, see Bickhard (2024).

out against this trend is the realm of normativity, such as function and representing, and, in fact, the entire realm of biological, psychological, and social phenomena. Emergence seems at best problematic, and normative emergence seems impossible.

What is Process?

Dynamical phenomena are process phenomena, but a process metaphysics involves deeper issues than that. For example, atmospheric wind is a dynamic process, but its constituents of various kinds of gas molecules and atoms could be construed or supposed to be consistent with a particle metaphysics, and, thus, refutations of the necessity of process to account for the world. This is a challenge to a process metaphysics: how to account for phenomena that, at least prima facie, look like particle or substance phenomena. A claim for process metaphysics, thus, faces at least two kinds of tasks: 1) account for phenomena in the world all the way 'down' (e.g., atoms) and all the way up, and 2) show that a particle metaphysics encounters serious problems in constructing any such account.

One window into this contrast focuses on relations. Particles are supposed to be particular, and particulars are supposed to be metaphysically independent of any and everything else. A particular particle may participate in multiple relationships, such as 'bigger than' or 'same charge as', but none of these relations are necessary to the existence of the particle or to what it is. It makes sense to consider a world in which one and only one particle (or entity) exists — in which that particle would have no such relations.

Process, in contrast, is constituted by phenomena that are intrinsically relational. That is, process is fundamentally constituted as phenomena that are intrinsically relational in space-time. A paradigm example would be a (quantum) field: it is intrinsically process, and it is intrinsically relational in space-time. Even space-time 'points' themselves are not particulars. E.g., a manifold, a continuum, cannot be constituted out of individuated points; insofar as points are

involved in manifolds, they are constituted relationally — e.g., as limit points.[2] Without this relationalism, there would not be topologies, metrics, tanget vectors, etc., and, thus, physics would not make sense (Bickhard, 2015, 2024).

Conversely, in a universe in which there were nothing but particles as particulars, there would be zero probability of their hitting one another — or interacting in any other way. A universe of particulars would be a universe in which, at best, nothing ever happens (and nothing could happen).

A standard contemporary framework is that of particles that do interact, via fields — e.g., electromagnetic fields. This 'solves' the 'no interaction' problem, but does not resolve the basic issues: 1) fields are themselves processes, and so the admission of fields already introduces relationalisms of process, and 2) in contemporary models, there are no particles even in this sense (Cao, 1999; Davies, 1984; Fraser, 2008; Halverson & Clifton, 2002; Hobson, 03; Weinberg, 1995). "particles" are quantized excitations of quantum field processes — quantized processes. This is akin to the quantization of guitar string vibrations, and there are no guitar sound particles. Further, there are additional relations among these excitations that are themselves intrinsic: e.g., the Pauli exclusion principle.

A process metaphysics, thus, avoids the "nothing ever happens" reductio of a particle metaphysics, and fits well with contemporary physics. It is consistent with multiple developments in science and philosophy over recent centuries. Process metaphysics are internally and externally coherent and consistent, and particle (or substance) metaphysics are not.[3]

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[2] Quantum gravity addresses the nature of space-time itself (e.g., Rovelli, 2004), and, thus, might appear to put this point in question. But quantum gravity will need to explain these relationalisms, not eliminate them.

[3] For a discussion of some of the probems of substance models that are not particle models, see Bickhard (2024-in press). There are additional possibilities, but they encounter their own serious problems. For discussions of, for example, trope theories, see Seibt (2002) and Ferrari (2024).

Emergence

Emergence seems to be a metaphysical impossibility: how can something come into being that wasn't there in the first place? There have been philosophical blocks to emergence since the Greeks, and powerful versions of these throughout Western history. Among the most powerful recent arguments are those of Jaegwon Kim (1993a, 1993b). I will address one of Kim's central arguments, and argue that it is based on an assumption of a particle metaphysics, and, thus, that it is not sound because that assumption is false.

The argument that I focus on here is the 'causal regularities' argument (Kim, 1993a, 1993b). Kim focuses on whether anything supposedly emergent could have its own emergent causal efficacy in the world, or would be necessarily epiphenomenal.

