STRONG EMERGENCE

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ABSTRACT

A crucial question for both philosophy and for science concerns the kind of relationship that obtains between entities—objects, properties, states, processes, kinds and so on—that exist at apparently higher and lower 'levels' of reality. According to reductionism, seeming higher-level entities can in fact be fully accounted for by more fundamental, lower-level entities. Conversely, emergentists of various stripes hold that whilst higher-level entities depend in some important sense on lower-level entities, they are nevertheless irreducible to them. This introductory paper outlines the context of the debate between emergentists and reductionists; offers a broad characterisation of 'strong' or ontological emergence, and provides summaries of each of the papers to come in this special issue.

1. The structure of inquiry and the structure of the world

Part of the job of scientific inquiry is to engage with, make sense of, describe, explain and make predictions concerning the wildly varied phenomena which constitute the world around us. As a consequence of this aforementioned variety, distinct disciplines each with their own intellectual regimes—domains of inquiry, basic assumptions, investigative techniques and so on—address different groupings of this phenomena. Thus, physics, or at least an important part of that discipline, is concerned with the properties of and interactions between the relatively small and simple constituents of matter, and of energy. Chemistry addresses more complexly structured systems of those constituents that form substances—in the standard, as opposed to technical metaphysical, sense: elements, compounds, mixtures, suspensions and so on. Biology treats phenomena which exhibit the characteristics which are criterial for life, ranging over micro-organisms, flora, fauna etc. Psychology and cognitive science engage with just those living things which possess mentality, and sociology, economics and political science all range over aspects of the interactions between these thinking agents. These characterisations are somewhat glib, and they surely fall short of a properly nuanced and comprehensive conception of each discipline, but hopefully they are fit for the illustrative purpose to which they are employed.

That inquiry has this sort of structure raises a number of interesting philosophical questions. One such set of questions concerns the sorts of relationships that obtain between the theories put forward by each discipline. Another set of questions concerns the extent to which the sort of structure described above is a feature not just of the way we organise our inquiry into the world, but of the world itself: that is, addressing the

sorts of relationships that obtain between the phenomena with which the various sciences are concerned. This special issue is primarily focussed on questions of the latter sort: the papers collected here examine the *ontological* debate between emergentists and reductionists. 'Strong' or ontological emergenistism could be roughly characterised as the view that the sort of structure exhibited by inquiry is mirrored in the world itself: there are genuinely distinct, hierarchically arranged 'levels of reality', with entities or phenomena at higher levels existing separately from those at lower levels, but still somehow dependent on those lower-level entities and phenomena. The most common converse view, wholesale ontological reductionism, holds that this structure is merely apparent, and is not mirrored in reality: all genuine existence is confined to a single, fundamental level, and apparently higher-level entities can be identified with or reduced to or otherwise accounted for by the fundamental entities.

2. Introducing 'strong' emergence

So far, it has been said that strong emergentism involves a denial of reductionism. However, strong emergentism involves more than just this. For one thing, there are positions other than emergentism which also deny reductionism—for instance, one might hold a sort of ontological pluralism that involves the denial of reductionism, but which also denies the sort of levelled structure of dependencies which the emergentist takes to obtain between different domains of phenomena. Some further commitments which are characteristic of strong emergentism include, but probably aren't limited to:

Distinctness: the emergent entity must be something *different* from the 'base' entities from which it emerges.

Novelty: the emergent entity must be *novel with respect to* its base; although it needn't be novel in some absolute sense, that is, it needn't be the first individual entity of its kind to exist. This novelty must be more than additive/aggregative novelty: the mass of a one kilogram sample of sugar is distinct from the masses of each of the granules which constitute it, but it is easy to see how the mass of the whole sample is merely an aggregate of the masses of its members. The combination of *novelty* with *distinctness* perhaps captures the sense of the locution 'over and above', which is often used to describe the relation emergent entities bear to the base entities from which they emerge.

Dependence: there is some relationship of dependence between the emergent entities and the base entities from which they emerge. This dependence should be asymmetric: it shouldn't also be the case that the basic entities depend on the emergent entities. It should also be existential in nature: the emergent entities would not exist without the base entities.

3. Emergence: weak and strong

Strong emergence is typically taken to be ontological in nature. However, alternative notions of emergence have been proposed that are more epistemological. *Weak* emergence, as described by Chalmers (2006), only holds that the truths concerning high-level phenomenon are unexpected given the principles at the lower domain. Cases of strong emergence as outlined above will therefore be instances of weak emergence in Chalmers' sense, but not necessarily vice versa. Similarly, we can understand the reduction relation as holding between objects, events, or properties, or as holding between theories, concepts, or models. The former can be taken to be ontological reduction; the latter representational reduction (Van Gulick 2001).

The philosophical literature on emergence has, broadly, been concerned mostly with strong or ontological emergence. But epistemological emergence has been more influential and popular within the scientific community, with many persuaded to adopt weak emergentism on the back of the seeming impossibility of inter-theoretic reduction. Such weakly emergent phenomenon would have some, but not all, of the characteristics of strongly emergent phenomenon. Some form of dependence, novelty, and distinctness would still apply; however, there would be no influence of the higher-level on the lower. That is, no claim of *downwards causation* wherein a higher-level entity is in some way causally powerful at the lower-level. To be clear, not all notions of strong emergence must accept this possibility either, but weak emergence, with its focus on theories and concepts rather than objects, events, or properties, must instead posit emergent phenomenon as being (a possibly unavoidable) part of our descriptions of reality rather than part of reality itself.

