OPINION

by Prof. Teodora Ivanova Bakardjieva, PhD
Varna Free University, professional field 4.6 Informatics and computer sciences
on the scientific works presented for participation in the competition for the
academic position "Associate Professor" in the field of higher education 4. Natural sciences, mathematics and informatics, professional field 4.6 Informatics and computer sciences
for the needs of the department of Informatics at the New Bulgarian University (NBU)
published in the State Gazette no. 26/21.03.2023
with candidate Chief Assist. Prof. Stoyan Raykova Mishev, PhD

I. Assessment of compliance with the minimum national requirements and the requirements of the New Bulgarian University

The attached set of documents include a reference-self-assessment for the fulfillment of the minimum requirements of the ZRASRB, the Regulations for its application and the Ordinance for the development of the academic staff of the NBU. The minimum required points by groups of indicators for the academic position "associate professor" are presented in the following table:

Group of indicators	Contents	PhD	DSc	Chief Assist. Prof.	**Assoc. Prof.**	Professor	**Fulfillment of points**
А	Indicator 1	50	50	50	**50**	50	**50**
Б	Indicator 2	0	100	0	**0**	0	
В	Indicators 3, 4	0	0	0	**100**	100	**135**
Г	Sum of indicators 5 to 9	30	100	0	**200**	200	**357**
Д	Sum of indicators 10 to 12	0	100	0	**50**	100	**264**
Е	Sum of indicators 13 to 20	0	0	0	**0**	150	
Ж	Sum of indicators 21 to the end (mandatory for NBU)	0	0	40	**50**	70	**80**
З		0	0	40	**70**	70	**110**
И		0	0	40	**50**	70	**75**

The quantitative data shown certify that the candidate exceeds the minimum requirements for the individual groups of indicators. In the mandatory for NBU groups Ж-И, he fulfills 265 points against the required 170, and in group Д (citations in scientific publications, referenced in world-recognized databases with scientific information WoS and Scopus) – 34 citations, carrying 264 items.

The presented publications and citations by Dr. Stoyan Mishev have not been used to acquire the PhD degree.

II. Research activity and results

Dr. Mishev's research activities are mainly in two areas – theoretical and mathematical physics, as well as in machine learning and high-performance computing. This is evidenced by the titles of a large part of the publications presented at the competition, as well as the topic of the PhD dissertation "Correlations in the ground state and the structure of the low-lying states of spherical and transition nuclei".

The first research area includes approaches to the solution of the many-body problem in quantum mechanics and the applications of the obtained solutions in different physical systems. The coupled cluster method is of interest, as it makes it possible to generalize the quasi-particle-phonon model, significantly increasing its accuracy, and also to obtain new results for infinite nuclear matter at high densities, important for the central parts of neutron stars.

In the second research area, Dr. Mishev applies symmetric approaches borrowed from theoretical physics that give bounds on transformations between layers of forward-propagation neural networks, with some first results presented at a seminar paper. The candidate is currently working on presenting results on equivariant and invariant transformations between layers in graph neural networks, as well as applications of machine learning algorithms implemented on a quantum computer.

The candidate presents publications as a habilitation thesis.

The main scientific and scientific-applied contributions of Dr. Mishev can be summarized in several directions:

- Correlations in ground states and structure of low-lying states in odd-even atomic nuclei (4 publications in which the candidate is the first author);
- Equation of state of infinite nuclear matter (3 publications in which the candidate is the first author);
- Structure of a quantum state known as the phonon "vacuum" (2 separate publications);
- Excitation of "pygmy" dipole resonance in atomic nuclei by beta decay of neighboring nuclei (2 publications in which the candidate is second author)

Applied contributions include the use of computing for scientific research and teaching of computing disciplines.

All articles are in English and in publications that are referenced and indexed in world-renowned databases of scientific information.

The scientific production of the candidate is known and well accepted, which is evident from the citations of his works, as shown by the data in the table (264 points). The activity on projects is also large in volume.

III. Learning and teaching activity

The candidate has taught classes, independently or with colleagues, in a number of informatics disciplines and related areas: Processing of large volumes of data, Laboratory exercises in programming, Laboratory exercises in object-oriented programming, Programming, Object-oriented programming (C++), Prediction through data analysis, Neural networks, Machine learning software architectures, Quantum computers, Autonomous control systems. In 2022-2023, he is the main lecturer in a course of 34 lectures on quantum computers for advanced students at Sofia Tech Park. In the last three years, he has lectured for doctoral students and presented papers at various schools and seminars on the subject of machine learning. The average score from the student surveys is 4.46 (out of a maximum of 5). In my opinion, the pedagogical activity of the candidate Chief Assist. Prof. Dr. Stoyan Mishev is fully oriented in the field of the competition and he is suitable for occupying the academic position of "Associate Professor".

IV. Administrative and public activity

Dr. Stoyan Mishev is a member of the Union of Mathematicians, the Union of Physicists and the Union of Automation and Informatics in Bulgaria. He holds the post of chairman of the governing board of the "Institute for Modern Physical Research".

He created and developed the Master’s programme "Extraction of knowledge and technologies for big data" in the NBU. From December 2018 to July 2021, he organized four schools (three at NAO Rozhen and one AO Yuri Gagarin, Stara Zagora) in astrophysics and astronomy with the wide participation of NBU students. He has helped several times the participation of the NBU student in schools, practices and scientific visits to CERN, JINR-Dubna, University of Tübingen, as well as participation of NBU student with scientific reports at international scientific forums.

V. Personal impressions of the candidate (if any)

I have known Chief Assit. Prof. Dr. Stoyan Mishev recently in connection with his project activities. His competence and expertise in project management are impressive.

VI. Opinions, recommendations and notes on the activity and achievements of the candidate

I have no critical remarks on the candidate's work. I recommend that he continue his scientific work on the chosen topic.

CONCLUSION

The presented set of materials, as well as the general characteristics of the candidate's pedagogical, scientific and scientific-applied activity, are sufficient as an asset, as content and as a contribution, to motivate my clear conclusion to award the academic position of "Associate Professor" to Chief Assist. Prof. Dr. Stoyan Mishev. **I give my positive evaluation to the candidate Chief Assist. Prof. Dr. Stoyan Mishev** and I suggest to the respected Scientific Jury to vote on a proposal to the Academic Council of the New Bulgarian University – Sofia to be admitted to the academic position "Associate Professor" in professional field 4.6 "Informatics and Computer Sciences".

22.06.2023 Signature ……

/ Prof. Teodora Ivanova Bakardjieva, PhD /