Emergence, in this view, is supposed to occur when certain configurations of particles occur.[4] Kim points out that, although it may be correct that differing configurations will yield differing patterns of results, those results will be products solely of the causal interactions among the particles. They will be 'causal regularities' resulting from those configurations, but will not manifest any new 'causal powers'. All causality is with the particles; configurations are just stage settings for the particle causal dance; and there is no emergent causal power.

Note, however, that the argument presuppses that all causal power (whatever that is) is held solely by particles. Configuration, which is 'supposed' to be the locus of emergence, is not a candidate for causal power — it is not a particle (or any other kind of substance or entity). This delegitimation of configuration as even a potential locus of causal power is inherent in the argument. The overall argument assumes its conclusion against configurational

[4] This view of emergence, as for many of Kim's targets, is descendent from British Emergentist positions (McLaughlin, 1992). The model of emergence developed in the text is not consistent with the British Emergentist notion; see Bickhard (2015, 2024; Campbell, 2015; Campbell & Bickhard, 2011).

emergence. It is circular; it begs the question. But this assumption is built into the framing particle metaphysics from the beginning, and that metaphysics is false. The argument, then, is circular and unsound.

This does not show that configuration is or can be a/the locus of emergence, but it does show that a central argument against that possibility is itself not a barrier.[5] So, the possibility of emergence seems open: the strongest arguments against it do not work. But that leaves the task of developing a model of emergence that doesn't fall to those arguments.

Clearly, the crucial step is to move from a particle metaphysics to a process metaphysics: process makes accounting for emergence possible, and, in fact, transparent.

Emergence in Process

The crucial issue here is whether or not organization can possibly be a locus of causal power. Within a particle metaphysics, it is not a candidate to be causal. But within a process metaphysics, there are no particles to monopolize having causal power, and, most crucially, process has whatever influence it has on the world *necessarily* in part due to its organization. Organization must be a potential locus for causal "power", else causality disappears from the world. And, so, differing organizations will realize differing (potentially efficacious) properties — they will be emergent in those organizations.

There are several further consequences of this model of emergence. For one, it makes emergence ubiquitous — everything is emergent. Most of our world did not exist

[5] Kim's pre-emption argument against emergence is more well known than the causal regularities argument. The pre-emption argument is ingenious and relatively complex, but presupposes (so I argue) the regularities argument (Bickhard, 2024), and, thus fails if the regularities argument fails. It also has critical problems of its own; see (Campbell, 2015; Campbell, Bickhard, 2011; Corry, 2013; Ferrari, Bickhard, 2023).

shortly after the Big Bang, so most everthing has to have emerged. The ubiquity of process emergence makes sense of that. In this view, specific kinds of emergence, e.g., of chemical valence, or life, or mind, will require their own models, but the supposed barriers to the possibilities of any kind of emergence are dispelled.

A further consequence is that the notion of *levels* as *essential* to emergence is eliminated. Many organizations will admit of a characterization of levels, or approximations to levels, and in some cases those may be important to relevant emergences, but the general notion of organization does not require levels, and, thus, neither does the model of emergence. The supposition that levels are necessary to emergence is a descendent of substance notions — substances are supposed to emerge out of configurations of lower level substances, constituting a 'higher' level. A process framework does not support the necessity of such an organization. Properties are emergently realized *in* process organizations, rather than substances being emergent *from* substance configurations.

Another consequence is that the assumption of metaphysical stability that is inherent in substance and particle frameworks is undone in a process metaphysics — everything is always in process; it is always changing. This writes a promissory note to be able to account for the kinds of stabilities that are the paradigm examples for substance and particle discussions. What can be stable in a process view is precisely the organization of process; process per se is always changing, but may be changing *within* a stable organization. Various kinds of stability are themselves emergent in various kinds of organzations.[6]

[6] And not only temporal stability: there are also emergences of cohesion, boundaries, kinds of individuation, and so on. Much of the metaphysics of substance/particle frameworks are themselves emergents in process organizations: they are not metaphysically fundametal (Bickhard, 2024).

