OPINION

by Prof. Iva Ugrinova, Ph.D. – Institute of Molecular Biology "Acad. Roumen Tsanev" – BAS

About: Competition for the position of Associate Professor, announced by IMB-BAS in State Gazette issue 104, dated 10.12.2024

This opinion has been prepared in accordance with Protocol No. 1/17.02.2025 from the first meeting of the scientific jury appointed by Order No. 32-OB/28.01.2025 of the Director of IMB-BAS, determining its composition.

Documents and eligibility of the procedure:

A review of the documents submitted for participation in the competition shows that the procedure has been followed and the documents are in compliance with the requirements of the Law on the Development of Academic Staff in the Republic of Bulgaria and its application regulations.

Brief biographical data:

Dr. Emil Parvanov is a molecular biologist with rich international experience. He began his academic career with a Master's degree in Molecular Biology with a specialization in Biochemistry from the Faculty of Biology at Sofia University "St. Kliment Ohridski" in 2001. In 2006, he defended his Ph.D. at the Institute of Cell Biology, University of Bern, Switzerland, focusing on yeast genetics.

After his doctorate, Dr. Parvanov continued his research as a postdoctoral fellow at the prestigious Jackson Laboratory (USA), working on mouse genetics, specifically genotyping and phenotyping of hybrids. He later worked at Masaryk University in Brno, Czech Republic, deepening his expertise in protein analysis involved in DNA repair. Between 2014–2015, he rejoined the Jackson Laboratory to study proteins involved in DNA recombination.

From 2015 to 2021, he worked as a researcher at the Institute of Molecular Genetics, Czech Academy of Sciences in Prague, investigating the genetic mechanisms behind hybrid sterility in mouse lines. Upon returning to Bulgaria, he joined the Medical University – Varna (2021–2024), where he developed and optimized methods for the isolation of bone marrow stem cells as part of an external project.

Since June 2024, Dr. Parvanov has held the position of Assistant Professor at the Institute of Molecular Biology "Acad. Roumen Tsanev" at BAS, continuing his research in molecular and cell biology.

Scientometric indicators:

The candidate is participating in the competition with 15 publications, all original articles with an impact factor, totaling IF = 114.54. Of these, 11 are in Q1 quartile journals, 3 in Q2, and 1 in

Q3. Particularly impressive is the presence of articles in top-tier journals in the field such as *Science, PLoS Biology, PLoS Genetics*, etc.

The high value of the published results is reflected in both the journal names and their international impact – according to ISI Web of Knowledge, there are 1,057 citations (excluding self-citations). Dr. Parvanov's h-index is 15. It is noteworthy that in three of the five articles included in his habilitation work, he is the first author, clearly highlighting his individual contribution to the research.

Evaluation of major scientific contributions:

Dr. Parvanov has systematically categorized his original scientific contributions into four thematic areas. The first three form the foundation of his habilitation work (criteria B4), and the fourth relates to works included under indicator G7.

What stands out is the intelligent and accessible way the candidate has presented his contributions, which greatly facilitates understanding, even for non-specialists. I will briefly summarize the key contributions below:

1. **Mapping of recombination events along mouse chromosomes:** This study focused on meiotic recombination mapping across mouse chromosomes to identify crossover and gene conversion sites. Using crosses between evolutionary distant mouse strains C57BL/6J and CAST/EiJ and genotyping over 6,000 individuals, the research revealed uneven recombination distribution, identifying hotspots that account for most recombination activity. Crossover interference and sex-based differences were also observed. (Publication B4.1, 120 citations)

2. **Identification of trans-acting factors determining hotspot positions and activity:** Based on the recombination map of mouse chromosome 1, this research aimed to identify genetic factors influencing hotspot activity. Through the use of congenic lines and QTL analysis, the gene *Prdm9* was pinpointed as a key regulator. *Prdm9* encodes a histone methyltransferase that defines recombination sites via zinc finger-mediated DNA binding. This work also resolves the "hotspot paradox" by showing how *Prdm9*'s allelic diversity maintains recombination sites. (Publications B4.2 and B4.3, 493 citations)

3. **Mechanism of action of Prdm9:** The study revealed that *Prdm9* trimethylates both H3K4 and H3K36 at recombination hotspots. This dual histone mark was correlated with crossover length. In vitro data further suggested a potential H3K9 trimethylation. Protein interaction studies identified CXXC1, EWSR1, EHMT2, and CDYL as direct partners via *Prdm9*'s KRAB domain. A model was proposed wherein *Prdm9* directs DNA to the chromosomal axis via interactions that ultimately lead to SPO11-mediated double-strand breaks. (Publications B4.4 and B4.4, 192 citations)

4. **Analysis of digital health, patient safety, and personalized medicine:** In another direction of his work, Dr. Parvanov contributed to medical and public health research, especially in digital health and patient safety. His publications include reviews on liver diseases, plant-based therapies, molecular mechanisms of hepatocellular carcinoma (e.g., NRF2), and analyses of societal responses during COVID-19 (e.g., antigen testing, mask use, misinformation via social media). Additionally, he examined trends in non-invasive sensors for monitoring blood pressure and glucose using patent databases. These works, included under indicator G (G1–G10), have attracted 252 citations.

Assessment of additional indicators:

Projects and funding: Dr. Parvanov's professional experience in Austria, the USA, and the Czech Republic was largely supported by competitive funding – through scholarships or research projects. Notably, he led two projects in the Czech Republic, securing nearly €450,000 in funding, demonstrating his capability to manage national and international research funding.

Participation in scientific forums: The candidate has participated in over 20 international scientific events.

Teaching experience: While in Prague, Dr. Parvanov supervised Ph.D. student Amisa Mukai, who defended her thesis in 2022 at Charles University on the role of *Prdm9* in hybrid sterility in mice.

CONCLUSION:

In summary, the brief analysis of Dr. Emil Damyanov Parvanov's publications clearly demonstrates the high scientific value of his research. Publications in prestigious journals such as *Science*, *PLoS Biology*, *PLoS Genetics*, and *Frontiers in Pharmacology* are strong evidence in support of a positive evaluation.

There is no doubt that the candidate is an accomplished independent researcher with analytical thinking, enthusiasm, and creativity. His scientometric indicators not only meet but in many respects exceed the requirements for the position of Associate Professor at IMB-BAS.

I know the candidate personally and believe that in addition to being a researcher and lecturer, he has the necessary qualities to work in and lead a team. I strongly recommend to the esteemed Scientific Jury to vote positively for the appointment of Dr. Emil Damyanov Parvanov as Associate Professor at IMB-BAS.

April 15, 2025

Sincerely: