

OPINION
on holding an academic position "PROFESSOR"

presented to a scientific jury formed by order № 4 of 14.05. 2021 of the Rector of the Plovdiv University "Paissi Hilendarski" (PU)

Subject: Announced competition: for Professor in professional field 4.3. Biological Sciences (**Microbiology**), announced for the needs of the Department of Biochemistry and microbiology of the Faculty of Biology at PU

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In the competition for "professor", announced in the State Gazette, issue 4 from 14.05. 2021 and in the website of Plovdiv University "Paisii Hilendarski" for the needs of the Department of Biochemistry and Microbiology at the Faculty of Biology as a candidate participates Assoc. Prof. Dr. Sonya Trifonova Kostadinova from the Department of Biochemistry and Microbiology at the Faculty of Biology of Plovdiv University " Paisii Hilendarski"

The materials presented by the candidate on paper is in accordance with the Regulations for development of the academic staff of PU, and includes the following documents:

- Administrative documents (14 documents, including application to the Rector, CV, list of scientific papers, references to the minimum requirements for the academic position of professor according to the law and the additional requirements of PU, habilitation certificate, reference to the workload and others)
- Appendices (3 issues, including scientific papers, reference to citations of papers, etc.)

The candidate Assoc. Prof. Dr. Sonya Trifonova Kostadinova has presented a full list of 60 scientific papers, one monograph, 5 textbooks and teaching materials.

In order to participate in the competition for the academic position of "Professor", 36 scientific publications were presented, which were not used for the acquisition of PhD and the academic positions of "Assistant Professor" and "Associate Professor", distributed as follows - 18 publications in journals with impact factor and refereed and indexed, 12 publications in journals without impact factor, 3 publications in proceedings of scientific conferences with scientific review, one monograph and one textbook. All presented scientific papers are on the subject of the competition.

All documents for the competition are prepared precisely and accurately and are presented according to the requirements.

General information about the candidate's professional career

Assoc. Prof. Dr. Sonya Kostadinova Trifonova is a graduate of Paisii Hilendarski University of Plovdiv. After graduating she worked for 2 years as a teacher in PG in food technology, in 1988 she started working as a biologist in PU. From 1990 to 2003 is an assistant and Assistant Professor of Microbiology at the Department of Biochemistry and Microbiology. Since 2003 she is currently an associate professor at the same department. She has extensive experience in teaching - gives a number of lecture courses in microbiology in the bachelor's and master's degrees of the Faculty of Biology. Actively participates in the organization of the educational process and accreditation of quality in the Faculty of Law, Organization and management of the activities of the Faculty of Biology of the University of Plovdiv. She has held

important management activities – Deputy Dean of the Faculty of Law, Head of the Department of Biochemistry and Microbiology. Since 2015 up to now she is the Dean of the Faculty of Biology. It is obvious that the candidate has expertise for teamwork, high professionalism in the organization and implementation of training at the university.

The overall experience of the candidate (teaching, scientific and professional) is entirely related to the direction of this competition.

Analysis of the materials submitted for participation in the competition

The analysis of the materials submitted for participation in the competition is in accordance with the requirements of the Law on the Development of the Academic Staff of the Republic of Bulgaria as well as in accordance with additional requirements of the Plovdiv University

The candidate has attached a list of 60 scientific papers, 36 of which are after acquiring the academic position of associate professor. One of these papers is published in a journal with Q1, 2 in a journal with Q2, 8 publications in journal with Q3 and 8 papers in journal with Q4. A monograph, two textbooks (one independent and one co-authored) and a guide for practical exercises are presented two.

The list of the citations of the candidate's publications is presented (101). The citations are mainly from foreign scholars with impact factor and impact rank journals

The scientific papers are distributed as follows: 18 publications in journals with impact factor or impact rank, which are referenced and indexed in the databases with scientific information - Web of Science and Scopus, 12 publications in refereed journals without impact factor or impact rank, 3 publications in proceedings of scientific conferences with scientific review. The candidate has participated in international and national forums with oral and poster presentations. She has been a project manager and has participated as a member of the teams of several national projects. The Assoc. Prof. Dr. Sonya Trifonova has been supervisor of many master's students and 2 PhD students successfully defended. In conclusion, the candidate fully meets the criteria of ZRASRB and the Regulations for its application for the academic position of Professor and some of the indicators exceed its requirements. The additional requirements of the Faculty of Biology of the University of Plovdiv for holding the academic position of Professor are also fulfilled as follows: Author of the textbook: Microbial Metabolism, 2021, ISBN 978-619-202-641-7, Co-author of the textbook: Biological Membranes, 2016, ISBN 978-619-202-111-5, supervisor of two doctoral students, 32 years of pedagogical experience in the University of Plovdiv, Head of a national project - HE 321/07 (DOI-884 / 16.10.2007), of PI 5.11 Biotechnologies, 1.3 Pedagogy of teaching in, 4.3 Biological sciences (bachelor's and master's degrees) , Participation in the institutional accreditation of PU "P. Hilendarski "- 2013 and 2018, Participation in activities for preparation and updating of educational documentation and other activities.

