

OPINION

By Prof. Tania Koleva Pencheva, PhD

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For the concourse for promotion to **the academic position “Associate Professor”**,

announced in **State Gazette, issue 21 of 14.03.2025**

Area of Higher Education: **5. Technical Sciences**

Professional Field: **5.11. Biotechnologies**

Scientific Specialty: **Biotechnology**

Candidate: **Senior Assist. Prof. Elena Iordanova Chorukova, PhD**

Review of the presented materials

With Ordinance No. I-66/29.04.2025 of the Director of the Stephan Angeloff Institute of Microbiology – Bulgarian Academy of Sciences, I have been appointed as a member of the Scientific Jury in **a concourse for the academic position “Associate Professor”** where the only candidate is **Senior Assist. Prof. Elena Iordanova Chorukova, PhD**.

As a member of the Scientific Jury, I have received:

1. Documents regarding the candidate's participation in the concourse.
2. Copies of the publications submitted for participation in the concourse.

In the presented form, the documents of **Senior Assist. Prof. Elena Chorukova, PhD** meet the requirements stipulated in the Act on Development of the Academic Staff in the Republic of Bulgaria (ADASRB), as well as the regulations for its implementation, approved by the Council of Ministers and the Stephan Angeloff Institute of Microbiology – BAS.

Short biographical notes

Elena Chorukova graduated as M.Sc. of “Biotechnics” from the Technical University - Sofia in 1994. She began her scientific career as a PhD student at the Stephan Angeloff Institute of Microbiology - BAS in 2005, where in 2009 she defended a PhD thesis in the scientific specialty “Bioautomation” on the topic “Neural and Hybrid Modelling of Biotechnological Processes”. Since 2011, Elena Chorukova has held an academic position of Senior Assistant Professor in the Stephan Angeloff Institute of Microbiology - BAS. The scientific interests of Elena Chorukova are in the fields of modelling, optimization and control of biotechnological processes, mainly aimed at the anaerobic degradation of various types of organic waste, through the application of neural networks, metaheuristic algorithms, state observers (software sensors), computer systems, etc.

Publication and lecturing activities, project participation

For participation in the concourse for promotion to the academic position “Associate Professor”, Elena Chorukova has presented **33 scientific publications**, of which **22 in journals that are refereed and indexed in world-renowned databases of scientific information** and **11 in non-refereed peer-reviewed journals or in edited collective volumes**. **Twelve of her publications in refereed and indexed journals are with an impact factor and 8 – with an impact rank.**

I would like to point out a few inaccuracies in the number of points in the provided “*Report on compliance with the minimum requirements according to the ADASRB*”: 1) In **Group of Indicators B, publication 4** should bring 10 instead of 12 points, thus the total number of points under **Group of Indicators B** should be **reduced by 2 points to 140.57 points**, which is still **above the minimum of**

100 points required under this group of indicators. 2) In **Group of Indicators G**, **publication 19** should bring 20 instead of 13.33 points, thus the total number of points under **Group of Indicators G** should be **increased by 6.67 points to 257.53 points**, which is **above the minimum of 100 points required** under this group of indicators.

All scientific publications presented for participation in the concourse are co-authored, but I would still like to note the fact that in **12** of the collective works, **Elena Chorukova is the first author**. This fact irrefutably shows the **personal input of the candidate** in her research developments. I recognize all publications by Elena Chorukova presented for the concourse as fully compliant with the requirements for proven excellence of the scientific publications, as well as strictly relevant to the thematic scope of the concourse.

In the *“Report on compliance with the minimum requirements according to the ADASRB”*, in **Group of Indicators D**, Elena Chorukova indicates **112 citations**, duly presented in a general *“List of citations of scientific publications”* and a separate *“List of citations referenced in WOS or SCOPUS”*, whereby with **1001 points** she exceeds many times the **minimum of 50 points required** under **Group of Indicators D**.

Elena Chorukova has provided a list of participation in **14 projects**, including **11 national** (declared as 10, but presented a list of 11), in 2 of which she was **the principal investigator**, and **3 international projects**, as well as information on **3 individual grants won for participation in international projects**.

Elena Chorukova has also presented a *“Report on the fulfilment of the additional criteria of the Stephan Angeloff Institute of Microbiology – BAS”*, which shows that the candidate **not only covers**, but also **significantly exceeds almost all additional criteria** for the promotion to the academic position of “Associate Professor” at the Stephan Angeloff Institute of Microbiology – BAS.

All of the above presents the candidate in the concourse for promotion to the academic position “Associate Professor” Elena Chorukova as a fully competent specialist in the field of modelling, optimization and control of biotechnological processes, mainly aimed at the anaerobic degradation of various types of organic waste.