Stabilities

Among kinds of stable process organizations, there are two that are central to the model of normative emergence to be developed later in this discussion. The first is an energy-well stability. These are organizations of process that remain stable as organizations so long as they do not encounter above threshold energy. That is, some minimal or above energy input will disrupt them, but without such disruption they will continue. An atom, for example, can remain stable for cosmological durations, but the energy in a star can disrupt the quantum field process organization that constitutes the atom.

Energy well stabilities are stable so long as they are not disruptively interfered with. In particular, if they are isolated and go to thermodynamic equilibrium they are quite "happy" and will remain stable for indefinite time periods. This is in contrast to the second form of stability that I will address: far from thermodynamic equilibrium process organization. A far from equilibrium organization *requires* interactions with its environment in order to remain stable. Without appropriate such interaction, it will go to equilibrium and cease to exist. A canonical example would be a candle flame. It requires continuous inflow of oxygen and outflow of waste products to continue. If it goes to equilibrium, there is no longer a flame. Far from equilibrium *requires maintenance*, while energy well stability doe not. This is the fundamental asymmetry that underlie normative asymmetries (Bickhard, 2024).

Normative Emergence

Far from equilibrium processes that are held far from equilibrium will tend to organize into some form of organization or pattern or trajectory. A pan of water with a sufficient heat source under it, for example, will generate organization into multiple boils of water — Bénard cells. This organizing is not direct or controled — it is induced as a *self-organization*. Many far from equilibrium processes, such

as Bénard cells, are held — *maintained* — far from equilibrium by external sources, such as the heat source below the pan of water. The earth, for a major example, is maintained far from equilibrium primarily by the sun.

Some processes, in contrast, make contributions to their own far from equilibrium conditions, and, thus, their own persistence — stability in that sense. A candle flame, mentioned earlier, would be a canonical example: the maintenance of above combustion threshold temperature, the induction of convection, and other contributions are all contributions to the continued existence of the flame. A candle flame is *self-maintenant*. A candle flame is constituted as these self-maintaining processes.

If a candle is running out of wax, it has no options for continuing its self-maintenance. Some processes, however, are able to shift the organization of their processess in order to maintain the condition of being self-maintenant when changing conditions are encountered. Such processes self-maintain their self-maintenance: they are *recursively self-maintenant*.

A bacterium, for example, may able to swim when oriented up a sugar gradient, but shift to tumbling if oriented down a sugar gradient (Campbell, 1974, 1990). Note that this requires some means of detecting the difference between the condtions, being capable of the differing process organizations, and being able to shift between (or among) various possibilities in accordance with apt difference detections.

Support for such possibilities will require process organizations that are themselves *relatively* stable at the time scales of the processes being guided or controlled. In the case of the bacterium, for example, this will involve, e.g., cell walls and microtubules. These are part of the overall open-system far from equilibrium process organization, but with a slower time scale of turn-over. They constitute *infrastructure*, and their maintenance constitutes *metabolism* (Bickhard, 2024).

Normative Function

The fundamental form of emergence of normative phenomena has already been outlined: a contribution to the persistence of a far from equilibrium process organization is *normatively functional for* that persistence. Such an influence on process persistence can succeed, or fail, or detract, or be sufficient under some conditions but not others. It is a functionality that is *relative to* the process organization: e.g., the heart beat of a parasite is functional for the parasite but dysfunctional for the host.

This is in contrast, for example, to attempts to model the constitution of function in terms of the evolutionary etiology, or selection history, of that process relation (Millikan, 1984, 1993). A kidney, for example, has the function of filtering blood, according to this kind of model, in virtue of ancestral kidneys having been selected for filtering blood. This is also a model of normative function, but it encounters serious problems.

One is illustrated by a much discussed thought experiment: Suppose that with extreme improbability the molecules in a room came together to create a lion that is molecule by molecule identical to a lion in the zoo. In spite of this identity, the lion in the zoo has organs with selection history etiologies, and, thus, with functions, while the lion in the corner has no evolutionary history, thus no functions. This could 'just' illustrate a counter-intuitive but ultimately acceptable consequence of etiological models, but there is a further consequence that is not so readily acceptable.