Assessment of educational and pedagogical activity and preparation of the candidate

The teaching activity of the candidate is impressive. Assoc. Prof. Dr. Sonya Trifonova has conducted lectures on Microbiology for all bachelor's programs at the Faculty of Biology, lectures on Ecology of Microorganisms, Physiology and Biochemistry of Microorganisms, Microbial Metabolism, Microbiological Diagnostics, Biotransformation in master's programs. According to the presented report, her teaching load annually significantly exceeds the requirements for classroom employment of habilitated lecturers. It is obvious that Assoc. Prof. Dr. Sonya Trifonova is a lecturer with extensive experience in teaching both General Microbiology and various areas of this science. The lecture courses as well as the practical classes are provided with the respective textbooks in which she is the author and co-author.

Evaluation of the scientific and scientific-applied activity of the candidate

The scientific papers submitted for review are in the scientific field of the competition for the academic position of "Professor" in Microbiology and can be systematized in the following areas: Microbial enzymes, Virulence factors in microorganisms and Ecology of microorganisms

As it was mentioned before the candidate submitted 36 scientific papers as follows:

1 monograph, 18 publications in journals with impact factor or impact rank, which are referenced and indexed in the databases with scientific information - Web of Science and Scopus, 12 publications in refereed journals without impact factor or impact rank, 3 publications in proceedings of scientific conferences

The monograph on "Phospholipases C, produced by *Bacillus* species, of which the candidate is the sole author, is on a particularly important topic in recent years, related to the study of the potential for production of hydrolytic enzymes (phospholipases) from bacteria with different taxonomic status. The results presented in it are original and an in-depth analysis of the obtained results is made in comparison with those of other authors as well as significant conclusions are drawn about the importance of this group of enzymes. The monograph is an in-depth scientific work that would be of great value to those working in the field of bacterial enzymes as well as for masters and PhD students.

In the above-mentioned areas, the candidate's research has significant scientific contributions with both fundamental and potential for practical application. More significant contributions are:

•In the field of microbial enzymes (papers №№ III.2.2, 3.2, 3.5, 2.16)

The research is related to determining the activity of hydrolytic enzymes in bacteria, optimizing the conditions of cultivation, isolation and purification of enzymes, determination of the enzymatic and molecular properties of the purified proteins. In this direction, the candidate has significant contributions of a fundamental nature. Significant screening was performed, active producers were selected, and the production of phosphatidylinositol-specific phospholipase C in *B. sphaericus* strains was demonstrated for the first time. The finding that *B. cereus* and *B. thuringiensis* species are among the best bacterial producers of phospholipase C has been confirmed. Very high enzyme production has also been demonstrated in *B. thuringiensis* species. A number of characteristics related to the cultivation and enzymatic production of *B. cereus* and *B. thuringiensis* have been identified. In addition to phospholipase C, species of the genus *Bacillus* have also been studied for production of other enzymes. The activity of the enzyme alkaline phosphatase in *B. cereus* was studied and the production of extracellular (AP I) and membrane-bound (AP II) alkaline phosphatase was established. The conditions for the production of the enzyme have been established, an effective procedure for purification of the enzyme, the conditions for maximum activity of the enzymes and the factors inhibiting this activity have been carried out. In the analysis of the proteolytic activity of 166 strains of the genus *Bacillus*, activity was proved in 90% of them. Strain *B. thuringiensis* 14 was selected as a highly active enzyme producer. Representatives of the genus *Pseudomonas* - *P. fluorescens*, *P. putida* and *Pseudomonas sp.* has been investigated too. The highest activity was found in *P. fluorescens* and the cultivation conditions were optimized to stimulate enzyme production. The obtained results and original contributions are reflected in several scientific publications, which are some of the most cited by other authors. These results have the potential for practical application in the future work of the candidate.

In the field of microbial pathogenesis (papers №№ III.3.10, 3.7, 2.1, 2.3, 2.4, 2.5, 3.4, 3.12)

The research is related to the identification of microorganisms associated with urogenital tract infections, determination of virulence and pathogenicity factors in microorganisms and the correlation between them, elucidation of the mechanisms of microbial pathogenesis. Bacteria isolated from patients with urogenital tract infections, determination of virulent determinants, determination of their drug resistance, which is necessary both for the application of appropriate therapy and for the discovery of new approaches in the treatment of infections. Extensive screening has been performed and the most common etiological agents have been identified. The virulent determinants of twenty strains of *Escherichia coli* isolated from the urine of patients with various urinary tract infections were studied. Virulent determinants such as adhesins, motility, hemolysins, serum resistance, and biofilm formation were studied phenotypically and by multiplex PCR.

