

Emergentism a Brand New Shopper's Guide

Achim Stephan, University of Osnabrück

*If we owe the gravitational theory to the contemplation of an apple tree, that
of emergent evolution should originate with a visit to the circus.
(F. L. Wells 1928)*

Weak Emergentism

- (i) *Physical monism.* Entities existing or coming into being consist solely of physical components. Likewise, properties, dispositions, behaviors, or structures classified as emergent are instantiated by systems consisting exclusively of physical entities.
- (ii) *Systemic properties.* Emergent properties are systemic properties. A property is a systemic property if and only if a system possesses it but no part of the system possesses it.
- (iii) *Synchronic determination.* A system's intrinsic properties and dispositions to behave depend nomologically on its micro-structure, that is to say, on the properties and arrangement of its parts. There can be no difference in a system's systemic properties without some differences in the properties or arrangement of its parts.

Diachronic Emergentism

- (iv) *Novelty*. In the course of evolution exemplifications of “genuine novelties” occur again and again. Existing building blocks develop new configurations; new structures are formed that constitute new entities with new properties and behaviors.

- (v) *Structure-unpredictability*. The rise of novel structures is unpredictable in principle, if their formation is governed by laws of deterministic chaos. Likewise, all novel properties that are instantiated by those structures are unpredictable in principle.

Put in abstract terms the emergent theory asserts that there are certain wholes, composed (say) of constituents A , B , and C in a relation R to each other; that all wholes composed of constituents of the same kind as A , B , and C in relations of the same kind as R have certain characteristic properties; that A , B , and C are capable of occurring in other kinds of complex where the relation is not the same kind as R ; and that the characteristic properties of the whole $R(A,B,C)$ cannot, even in theory, be *deduced* from the most complete knowledge of the properties of A , B , and C in isolation or in other wholes which are not of the form $R(A,B,C)$

(C. D. Broad 1925, 61).

Synchronic Emergentism

- (vi.a) *Unanalyzability*. Systemic properties which are not behaviorally (or functionally) analyzable – be it micro- or macroscopically – are irreducible.

- (vi.b) *Irreducibility of the components' behavior*. The specific behavior of a system's components within the system is irreducible if it does not follow from the components' behavior in isolation or in other (simpler) constellations.

- (vi) *Irreducibility*. A systemic property is irreducible if (a) it is neither micro- nor macroscopically analyzable, or if (b) the specific behavior of the system's components on which the systemic property supervenes does not follow from the component's behavior in isolation or in other (simpler) constellations.

On the way to reductive explanations ...

Step 1 *E* must be *functionalized* – that is, *E* must be construed, or reconstrued, as a property defined by its causal/nomic relations to other properties, specifically properties in the reduction base **B**.

Step 2 Find realizers of *E* in **B**. If the reduction, or reductive explanation, of a particular instance of *E* in a given system is wanted, find the particular realizing property *P* in virtue of which *E* is instantiated on this occasion in this system (similarly, for classes of systems belonging to the same species or structure types).

Step 3 Find a theory (at the level of **B**) that explains how realizers of *E* perform the causal task that is constitutive of *E* (i.e., the causal role specified in Step 1). Such a theory may also explain other significant causal/nomic relations in which *E* plays a role.