The two lions are, by assumption, not only molecularly identical, but also, therefore, dynamically identical. So the zoo lion and the science fiction lion have all the same process organizations and interactions, but one has etiological functions and the other does not — etiological function is dynamically, causally, epiphenomenal.

And this problem is not restricted to science fiction examples. Consider the first time some organ, perhaps a (proto-)kidney, engages in a process that is selected for. At that point, it has no relevant etiology, thus no function, but

it is performing the same kind of service as a descendent some generations down the etiological selection trajectory.[7]

Still further, what are the selections in such an evolutionary trajectory selecting for? They are selecting for processes that contribute to the persistence of the process organization that is the locus of selection. And that, then, is a normative contribution that is being selected for: the evolutionary etiological framework presupposes normativity in the selection history model; it does not account for the emergence of normativity.

So, etiological history can account for origins, and that can be of crucial interest and importance, but it does not account for emergent normativity, and, thus, not for normative function.

Another contrast with etiological models is that etiological models (claim to) account for *having a function*, while the model outlined above accounts for *serving a function*. Etiological models offer an account of serving a function as being constituted in something (e.g., an organ) successfully accomplishing the function that it has (e.g., filtering blood). If the background framework is accepted, this is the clear option, but it has its own problems. For example, it makes it at least difficult to account for a function being served by something that does not have that function (e.g., the first time blood filtering occurs, or even an 'accidental' serving of a function).

The interactive model outlined has the opposite promissory note: how to account for having a function given the model of serving a function. The answer utilizes a relationship of functional presupposition that can hold among processes, including semi-stable processes such as biological organs. A functional process will in general serve one or more functions under some conditions, and not under other conditions. So, a recursively self-maintenant system that switches to one of its self-maintaining processes functionally presupposes that sufficient supporting

[7] And also there is no specifiable number of generations that inserts the magic emergence of function.

conditions hold for that function to be served. If those presupposed conditions differentiate an organ as a or the locus for serving that function, e.g., a kidney, then that organ *has the function* of creating or maintaining those conditions.[8]

Having a function, in this model, is constituted in being functionally presupposed to serve that function. Having a function is relative to those processes that involve those presuppositions (Bickhard, 2024).

Representing

Function is the basic level of evolutionary emergence of normativity; representing is a major further emergence that is realized in a particular kind of function: Any complex agent must have some way of anticipating what further interactions are possible in order to select among them what to attempt to engage in. A frog might have a functional indication that it could flick its tongue in a certain direction and eat, or another direction and eat, but not indications for eating anticipations in any other directions; for another example, it does not help to get a drink to open the refrigerator door if there is no refrigerator nearby.

Crucially, such indications of interactive potentiality will be supported in some circumstances, and not in others: they involve presuppositions. Such presuppositions are about the interactive environment. They constitute *content* — this context supports this interactive anticipation. The specifics of that content are *implicit* in the sense that the specific conditions that constitute that support are not explicit, but are implicit in the presupposition per se.

Furthermore, if the anticipation is correct, then it is *true*. An anticipation of the possibility of interaction type X is true if interaction type X is in fact possible, and it is possible if the presupposition — the implicit content — is true about the interactive environment.

[8] Such presuppositions do not have to be of biological organs, or even of entities of any kind. E.g., most living beings functionally presuppose the availability of sufficient oxygen.

For the frog, if a visual interaction is engaged in that differentiates appropriate supporting conditions (e.g., a fly or a worm), it may set up an indication of the possibility of tongue flicking in a certain direction and eating. It is the indication of such possibility that will have truth value. The appropriate conditions may be that there is a fly in that direction, but the frog need not have content about the fly per se — it need not represent that fly, but only differentiate conditions in which there is — as a matter of fact — a fly there. Differentiation does not have truth value: differentiation is not representing. Such differentiations constitute *contact* with the environment; anticipations (generally *based on* differentiations) constitute *content* about that environment.

