Attitude of Reviewer

by Professor Nina Atanassova, PhD, DSc, Institute of Experimental Morphology, Pathology and Anthropology with Museum, Bulgarian Academy of Sciences

Re: competition for the academic position „PROFESSOR“ in the professional field 4.3. Biological Sciences, specialty "Microbiology – genomics and regulation of gene expression in prokaryotes" in the Department "General Microbiology" of the Stephan Angeloff Institute of Microbiology, Bulgarian Academy of Sciences, announced in the Newspaper of State no. 47 of 22.05.2020

Associated Professor Penka Mladenova Petrova is the only candidate in the announced competition for the occupation of the academic position "Professor" in the Department "General Microbiology" of the Stephan Angeloff Institute of Microbiology, Bulgarian Academy of Sciences. She presents detailed documentation of an outstanding scientists with undoubted indicators for academic promotion.

Assoc. Prof. Petrova is a graduate of the National High School of Natural Sciences and Mathematics "Acad. Lubomir Chakalov“. She graduated in 1994 from the Faculty of Biology at Sofia University “St. Kliment Ohridski” with a degree in Biotechnological Processes, Genetic and Cell Engineering. She started work in the Institute of Microbiology in 1997 as a PhD student in the field of microbial genetics. Assoc. Prof. Petrova defended her PhD thesis in 2003 and she was habilitated in 2011. She obtained the scientific degree "Doctor of Science" in 2020 after successfully defending dissertation on “Molecular biological investigations of new bacterial glycoside hydrolases with industrial application”.

Assoc. Prof. Petrova's entire scientific production includes 68 publications. Of these, 40 have been published in scientific journal with impact factor or impact rang and 2 articles are book chapters published by prestigious international publishers - Elsevier и CRC Press. The total impact factor from the publications is 54,785. Eleven reports presented at scientific forums, have been published and of these four are presented abroad. She is a co-author of patent №66411 “Method for the preparation of 2,3-butanediol” from 2014. 731 citations were found, of these 404 in SCOPUS giving an h-index 12.

The publications presented in the current competition are 37, of which 23 are published in indexed journals, 4 are reports in proceedings of international conferences and 10 are in journals without impact factor / impact rang. Articles in indexed journals (23) are distributed as follows: 1) in Q1 - 6, Q2 - 9, Q3 - 3 Q4 - 1, with SJR without Q - 1, book chapters - 2; patent - 1. Five publications are included in dissertation for scientific degree "Doctor of Science" and they are published in journals with Q2. It is obvious that the articles with Q1 and Q2 are over 65%, which indisputably proves the quality of the scientific production of Assoc. Prof. Petrova.

Assoc. Prof. Petrova presents a detailed information on the fulfillment of the group of criteria in section 4.3. Biological Sciences required by the Regulations of the Institute of Microbiology and the Bulgarian Academy of Sciences for application of ZRAS RB. She used 23 publications. The leading role of the candidate is proved by the fact that in over 2/3 of the articles (16 out of 23) she is the first or last / corresponding author.

The metric data of scientific activity were calculated using the metric of SJR (**Table 1**). In the **Б indicator**, the candidate presents 5 articles with Q2 which give **100** points covering the respective minimum. **Indicator B** includes 5 articles, respectively in Q1 - 3, Q2 - 1, with SJR, without Q - 1 and they generate a total of **105** points with a required minimum of 100 points.

Indicator Г presents a total of 13 articles, respectively in Q1 - 3, Q2 - 3, Q3 - 3, Q4 - 1, book chapters - 2 and 1 patent and they generate a total of **247** points with a required minimum of 220 points. **Indicator Д** include a total of 200 citations in SCOPUS and WoS, observed after the habilitation (from 2012 to 2020), which give **400** points, with a required minimum of 120 points. In the indicators of **group Е - 575** points with a required minimum of 150 points. **The table 1** shows that **indicators Б, В, Г, Д and Е** received a total number of points significantly exceeding the required minimum.

Table 1. *Comparison of the metric data of scientific activity by Assoc. Prof. Petrova with the required minimum according to the Regulation of the Institute of Microbiology and the Bulgarian Academy of Sciences for application of ZRAS RB.*

Indicators	Content	Required score in points	Applicant's score in points
А	PhD Thesis	50	**50**
Б	Dissertation for scientific degree "Doctor of Sciences"	100	**100**
В	Habilitation work – scientific articles published in journals/books referred and indexed in Web of Science and Scopus (Q1) (Q2) (SJR without Q)	100	 75 20 10 **105**
Г	Scientific articles published in journals/books referred and indexed in Web of Science and Scopus that are not included in the Habilitation work (Q1) (Q2) (Q3) (Q4) (Book chapter) Patent	220	 75 60 45 12 30 25 **247**
D	Citation in scientific journals, books, patents found in Web of Science and Scopus	120	**400**
Е	✓ Scientific degree "Doctor of Science" (27.03.2020) ✓ Supervisor of defended PhD thesis ✓ Participation in national research or educational project ✓ Participation in international research or educational project ✓ Coordination of national research or educational project ✓ Coordination of Bulgarian team of international research or educational project		75 75 120 40 60 150

	✓ Funding amount received from the project coordinated by the applicant	120	55 **575**
TOTAL		710	**1477**

The total score of Dr Petrova's metric data exceeds the additional requirements of Iinstitute of Microbiology, included in its regulations, concerning the number of citations, the value of the total impact factor of publications, the h-index, project management and defended PhD students.

