# REPORT

on the materials submitted for a competition for the academic position of "Associate professor" in the field of higher education 4. "Natural Sciences, Mathematics and Informatics", professional field 4.3 "Biological Sciences", scientific specialty "Biophysics", for the needs of the Laboratory " Transmembrane Signaling", Institute of Biophysics and Biomedical Engineering" - BAS, announced in SG No. 58/18.07.2025

by Prof. Dr. Maya Yaneva Velitchkova,

a member of the scientific jury according to order No. № 632/01.08.2025 of the Director of IBBE-BAS

One candidate participated in the competition announced by the Institute of Biophysics and Biomedical Engineering – BAS (SG No. 58/18.07.2025) for the academic position of "Associate professor" for the needs of Laboratory "Transmembrane Signaling " – Senior assistant professor Dr. Sonia Nikolova Apostolova. In order to participate in the competition, all the required documents that meet the requirements of LDASRB and the Regulations on the terms and conditions for acquiring scientific degrees and occupying academic positions at IBBE - BAS have been submitted.

***Professional and thematic development of the candidate***

Senior assistant professor Dr. Sonia Apostolova graduated from the Faculty of Biology of Sofia University "St. Kl. Ohridski" with a bachelor's degree in "Molecular Biology". After two years of training at the same faculty, she received a "Master's" degree in "Virology". She began her career as a specialist biologist at the Institute of Experimental Morphology, Pathology and Anthropology with a Museum before moving on to the IBBE. In 2015, she won a scholarship and went as a doctoral student to the University of Lerida and the Biomedical Research Institute in Lerida (IRB Lerida) in Lerida, Spain. After successfully defending his thesis on the topic: "The RING domain of Nse1: roles in the stability of the Smc5/6 complex and genome integrity in human cells" with the grade "Excellent "Cum Laude" she obtained PhD degree. After returning to Bulgaria, Dr. Apostolova was appointed as a specialist biologist at the IBBE, and after a competition in 2022, she took up the position of Senior assistant professor in the Laboratory "Transmembrane Signaling". Undoubtedly, her work on her dissertation at the prestigious University of Lerida, as well as her specialization in the Cell Cycle Signaling and Control Laboratory at the Faculty of Medicine of the University of Barcelona, contributed to her professional growth.

Dr. Apostolova's scientific activity is in the field of research on the antitumor activity of natural and synthetic compounds and the biocompatibility of materials for application in tissue engineering and regenerative medicine. This topic is directly related to the scientific direction of the research of the Transmembrane Signaling Laboratory of the IBBE, part of the main scientific directions of the IBBE. Dr. Apostolova is a co-author of 21 scientific publications in a number of reputable scientific journals, presenting results from her research, which have collected over 80

independent citations (excluding self-citations of all authors). A large part of the experimental results have been presented at international and national scientific forums as posters and reports.

***Scientific data***

Senior assistant professor Apostolova has presented a detailed report on the fulfillment of the minimum national requirements for holding the academic position of "associate professor", which correctly reflects her scientific production and shows that these requirements have been met.

Dr. Apostolova participated in the competition with 15 scientific papers, 13 of which are in journals with an impact factor and two in journals with an SJR. The total impact factor of the articles is 40.068. The articles are distributed as follows: 8 in journals in quartile Q1, 4 in journals in quartile Q2 and 3 in journals in quartile Q3. Dr. Apostolova is the first author of three of the materials and the second author of three of the articles with more than 4-5 authors. It should be noted that a significant part of the publications – 9 issues with which Dr. Apostolova participates in the competition, are from the last 5 years. To participate in the competition, the candidate has submitted a list of 44 independent citations (excluding self-citations of all authors) of the articles submitted for the competition. After excluding self-citations of all authors, Dr. Apostolova's h-index is 6 (Scopus, 01.10.2025). These scientometric data define Senior assistant professor Dr. Apostolova as a scientist with active research activity.

According to the submitted report on the fulfillment of the minimum national requirements of the ZRASRB and the Regulations on the specific conditions and procedure for occupying the academic position of "Associate professor" at the IBFBMI-BAS, the total number of points from the scientific indicators with which Dr. Apostolova participated in the competition is 463 points, thus fulfilling and exceeding the required minimum of 430 points.

The distribution of points by indicators is as follows:

In group A (dissertation for awarding the ESD "doctor") – 50 points.

In group B.4, 5 articles are included, 2 of which are in journals in quartile Q1, one in Q2 and two in journals in quartile Q3, with the total number of points by indicators group B being 100 points (the requirement is for a minimum of 100 points). The total impact factor of the articles in indicator B.4 is 8.526.