This special issue aims to clarify a range of issues concerning what the claim that there are strongly emergent phenomena commits us to, and to investigate the plausibility of certain candidate examples of strong emergence. The papers therefore take up both theoretical and empirical questions around the possible existence of strong emergence. This intersecting of the theoretical and the empirical is especially important in the case of debates about emergence. This is because many of the supporters of emergence draw their belief in emergence from the apparent examples of emergent phenomena: that is, phenomena that, it is claimed, cannot be explained if we adopt alternative views about the nature of reality. The papers in this issue embrace this interdisciplinary enterprise.

4.   Overview of papers in volume 1

In 'Explanatory Emergence as a Guide to Metaphysical Structure', Elanor Taylor argues that explanatory emergence might be used for metaphysical purposes. Under this view, emergence is relativized to factors such as an observer, a form of explanation, a standard for unavailability, and a distinction between component and whole. However, whilst emergence is explanatory, Taylor argues that it may be so for metaphysical reasons.

Taylor admits that working out which cases of explanatory emergence are metaphysically relevant as opposed to being merely epistemic is difficult. However, Taylor points towards the recognition by many that certain kinds of explanation might be metaphysical in nature, and thus be metaphysically significant. Likewise for the idea of a metaphysically significant observer rather than a scientific observer. Taylor argues that at least some scientific observers will be metaphysically significant even though the two will not exactly coincide. These considerations are grounds for thinking that the idea that explanatory emergence is metaphysically significant is not as unusual as we might think. Taylor closes with two case studies, from the 19th century debate between mechanists and vitalists and the contemporary debate about the explanatory gap in philosophy of mind, which show that in fact we already do take explanatory emergence as a guide to metaphysical structure.

In 'Must Strong Emergence Collapse?', Jessica Wilson and Umut Baysan focus on a set of objections that have been proposed against the coherency of strong emergence that can together be classed as 'collapse objections'. This is done with particular respect to a powers-based account of emergence. Wilson and Baysan develop four new strategies that the powers-based account can respond to the collapse problem: an appeal to a distinction between direct and indirect having of powers, an

appeal to a distinction between lightweight and heavyweight dispositions, a view on which strong emergence is relativized to sets of fundamental interactions, and a view on which strongly emergent powers are had by new objects. Wilson and Baysan also argue that these four responses can be independently motivated.

As with other papers in this special issue, Wilson and Baysan admit that these responses do not prove the existence of strongly emergent powers. However, they argue that it does show that a powers-based strong emergence can be made sense of, and that the view is at least a plausible candidate alternative to reductivist views.

In 'Language and Ontological Emergence', James Miller outlines a case for a novel example of strong emergence to be found in linguistics. Miller argues that if some plausible and well-supported linguistic views are correct, most centrally claims within generative grammar about the role and scope of both the semantic and syntactic components of the human linguistic faculty, then a case can be made for strongly emergent properties at the sentential level. The example that is focused on here is the property of truth-evaluability, which Miller argues cannot be easily reduced to a lower-level property, or the interaction of lower-level properties.

Miller's claim is not that the argument in his paper proves that the property of truth-evaluability is strongly emergent. Rather, the claim is that emergence is as plausible a view as a reductionist one. If correct, this would show that the explanatory power of emergence stretches beyond more commonly cited and debated examples in physics and the philosophy of mind. At the least, this example would seem to pose a new challenge to the reductionist to show how such causally powerful but higher-level linguistic properties can indeed be reduced without introducing new posits that cannot be empirically supported by linguistic data.

In 'Strong Emergence, No, Contextual Emergence, Yes', Michael Silberstein outlines contextual emergence, as a position that is a robust alternative to ontological reductionism, but without the gaps in the unity of nature that might be implied by traditionally understood strong emergence. Contextual emergence is the view that new entities emerge out of multiscale contexts, which modally constrain the overall system. Nature is inherently contextual, allowing for the coming into existence of novel, irreducible entities (e.g. an entangled state), but without violating compositional and realization accounts of part/whole relations. This form of middle-ground emergence, for Silberstein, is not simply philosophically and empirically more supportable than the stronger and weaker forms, but that contextual emergence should be seen as the norm, not just an exception, when trying to explain new and stable phenomena.

Furthermore, this is not an epistemic form of emergence; it is ontic. New entities come into existence with the more fundamental domain providing at best necessary but no sufficient conditions for emergence of the less fundamental phenomena. Silberstein goes on to argue that far from being a fringe view, ontic structural realism, monism and dispositionalism all involve some commitment to ontological contextual emergence. The world might look at times to be reductionist, and at others emergentist; but Silberstein proposes that this is ultimately due in fact to its contextual nature.

In volume 2 of this special issue Mark Pexton addresses questions concerning manipulationism and causal exclusion; Peter Lewis discusses quantum mechanics, emergence and fundamentality; Jonathan Bain examines issues concerning topological ordering and emergence; Tom McLeish discusses downward causation and emergence in biological physics; and Steven Blundell addresses questions concerning condensed matter physics, emergence and the limitations of the human mind.

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REFERENCES

Chalmers, D., 2006, "Strong and Weak Emergence" In Davies & Clayton (eds.) *The Re-Emergence of Emergence*. Oxford University Press.
van Gulick, Robert, 2001, "Reduction, Emergence and Other Recent Options on the Mind/Body Problem: A Philosophic Overview", *Synthese*, 8:1-34.