The high quality of the scientific production by Assoc. Prof. Petrova and the top priority of her research field have been proved by the fact that her articles have been published in prestigious international journals in the field of applied microbiology and biochemistry, biotechnology, bioresources technologies and food biotechnologies, which illustrates the interdisciplinary profile of her research. This determines their high citation rate, even articles published in 2019 also have been founded cited.

The scientific achievements by Assoc. Prof. Petrova are in the field of development and application of new molecular approaches in three main topics: 1) detection of new enzymes through genomic, transcriptional and enzymological approaches; 2) sequencing of genomes and metagenomas; 3) application of genetic engineering methods for construction of new bacterial producers of acids and fuels.

The contributions from the first topic are of fundamental and applied importance for the food industry and medicine. They are derived from extensive and in-depth research on the enzymes responsible for the degradation or synthesis of prebiotic carbohydrates (inulin, fructooligosaccharides, galactooligosaccharides and starch) by lactic acid bacteria (LB), which have been of interest to foreign companies. New LB strains capable of degrading or synthesizing prebiotics have been isolated and their geographical biodiversity has been analysed in details. LB strain isolated from boza have been described for the first time and they combine amylolytic and probiotic properties with significant antimicrobial efficacy against some pathogenic microorganisms. Of particular importance to the dairy industry are the studies, revealing the unique beneficial properties of Bulgarian yogurt and in particular the ability of the Rhodope strains of L. delbrueckii ssp. bulgaricus to synthesize galacto-oligosaccharides (GOS) with a proven bifidogenic effect. Moreover, Assoc. Prof. Petrova has developed her vision for future genetic research of LB related to the application of Next Generation Sequencing (NGS) for rapid analysis of entire genomes and microbial communities, with application in the development of traditional Bulgarian dairy and cereal foods.

The scientific achievements of the second topic reveal the genetic basis of Bacillus velezensis to convert cellulose, lignocellulose, starch and inulin directly into valuable low molecular weight products contributing to the ecology and utilization of organic waste from agricultural and cellulose processing industry. A new scientific field is metagenomic sequencing of a cellulose-degrading community with application for waste purification in space missions.

The third area of contributions is in the field of biotechnology and is related to the biosynthesis of fuels based on cloning of genes encoding hydrolytic enzymes in different hosts. A strain of Klebsiella pneumoniae G31 capable of producing 2,3-butanediol from starch was constructed. The discovery is the first in the world and was patented in 2014 in co-authorship under number №66411 as a "Method for the production of 2,3-butanediol". New strains of LB have been isolated, that are highly resistant to butanol (up to 40 g/l) and they have a future perspectives as heterologous hosts of butanol synthesis genes. This is an extremely perspective

area as butanol is considered the fuel of the future and here the candidate has developed its own vision for future research.

Assoc. Prof. Petrova's contribution to the project activity is a strong point in her scientific biography. She was the leader of the Bulgarian team of 3 international agreements and 3 national projects. A total of nearly BGN 252,000 were allocated from the companies Chr. Hansen A / S, Denmark and Bright Dairy & Food Co. Ltd, China. She has participated in 6 international and 11 national projects with funding from COPERNICUS, CRNS-France, EU FP7, COST, the European Space Agency and the NSF. She is a leader of two work packages of the NNP "Healthy foods for a strong bio-economy and quality of life".

Under the supervision of Assoc. Prof. Petrova, 5 graduates of Sofia University "Kliment Ohridski" and two doctoral students defended their thesis. She is author of 4 courses and training programs, and 42 Bulgarian and foreign students have been trained.

She is a member of the European Federation of Microbiological Societies and the Editorial Board of the International Journal of Investigative Genomics, MedCrave Group, USA. She is the national representative on the Management Board of COST Action CA18101.

Assoc. Prof. Petrova is a member of the Scientific Board of Institute of Microbiolgy since 2012, its Secretary (2012-2016) and Chair (2017-2019). She is currently the Director of the Institute of Microbiology and member of the General Assembly of BAS.

Conclusion: Based on the materials presented at the competition and personal impressions, I find that Assoc. Prof. Penka Petrova is an outstanding and talented scientist in the field of microbiology and biotechnology with fundamental and applied scientific contributions of great importance for medicine and food industry, utilization of waste and the production of new fuels. The scientific production of Assoc. Prof. Petrova is distinguished by high metric data and highly deserved international recognition. The scientific production by Assoc. Prof. Petrova completely covers and even exceeds the required number of points in the criteria for the academic position "Professor" required by the Regulations of Bulgarian Academy of Sciences and Stephan Angeloff the Institute of Microbiology for the rules and procedure for obtaining academic degrees and for occupying academic positions.

I am completely convinced to propose to the Scientific Jury to vote positive and propose to the Scientific Board of Stephan Angeloff the Institute of Microbiology to promote Assoc. Prof. Penka Petrova in PROFESSOR in "Microbiology – genomics and regulation of gene expression in prokaryotes", professional field 4.3. Biological Sciences.

25.08.2020.

Signature: .....