Susceptibility studies of isolates to beta-lactam and aminoglycoside antibiotics and sulphonamides are important. The plasmid profile of the isolates and their participation in drug resistance were analyzed. To demonstrate the virulence determinants of strains associated with urinary tract infections, a biofilm-forming capacity of 50 *E. coli* strains isolated from patients with different symptoms of urinary tract infections was analyzed. The studies of extracts of medically important plants (*Rhodiola rosea*, *Arnica montana*, *Petasites albus*, *Petasites hybridus*) on the biofilm forming capacity of the clinical isolate *E. coli* are of original character. In connection with the increasing drug resistance of microorganisms and the search for alternative therapeutic agents, the studies of antimicrobial activity of newly synthesized benzimidazole derivatives are of original character and it was found that eight of the synthesized compounds show antimicrobial activity (bactericidal, bacteriostatic and antifungal) against *Staphylococcus aureus*, *Enterobacter aerogenes* and *Candida albicans*.

These studies are essential because urinary tract infections are the most commonly diagnosed infections in humans and pose a serious health and economic problem to society.

•In the field of ecology of microorganisms (papers №№ III. 2.7, 3.8, 3.6, 3.2.11,3.2.18,3.2-15,3.2.9,3.2.12,3.2.13,3.2.17)

Contributions in the field of microbial ecology can be systematized in several different areas - determining the microbiological status of aquatic ecosystems (dams) of important economic importance, analysis of microbiota in wetlands in southern Bulgaria, construction of biosorbents for heavy metals by waste biomass and bioremediation of polluted waters. These studies are of an original nature and are of great economic importance.

The first comprehensive metagenomic analysis of the planktonic bacterial community of two large and economically important for Bulgaria dams - Batak Dam and Tsankov Kamak Dam. The genera *Limnohabitans* and *Rhodoferrax* have been found to be dominant, suggesting their importance in aquatic food webs. The data obtained can contribute to a better understanding of microbial diversity in freshwater environments and serve as a basis for future comparisons.

Another area in the field of microbial ecology is the characteristics of microbial communities in wetlands in southern Bulgaria. The state of microbial communities and their ability to form biofilm in two Natura 2000 protected wetlands, which are rare specific ecosystems, were analyzed. This is the first detailed analysis of bacterial diversity in two different wetlands in the Maritsa River basin. Of particular interest are studies on the bioremediation of water contaminated with heavy metals. The approach to the use of immobilized microbial biosorbents for the removal and concentration of metals from aqueous solutions is of serious scientific interest. Studies have been carried out to construct a new composite biosorbent for the removal of heavy metals from

aqueous solutions. The possibility of waste biomass from *Bacillus thuringiensis* being used as a biosorbent for Pb, Cd and Hg was also investigated and the results obtained are promising.

The analysis of the candidate's research work shows that Assoc. Prof. Dr. Sonya Trifonova is a researcher familiar with the current problems of microbiology, a scientist who is able to develop new areas. The results obtained are fundamental, many of the contributions are original and of serious scientific interest. There are also a number of methodological contributions in all three areas of the candidate's research. There is significant potential for practical application of the obtained results. Particularly promising for development is the field of ecology, which the candidate will probably develop in the future

Conclusion

The documents and materials submitted by the candidate Assoc. Prof. Dr. Sonya Trifonova meet all the requirements of the Academic Staff Development in the Republic of Bulgaria (RASRB), the Regulations for implementation of the RASRB and the relevant Regulations of PU "Paisii Hilendarski". In the works of the candidate there are original scientific and applied contributions, which have received international recognition. The scientific and teaching qualification of Assoc. Prof. Dr. Sonya Trifonova is undoubted a highly qualified researcher, erudite lecturer, organizer with high expertise. The results achieved by Assoc. Prof. Dr. Sonya Trifonova in the teaching and research activities fully comply with and exceed the minimum national and additional requirements adopted in connection with the Regulations of the University of Plovdiv for the application of the Law on Research and Development.

After getting acquainted with the materials and scientific papers presented in the competition, analysis of their significance and the scientific, scientific and applied contributions contained in them, I find it reasonable to give my **positive assessment** and strongly recommend the Scientific Jury to prepare a report-proposal to The Faculty Council of the Faculty of Biology to choose Assoc. Prof. Dr. Sonya Trifonova for the academic position "Professor" at the University of Plovdiv "Paisii Hilendarski" in: Field of higher education 4. Natural Sciences, Mathematics and Informatics, Professional field 4.3. Biological Sciences (Microbiology).

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Sofia

Prepared the opinion:
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