In the group of indicators G, 10 publications are included, all of which are in indicator G7, distributed as follows: 6 are in journals in quartile Q1, 3 in Q2, 1 in Q3 and two with SJR. Their total impact factor is 31.677 and they carry 225 points with a required minimum of 220 points.

In group D (citations), the candidate presented a reference including 44 independent citations or 88 points with a minimum requirement of 60 points.

Dr. Apostolova has participated in the development of 8 national and 5 international scientific projects, and has led a project under the National Program "Young Scientists and Postdoctoral Fellows" at the Ministry of Education and Science.

***Main directions of scientific research work and scientific contributions of the candidate***

The scientific research work of Senior Assistant Professor S. Apostolova, reflected in the publications submitted for review, is united in three main directions:

***1. Study of antitumor activity and anti-metastatic potential of new natural and synthetic molecules in human in vitro cell models.***

***2. In vitro study of the biocompatibility of various materials for the purposes of tissue engineering and regenerative medicine.***

***3. Application of various therapeutic approaches for the treatment of diabetic neuropathy and study of the influence of melatonin deficiency in the aging process in in vivo models.***

In the first direction, Senior assistant professor Apostolova presents nine scientific articles, which combine research on the antitumor and anti-metastatic activity of some natural products, such as extracts from the plant *Petasites hybridus* L. (G7.7), some types of propolis (G7.6), hemocyanin from the sea snail *Rapana thomasiana* (B4.1). A part of the articles are devoted to improving the water solubility of natural molecules to facilitate their penetration through the cell membrane and hence to a better therapeutic effect (G7.1, G7.5). I would like to point out here the significant contribution of the developments related to the modification of highly hydrophobic molecules in ionic liquids (ILs) based on amino acids (AAs) applied to the biologically active compound betulinic acid (BA). It has been found that the inclusion of a cation charged or polar BA improves the water solubility of BA and leads to a more pronounced cytotoxicity towards non-invasive hormone-dependent breast cancer cells MCF-7, compared to unmodified BA, with the strongest cytotoxic effect being found for an ionic liquid with lysine (G7.1). The same innovative and reliable approach to increasing the solubility, absorption and assimilation by the body of natural substances has been applied to hemocyanin isolated from a sea snail and it has been shown that the one modified with ionic liquids or with organic salts based on choline exhibits higher antiproliferative activity and cell specificity (B.4). Of interest in terms of improving the effectiveness of antitumor compounds is also the work on the activity of benzimidazole-hydrazone incorporated into nanomicelles (G7.4), as well as research on the potential antitumor effect of existing drugs such as erufosine and statins (B4.4, G7.8).

In the second area regarding the *in vitro* compatibility of materials for the purposes of tissue engineering and regenerative medicine, three articles are included, and it should be noted the contributing nature of the study on the angiogenic potential of endothelial cells cultured on 3D gelatin-based matrices, as it was found that the application of a physiological electric field perpetuates the angiogenic response of endothelial cells (G7.9).

In the third direction, I will note the contributing nature of the demonstrated beneficial effect of the antioxidant riboflavin and the drug liraglutide in the treatment of diabetic aneuropathic pain and the proposed hypotheses for the mechanism of action of the studied preparations (B4.3; G7.2).

The above clearly shows that Dr. Apostolova has outlined a scientific topic that is relevant both for enriching our knowledge about the possibilities of using natural and synthetic products in the treatment of cancer, and for searching for suitable materials for regenerative medicine with significant potential for practical application.

***Critical notes and questions to the candidate***

As an omission, I would like to note that the proposed extended habilitation report does not represent Dr. Apostolova's views on her future research, but I expect them to be included in her presentation. In addition, I would recommend that the candidate in the future increase her activity, primarily in the management of research projects and in the training of master's and doctoral students.

***Conclusion***

The presented materials convincingly show that Dr. Sonya Apostolova is a scientist working in a relevant and significant area of modern science. The subject of his research is among the main areas in the goals and mission of the IBFBMI. A large part of the research is of an original nature and is a contribution to fundamental science, and many of them have serious potential for practical application. Dr. Apostolova's scientific indicators fully meet both the national and IBFBMI criteria for holding the academic position of "Associate professor".

I positively assess the candidacy of Senior Assistant Professor Dr. Sonya Apostolova for holding the academic position of "Associate professor" and will vote FOR. I recommend that the members of the esteemed Scientific Jury propose to the members of the Scientific Council of the IBBE to elect Dr. Apostolova to the academic position of "Associate professor" in professional area 4.3. "Biological Sciences", scientific specialty "Biophysics".

November, 19th , 2025
Sofia

Signature:
/Prof. M. Velitchkova/