

REVIEW

OF KALOYAN IVANOV NECHEV'S DOCTORAL THESIS

EMERGENT STRUCTURES AND FUNCTIONS IN MOLECULAR BIOLOGY AND NEUROBIOLOGY

For the awarding of the degree of Doctor of Philosophy (Ph.D.) in a professional field 2.3.
PHILOSOPHY (Philosophy of Science subfield)

Prepared by Associate Professor Dr. Boris D. Grozdanoff
Logic and Philosophy of Science Department
Institute of Philosophy and Sociology
Bulgarian Academy of Sciences

The text has 167 pages and consists of Introduction (4 pages), 4 chapters (150 pages in total, Conclusion (2 pages) and Bibliography (8 pages).

The dissertation has a well defined thesis that “The conceptual understanding of emergentness is to a high degree theoretically loaded and the positions in the debate on the issue often collide in unresolvable contradictions”. According to Nechev it is those contradictions that in fact lead to an unproductive conceptual fragmentation and theoretical isolation of the different offered interpretations. He puts an accent on the claim that “usually, this situation finds expression in the attempts to develop analyses, stepping solely on a theory, formulated in isolation and a methodology, characteristic of a given research discipline.”

The dissertation has a clear interdisciplinary character and supports this with the usage of originally developed research methods of “presenting facts of general and specific scientific achievements in the field of the emergent

structures, contextual descriptions, overview and an in-depth analysis of the problem”. The text formulates two original research methods as well.

In the Introduction Nechev argues for the actuality of the problem of emergentness as he defines it with the help of concepts from the classical metaphysics as characteristics, substances and phenomena, as well as with the help of the reduction operation as serving to deliver a working criteria for *difference* and *relation*. The doctoral candidate carves out the distinction between emergent phenomena and fundamental objects and argues that the latter stem from the former, but are nevertheless “novel” and “irreducible” to the latter. The role of the problem of emergentness is positioned in the context of the contemporary fields of the general philosophy of science and the general methodology of science as it uses predominantly, but not exclusively the methods of mathematical formalism and empirical observation as the leading sources of data for the scientific research.

Nechev underlies the role of emergentness for a number of concrete philosophic – scientific problems, such as scientific explanation, causality and the adequate analysis of empirical data with the help of the above mentioned methods. He also underlies the so called “revolution of observations”.

The main focus of the text is, of course, not blurred and dissolved in the too general field of this cross-disciplinary problem, as it actually figures in the debates; on the opposite, the dissertation focuses on the problem as it figures specifically in two distinct scientific fields, the ones of molecular biology and neurobiology.

The analysis of the emergentness problem concerns directly a number of distinct and modern philosophical problems which appear on the cross-points of epistemology, metaphysics and, in specific, philosophical ontology. Leading among them are causality, identity, supervenience, as well as the more general contrapositions of realism – antirealism and reductionism – antireductionism doctrines.

Nechev formulates and defends an original method for analysis of the emergentness phenomena, and dub it a cluster reaction analysis method. He demonstrates how the method can be applied towards the problem of epistemic status of the intuition. The potential of this application is demonstrated with respect to the possibility of clarifying explanatory incomplete concepts, figuring in relevant philosophical analyses.

The second original method, developed by Nechev in the dissertation, is the functional behavior analysis method. The doctoral candidate argues that this method can allow for the exhaustive critical discussion of an influential phenomenon in general philosophy, such as the problem of intuition. The method aims at the conceptual clarification of inferential and other problems in standard philosophical argumentations of theses, that involve appeal to the construct of the intuition. The method also demonstrates a promising potential for the categorical discrimination of the different emergentness phenomena, which is typically necessary due to being a result of the insufficiently well explicated propensity of a number of authors for those phenomena's "essentializing".

In the first chapter Nechev discusses critically and in a historical perspective the debate on the nature of emergentness and outlines the leading positions. Special attention is paid to the non-trivial distinction between emergent and resultant effects, as Nechev defends the thesis that the latter can be "computed by addition or subtraction of the participating acting causes". By contrast Nechev underlies that the emergent effects cannot be explained by such type of computational procedures due to their being distinctly novel with respect to the causes that bring them about.

