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Review Report for the Ph. D thesis

Submitted to Charles University in Prague,
Faculty of Science, Department of Philosophy and History Science

Title: Towards an Ecology of the Brain: Reassessing the Dominant as Paradigm of Organismic and Anthropological Physiology

Author: Andres Kurismaa, M.Sc.

Supervisor: Doc. Mgr. Karel Kleisner PhD.

Dear Mgr. Valerie Havrdova,

I thank you for the invitation to review the Ph. D. thesis of Andres Kurismaa which I accept and submit herein the review report as requested.

1. General comments

1.1 The thesis of Andres Kurismaa is devoted to very actual theme – rethinking the principle of the dominant of the great Russian physiologist and thinker A. A. Ukhtomsky in context of some sound current findings in psychophysiology and human neuroscience. Author of thesis convincingly proved that many ideas of that principle which A. A. Ukhtomsky developed to the whole conception and doctrine, anticipated some current findings in psychophysiology, and neurobiology. Besides, the author came to conclusion, that the conception of dominance is still innovative and waits for realization in the form of principally new models in psychophysiology, neurobiology, cognitive science, robotics and AI. The author of the thesis deliberately limited his analysis to the fields of physiology and psychophysiology. It's quite justified, given that the integrative concept of the dominant is clearly have trans-disciplinary character.

1.2 It should be noted that outside Russia the concept of dominant is little known. A certain breakthrough in this field is the collection of works of Russian scientists edited by M. Nadin

(Nadin, M. (Ed.). *Anticipation: Learning from the Past*. – Cham: Springer International Publishing, 2015). This is a thematic publication devoted to analysis of anticipatory mechanisms in physiological systems from two points of view – the principle of dominant by A.A. Ukhtomsky and the “functional system” by P. K. Anokhin. In Russia itself, interest to the ideas of A. A. Ukhtomsky in academic circles has recently significantly decreased despite the appearance of several valuable publications, devoted to the scientific and cultural heritage of the great Russian physiologist, written primarily by Professor Lyudmila Vladimirovna Sokolova (see ref. in the thesis).

1.3 The author rightly notes that highly integrative character of the dominant conception in many respects was reduced in Russia to a more particular, much less integrative model of "functional system" by academician P. K. Anokhin, based on the idea of feedback in the classical post war cybernetics and physiology. It becomes obvious that the doctrine of the dominant goes far beyond this model.

1.4 The novelty of Kurismaa's work lies in convincing proof of the modernity and actuality of the dominant principle ideas. The author has managed to establish an unexpected close similarity of the concept of dominance with the most advanced contemporary integrative ideas in the field of physiology, neuroscience, anthropology, cognitive sciences.

In particularly, the author focused on the questions of historicity and temporal variability in neurobiology as explanatory tools, evolutionary aspects of neuroscience. In the presented publications of case studies, in which author took part as co-author, conception of dominance was applied to problems of human labor and social neuroscience.

1.5 The defendant's research is based on extensive and complete bibliography of Russian and foreign researchers, as well as his own scientific publications written jointly with Russian scientists.

1.6 The special value has the list of problems touched by A. A. Ukhtomsky which defendant formulated in contemporary terms. Among them the role of non-linear oscillations in neurophysiology, the problem of stochastic facilitation, problem of steady biological non-equilibrium and work, the problem of critical stability, meta-stable states and its relation to problem of homeostasis, situatedness, context-dependence of processes, ideas of emergency, anticipatory faculties. These problems are innovative, and questions posed by A. A. Ukhtomsky

many year ago are under discussion and are promising for development of contemporary psychophysiology, neuroscience, medicine, cognitive science and new robotics.

1.7 At last, the defendant made right conclusion about the primacy of the role of organizational processes for scientific explanation in physiology over static structures and mechanisms.

2. Special comments

2.1. As already noted, the author does not pretend to a comprehensive analysis of the all aspects of the dominant doctrine which extends beyond natural sciences. He characterizes the doctrine as an integrative and organizational, but in his later works A. A. Ukhtomsky significantly expanded the scope of the concept of dominant to social, environmental levels and applied it to humanitarian sphere - ethical and spiritual. In my opinion, the dominant conception could be useful for development of actively discussed the extended mind hypothesis (Clark, A., & Chalmers, D., J. "The Extended Mind" – Analysis, 1998, vol. 58(1), pp.7-19) and its later variants, so called "E-approaches" – that is, embodied, embedded, extended, enactive, ecological approaches to cognition (e.g. Gallagher S. "Decentering the Brain: Embodied Cognition and Critique of Neurocentrism and Narrow-Minded Philosophy of Mind". – Constructivist Foundations, 2018, vol.14, N. 1, pp.8-21).

2.2 It's desirable, that references on publications made in Russian, should be marked.

3. Conclusion

3.1 Summarizing, the thesis relevantly revealed actual and prospective theme of reexamining of one of the main achievements of the Russian physiological school – the study of dominant by the great physiologist acad. A.A. Uchtomsky. Defendant stated relationships of this study with the many up-to day integrative ideas in physiology, psychophysiology, neuroscience, and some other related disciplines.

3.2 The work is original, references are complete, current and accurate.

3.3 The work is presented clearly and without errors.

3.4 All conclusions made are justified

3.5 The defendant adds new aspects to the historiography of the Russian psychophysiological school and to understanding of A. A. Ukhtomsky's legacy, especially, by scientists outside Russia.

3.6 In my opinion, the thesis of Andres Kurismaa meets all the requirements imposed on the PhD degree in Theoretical and Evolutionary Biology.

I clearly recommend its acceptance.

Sincerely

A. Kazansky

St.-Petersburg, Russia, 31.08.2019