Contemporary models of representation offer a range of models of representation as constituted in special forms of *encoding correspondences*. These special representation constituting correspondences are proposed, variously, to be causal, informatonal, lawful, pointing, etc. (Bickhard, 2014, 2024). Such models, so I argue, encounter fatal problems — problems resolved in the interactive model. I will focus here on one central problem: the problem of organism detectable representational error.

Encodingism models come in many varieties, and each model manifests its own unique pluses and problems (Bickhard, 2024). Some problems, however, afflict several models, even if not all of them. One of these is the possibility of representational error: how can the special encoding correspondence exist but be false? If it exists, it's true; if it doesn't exist, it can't be either true or false. There is no third possibility.[9] Multiple efforts were made in recent decades to solve this problem (e.g., Fodor, 1990), but without success.

[9] The major model that avoids this problem is Millikan's etiological model (Millikan, 1984, 1993). It has, however, other inherent problems (Bickhard, 2014, 2024).

There is a related problem that is not solved by *any* correspondence model.[10] This is the problem of organism detectable error: how could representational error be possibly detected? For a correspondence model, this would involve having some sort of epistemic access to what the representation is *supposed* to represent (its content) and being able to compare that with what is actually being 'represented'[11] to determine if they match — if the content is true of the 'represented'. But the special correspondence is, supposedly, *the* epistemic access to the 'represented', so any such check is circular. An organism would have to somehow step outside of itself to have independent access to the 'represented' to able to compare what's actually on the other end of the corresondence with what is being 'represented' as being there. This is impossible, so organism detectable error is impossible.[12]

But we know that organism detectable error occurs, however occasionally and fallibly. Without it, there could be no error guided behavior nor learning. So the conclusion that it is impossible must be false, which refutes the models that yield that conclusion. I argue that the conclusion follows from any encoding correspondence model, and, thus, that that class of models is refuted as a class.

The interactive model outlined above does not fall to this problem: if an indicated interaction is engaged and it fails to remain within the anticipated flow of interaction, this constitutes falsity of the indication, and it is detectable functionally by the organism itself. There is no need to have an 'extra-organism' perspective on what is 'really' on the

[10] And hasn't been solve for millennia.

[11] The scare quotes are because "represent" is often taken to be a success term, so a false representation is really not a representation at all. I'm using it here in the sense of applying some content to some other end of a special correspondence, whether correctly or incorrectly — the problem is how the truth or falsity could be in-principle detected.

[12] This is the radical skeptical argument — that has been unsolved since the ancient Greeks.

other end of a correspondence. The key here is that indications and anticipations are future oriented; while correspondence models are past oriented. Indications into the future can be falsified by engaging them into the future, and determining if the future is consistent with the anticipations or not.[13]

Two further contrasts with correspondence models have already been introduced: content for the interactive model is *implicit* while it is explicit for encoding models. And anticipations into the future are *modal* in the sense of future possibility, while correspondences are supposed to be factual correspondences with (supposedly) actualities. These differences and others resolve and avoid multiple problems with encodingism models, and, most importantly, constitute models of emergent content and truth value (Bickhard, 2024).

Conclusions

Process metaphysics are consistent with our dynamic world as well as with our best physics about that world; substance and particle metaphysics are neither. Process metaphysics makes sense of emergence, which substance and particle metaphysics preclude. Again, a consistency with our world, versus an inconsistency. This, in turn, enables a model of normative emergences. This has been illustrated with two crucial emergences: normative function and representing, as emergent in a special kind of function of indicating interactive potentialities. These also resolve problems that are not solved by alternative models.

In multiple ways, these considerations strongly support a process metaphysics and resultant emergences, including normative emergences. This contrasts with the aporia

[13] Action and interaction based models enable such future orientation but do not entail it. Versions of action and future framed models can be found, e.g., in pragmatism and in Piaget's model (Piaget, 1954; Müller, Carpendale, Smith, 2009).

encountered in multiple ways and at all levels by substance and particle frameworks.

Nevertheless, substance and particle assumptions are still dominant in studies of minds and persons — and all normative phenomena — so a shift to process necessitates major reconstructions of assumptions and of models that are grounded in these assumptions.[14]

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[14] An extensive contribution to that task is offered in Bickhard (2024).

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