Here I would like to critically comment that in the given in the dissertation example with addition and subtraction of certain parts, which Nechev interprets as a computational by kind procedure, is fully possible an additional interpretation of the procedures as of logical and thus non-computational type; which interpretation would allow for the exact same results via the employment

of, for example, quantifiers (existential, universal and plural quantification operator; for a discussion see the Stanford Encyclopedia entry at <https://plato.stanford.edu/entries/plural-quant/#Bib.>, and also Beall, J. and Restall, G., 2006, *Logical Pluralism*, Oxford: Oxford University Press.).

In addition, another non-computational procedure is conceivable, the one of the classical mereological interpretation, which is non-trivially distinct from the computational interpretation offered by Nechev, as well as from the above logical one, suggested by me (see Burge, T., 1977, 'A Theory of Aggregates', *Noûs*, 11: 97–117, както и Burgess, J. P., 2015, 'Lewis on Mereology and Set Theory', in B. Loewer and J. Schaffer (eds.), *A Companion to David Lewis*, Oxford: Wiley-Blackwell, pp. 459–469.) The critical comparative discussion of those two alternatives would only enrich the dissertation text in the possible perspective of its preparation for a monograph publication.

The second chapter of the dissertation presents the author's position of the phenomenon of emergentness. Nechev defends the thesis that the natural kinds and the emergent characteristics need to be viewed as elements that can be united in a common naturalistic framework of fixed tendencies of concrete system's reactions, realized by its internal relations and interactions. He develops his position as he evolves his original method of cluster reaction analysis.

In the original model, offered in the dissertation, the natural kinds are interpreted as *reaction clusters* and the emergent characteristics are interpreted as *complexes of reaction clusters*. Both qualifications are in a direct relation with Nechev's definitions of reaction potential and stability.

The leading result is the significant contribution for an effectiveness of the theoretical interpretations in the scientific methodology field as well as the argued for novel possibility of shared research work within the relevant fields of philosophical analyses.

The method itself is essentially the introduction of an original author's conceptual apparatus, which could provide the canvass for the developing a

naturalistic and non-essentialistic interpretation of the problem; this would contribute and cohere to the modern attempts of analysis of the emergentness phenomenon, such that are concretely relevant to the scientific practice of the specialized scientific disciplines.

In chapter 3 Nechev develops a critical analysis of the leading intuition positions, mainly with respect to their status of components in programs of knowledge accumulation, that can be subjected to the criterion of testability. The analysis is focused on the epistemic role of the intuition in the practices of rational-speculative argumentation. The arguments treat research programs and more specifically the ones that aim at exhaustive description and explanation of the subjective phenomena. Nechev criticizes the claimed possibility to achieve end foundations solely via rational-speculative argumentation. This is stated as the leading reason to chose the phenomenon of the intuition as a case study in the dissertation, as far as it in a significant degree expresses the attitudes to legitimize positions, akin to those found in classical metaphysical systems, for example.

In the last 4th chapter Nechev demonstrates the principle theoretical possibility to formulate a method of analysis for a subjective phenomenon, which includes two key aspects: argumentative-methodological and a naturalistic one. The method pretends also to allow the non-contradictory integration of two research models in a common naturalistic framework.

I accept the contributions (1-5) in the dissertation and I would like to underlie contribution 5 in particular, where are presented, analyzed and defended by arguments the two original author's methods, the cluster reaction analysis method and the functional behavior method, which serve 3 purposes. First, to justify applicatively the methodological claims, second to explicate and re-define the interrelations between systems, structures and functions of higher level and third, actually demonstrate the merits of the methods in cases of critical analyses of concrete phenomena from naturalist, non-essentialist and interdisciplinary perspectives.

I find and confirm that the contributions of the dissertation text comply with the academic requirements for a doctoral degree in both the Bulgarian Law and the academic practice of doctoral theses defenses in Bulgaria in the field of philosophy. I have no common publications with the author. I vote positively for the defense and I recommend the Commission to accept the current dissertation with a highest grade.

Dr. Boris D. Grozdanoff

Associate Prof.

IPS, BAS

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