

Dissertation Review

“EMERGENT STRUCTURES AND FUNCTIONS IN MOLECULAR BIOLOGY AND NEUROBIOLOGY”

Candidate: Kaloyan Nechev

The dissertation consists of 157 pages excluding the references section. The author used 142 sources, of which 22 are in Bulgarian.

The structure of the text is explicit and without a doubt the exposition is presented in an extremely high academic style. However, I would recommend simplifying the speech and reducing the volume of some quotes by implementing their reconstruction instead (e.g., the quotes from Jaegwon Kim on pp. 31-33 and 35-36).

The main goals of the dissertation are to argue the need for a new interpretation of emergent phenomena in different research domains, to present a method for realizing such an interpretation and to demonstrate the application of this method to a specific emergent phenomenon. I find all three objectives to be successfully achieved.

In the first chapter, Kaloyan Nechev discusses the historical predecessor to modern emergentism. I find the reconstruction to be accurate and informative. The dissertation clearly shows the conceptual reasons for the appearance of emergentism in various fields such as chemistry and biology and emphasizes how different theories and approaches evolve according to the accumulation of empirical evidence and the formulation of various arguments.

The author begins the second chapter with a discussion and a summary of the debate between reductionism and emergentism with an emphasis on the rigidity of strong emergentism, which analyses emergent properties in the natural kinds conceptual framework. This rigidity leads to intractable theoretical antagonism and to the impasse situations typical of philosophy. According to the author, such "dead-end" conceptual developments in emergentism's case can prove unproductive in the academic field, and especially where the humanities are concerned. Nechev correctly notes that emergentism in the field of science can be seen as "weak emergentism" characterized by instrumental and heuristic value. On the other hand, however, weak emergentism

suffers from taxonomic and conceptual ambiguity as it avoids strict ontological commitment (the case of biological species taxonomies is aptly referred to by the candidate to justify this claim).

To overcome the problems outlined, the author introduces their own method dubbed "reaction cluster analysis". The method is aimed at establishing a neutral and unified manner of interpretation that would allow one to unify the concepts of emergent properties and natural kinds and avoid the theoretical impasse in contemporary emergentism.

The method can be considered as a form of specialized conceptual analysis in the sense that it offers replacement of ontologically committed formulations and expressions assuming the existence of natural kinds with ontologically neutral terms such as "reaction clusters" (replacing the term "natural kinds") and "reaction potentials" (replacing the expression "emergent characteristics"). The term "emergence" itself is analyzed as "an expansion of the reaction potential of a given structure/complex system, found in dependence on its net stability" (p. 62).

I have my doubts about the use of the term "method" insofar as the dissertation offers an alternative terminology and taxonomy for describing systems with emergent properties, whereas a method would require a different exposition, such as a series of steps taken to achieve a specific research objective. However, I accept that "method" in this case is synonymous with "way of speaking".

The author gives sufficient reasons for the need for conceptual reforms that would simplify, clarify and unify the theoretical approach to emergent phenomena. This goal, according to Nechev, is entirely methodological and cannot be assigned unambiguously to one or another existing position in the debate, as well as within more general theoretical meta-distinctions such as realism and anti-realism. However, the author states that he adopts the position of scientific realism (p. 76), which recognizes experimentally established entities as independent of the factors facilitating their establishment.

The adoption of scientific realism prompts me to ask my first question to the candidate: to what extent is the alleged methodological and neutral character of his work compatible with scientific realism - a position which, in all its modifications, has an ontological commitment?

Reaction clusters and the related concepts introduced by the author are defined, generally speaking, as dispositional descriptions of the functioning of multi-scale systems. This approach, it seems, is similar to functionalism, and before that to the approach of methodological behaviorism, insofar

as theoretical terms become meaningful based on long-term empirical observations of the behavior of a system. Also, due to changes in the system's behavior confirmed in some cases, descriptions, explanations and predictions are not viewed deterministically, but rather probabilistically, which the candidate labels with the terms "disposition," "response," and "stability."

The main difference in comparison to functionalism and behaviorism is that the concepts of reaction clusters, reaction potentials, dispositional figures and functional clusters, introduced by Kaloyan Nechev, are not limited to a specific system ("organism", for example), but are applicable at different levels and to different systems. It is important to note that although the term "system" has been used to define reaction clusters and other newly introduced concepts, after the adoption of these concepts the term "system" itself should be replaced by "reaction cluster" or "functional cluster" depending on the research scale.