Analysis of the main fundamental and applied research contributions

Elena Chorukova has presented *“Brief Information on the Research Work”* in **4 main scientific directions**, as follows:

1. **“Application of deterministic methods for mathematical modelling, control and optimization of biotechnological processes”**, and more specifically: *1.1 Mathematical modelling, control and optimization of biotechnological processes carried out in a single bioreactor*; and *1.2 Mathematical modelling, control and optimization of biotechnological processes carried out in a cascade of two bioreactors*.
2. **“Application of artificial intelligence methods for mathematical modelling, control and optimization of biotechnological processes”**, and more specifically: *2.1 Application of the apparatus of artificial neural networks*; *2.2 Application of metaheuristic algorithms*; *2.3 Application of inter-criteria analysis*; and *2.4 Application of generalized networks*.
3. **“Implementation and research of biotechnological processes carried out in bioreactors”**, mainly for waste utilization with: *3.1 Substrate cattle manure*; *3.2 Substrate corn extract (corn steep liquor)*; *3.3 Lignocellulosic substrates, mainly wheat straw*; *3.4 Other substrates*; and *3.5 Biofilm bioreactors for anaerobic degradation of organic waste*.
4. **“Systems for automatic control of biotechnological processes”**.

It should be noted that when presenting the results of her research activities in the scientific directions as formulated in the *“Brief Information on the Research Work”*, in some of them Elena Chorukova also referred to publications from her dissertation work (i.e., 1.1, 2.1, 3.1, and 3.4). Despite this fact, in each of these directions Elena Chorukova also presents **new results**, which gives me reason to accept them as a **further development and upgrade of the research in the specific scientific direction**.

Based on her work in the scientific directions presented above, in the “*Reference for Original Scientific Contributions*” Elena Chorukova has defined **12 original scientific contributions** (2 of which are further specified in 3 or 2 specific models, respectively) in the field of advanced biotechnologies, obtained as a result of in-depth research in current fundamental and applied scientific challenges.

I consider the so formulated contributions of Elena Chorukova as original and reflecting her overall scientific research activity. I am convinced in my opinion that her **contributions are of essential importance** for the development of the field of advanced biotechnologies. **The relatively high number of citations** of the research works of Elena Chorukova is yet **another independent testimony** for the quality of the excellent research results achieved with her active participation. The **applicability and significance** of Elena Chorukova’s developments were highly appreciated through the recognition of a **patent** for “*Biofilm Reactor with Submerged Fixed Filling for Biogas Production*” in 2010 and a **utility model** for “*Composition for Biogas Production*” in 2013, which is **another indisputable certificate** of the quality of the high scientific and scientific-applied results achieved with her active participation.

Without belittling any of the other contributions, I would like **to highlight as extremely valuable the contributions to the creation of a biofilm reactor with a submerged fixed filling for biogas production**, in which suitable conditions have been created for the fixation of microorganisms on the solid support, **the development of a pilot biogas installation with a monitoring and control system** at the Stefan Angeloff Institute of Microbiology - Bulgarian Academy of Sciences, as well as **the development of a control system for a cascade of bioreactors for the production of hydrogen and methane from organic waste**. I believe that the invaluable contribution of Elena Chorukova in their construction and the experience gained from the research conducted are an **extremely promising factor** for the development of future biotechnology specialists, whom Elena Chorukova, already in her capacity as an associate professor, will train.

Personal impressions

I have known Elena Chorukova personally since the beginning of her scientific career. My personal impressions of her are of a **responsible, conscientious, hard-working and diligent colleague**. All of these personal qualities are demonstrated in the materials presented by Elena Chorukova for participation in the present concourse for the academic position “Associate Professor”.

Conclusion

In the formation of the final assessment of the candidate **Senior Assist. Elena Chorukova, PhD** for promotion to the academic position “Associate Professor”, the requirements of the ADASRB have to be taken into consideration, as well as the regulations for its implementation approved by the Council of Ministers, and the Stephan Angeloff Institute of Microbiology - BAS. According to the presented documents and their analysis, **Senior Assist. Prof. Elena Chorukova, PhD meets, and even surpasses, the requirements for the academic position “Associate Professor”.**

On the basis of the presented concourse documents and the candidate’s publications, which provide visibility of the obtained results, as well as on the basis of the notability of the scientific contributions included therein, I take the liberty to recommend to the respected members of the Scientific Jury to propose to the respected members of the Scientific Council of the Stephan Angeloff Institute of Microbiology - BAS to vote for the promotion of **Senior Assist. Prof. Elena Iordanova Chorukova, PhD** to the academic position “**Associate Professor**” in Professional Field **5.11. Biotechnologies**, Scientific Specialty **Biotechnology**.

16 June 2025
Sofia

Signature:
(Prof. Tania Pencheva, PhD)