

Emergent Properties and Inference Rules

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Abstract:

If one believes in the Darwinian picture of evolution, one has to accept the existence of so-called emergent properties and wholes. Through mutation and natural selection, completely new species have been caused to emerge. Similarly, if one believes that Gestalt psychology is right in its basic view that perceptions can, and mostly do, relate to non-reducible Gestalten of various sorts, then one has to accept emergent properties and wholes. Such perceptual Gestalten are not free-floating; they emerge on the basis of smaller perceptual units. The properties which they exemplify are, further, simultaneous with their constituents, and it is such emergent properties and wholes that I will focus on. Computer images are, in this sense, emergent wholes in relation to their pixels. At first, it might seem as if there cannot possibly be any formal inference rule that connects an emergent entity with its constituents. For if there were, then it would seem that the entity in question would not be worthy of the label “emergent”. Partly, this is true. If e is a case of an emergent kind of whole E , and c is the relevant case of that complex of constituents from which e emerges, then there is no formal inference rule that says that from the existence of c one can infer the existence of e . Nor is there a formal rule saying that from the type C the type E can be derived. However, there is a more complicated inference rule that seems to be formally valid. It says:

- Necessarily, if e emerges on the basis of the complex of constituents c , then everywhere where there is a case of C there is a case of the emergent whole E .

Here is an example: Necessarily, if, on the basis of a certain aggregate of pixels (c) a certain picture of Västerås (e) emerges, then on all exactly similar kinds of aggregates of pixels (C) the same kind of picture of Västerås (E) will emerge. In philosophy, this rule goes under the somewhat esoteric name “the indiscernibility requirement for supervenience”, but it can just as well be called “the indiscernibility requirement for emergent properties and wholes”. This rule can also be stated thus:

- Indiscernibility of constituents entails indiscernibility of associated emergent wholes.

The rule was discovered in discussions about the relationship between moral goodness (conceived as a non-reducible property) and ordinary natural non-evaluative properties. Necessarily, if the person P is morally good, then every other person that has exactly the same natural properties as P is also morally good. With respect to informatics, I have three hypotheses:

- (1) that many of the concepts that information scientists are working with refer to emergent properties and wholes,
- (2) that the inference rule stated can be useful in information science, and
- (3) that the rule is already tacitly being used.

Let's discuss the rule and my hypotheses.