As a result of the rejection of the rigidity of approaches that presuppose "natural kinds" in the ontology of a theory/model, these concepts are applicable continuously along the expansion of the research perspective from a reaction cluster to a complex of reaction clusters. Irreducible internal changes in a reaction cluster, commonly referred to as "emergent characteristics", i.e., as special properties of a complex system, are now viewed as changes in the reaction potential of the cluster under consideration. This move undoubtedly simplifies the analysis of emergent systems and overcomes problems associated with "digging" into the assumed references of the theoretical vocabulary widely used in the relevant field.

A "relevant field" in this case could be any theory that regards certain phenomena as emergent. This result is one of the many reasons to accept the author's claim that the method he advocates is indeed interdisciplinary in nature.

In the third chapter, Nechev aims to apply the approach from the previous chapter to analyze the intuition as an emergent phenomenon that is often assigned a specific methodological/heuristic responsibility within philosophy and other disciplines.

Intuition very often appears as a contender for a fundamental methodological regulator, as the author shows by reconstructing a number of influential authors in the field of philosophy.

The detail of the discussion in this chapter is impressive and once again confirms the erudition of the candidate. Academic vocabulary is changing significantly to adapt to talk about intuitions within the domains of philosophy, cognitive science, and neuroscience.

In the same chapter the author introduces an additional method of analysis, building on the reaction cluster analysis from Chapter Two. The method is dubbed "functional-behavioral method of analysis." This method can again be viewed as a specific form of conceptual analysis in which behavior is rendered as a common feature of systems under scientific consideration, no matter if the system is 'organism' or 'nervous system' (p. 72). This move allows Nechev to construct a consistent and scientifically compatible description of intuition that does not run into the problems generated by assumed ontological distinctions between body, nervous system, and behavior.

My second question to the candidate: since the "functional-behavioral method of analysis" is consistent with the reaction cluster analysis method, what does the functional-behavioural method achieve in addition? Is it not possible for intuition to be reconceptualized only via the theoretical vocabulary introduced in Chapter Two? This has been actually done on p. 154, where the results from the functional-behavioral analysis are presented in the terminology of the reaction cluster analysis. To repeat question succinctly, what necessitates the introduction of the second method?

Nechev concludes that the standard descriptions of intuition as a methodological tool and its role in rational-speculative argumentation are problematic not only for philosophy, but also from an interdisciplinary point of view: this is a problem for research programs in general, including those that can be presented as strictly scientific.

In the fourth chapter, Nechev uses contributions from the method he developed to propose two ways of analyzing the concept of intuition: a dispositional-behavioral definition and a functional-physiological definition. Although these two types of definitions can be presented as classical opponents belonging to different paradigms, the methods presented in the second and third chapters show how they can be considered within the same conceptual framework, or in the terms of the dissertation - through a method of "precise analysis of all levels of explanation of the phenomenon" (p. 127).

This is undoubtedly one of the great contributions of the text. The result is a demystified notion of intuition, translated into operational terms, but more importantly: intuition is stripped of its

unfounded epistemic guarantor status. It is also important to note that the particular conceptualization of intuition is but an example of applying the approach developed by the candidate. Such application is possible for a number of other phenomena of scientific and/or academic interest.

It is hard for me to explicate all positive traits of Kaloyan Nechev's text. In my opinion, the outstanding erudition, but above all the originality, the genuine approach, and the focus on the methodological (rather than, for instance, the historical) character of philosophy place the text into the top 5 of dissertations defended in the Department of Philosophy (at least since I have been a member of the Department, namely since 2012).

I accept the contributions indicated at the end of the abstract, insofar as the protocol for writing a dissertation requires the candidate to indicate them, but I want to emphasize that in this case we are really talking about a dissertation with a **contribution** to the field it investigates, although due to the interdisciplinary nature of the text this field is not clearly fixed. However, due to the fact that research methodology is a classic topic within the domain of Philosophy of Science, the dissertation undoubtedly provides the foundations of a large-scale research project precisely in Philosophy of Science.

Of course, I strongly recommend publication of the text, but I also hope that the author will publish more articles related to the method he developed, as well as that he will present it at scientific forums. Methodological reforms, especially on such scale, are possible after undergoing an active phase of criticism by researchers working in the same field. Kaloyan Nechev has achieved a lot, but the potential is even greater.

I congratulate the author and wholeheartedly vote „for” awarding Mr. Kaloyan Nechev the educational and scientific degree “Doctor in Philosophy”.

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