REVIEW

by Prof. Dr. Ana Iovkova Proykova, Doctor of Sciences
Faculty of Mathematics and Informatics,
Sofia University “St. Kliment Ohridski ”
a member of the jury in a competition for occupying the academic position "Associate Professor", professional field 4. Natural sciences, mathematics and informatics
4.5 Mathematics (Computational Mathematics)

opened in the Faculty of Mathematics and Informatics at the Plovdiv University “Paisii Hilendarski”

In the competition for 'Associate Professor', announced in the State Gazette, issue. 31 of April 12, 2019 and on the website of the Paisii Hilendarski University of Plovdiv (PU) for the needs of the Department of Applied Mathematics and Modeling at the Faculty of Mathematics and Informatics (FMI), the only candidate is the Chief Assistant Prof. Dr. Pavlina Hristova Atanasova, Department of Applied Mathematics and Modeling, FMI – PU.

1. General presentation of the received materials

By the order # P33-3778 of 12.07.2019 of the Rector of the Paisii Hilendarski University of Plovdiv (PS) I was appointed as a member of the scientific jury of the competition for occupation of the academic position of 'associate professor' in the PS in the professional field 4. Science, Mathematics and Informatics, professional field 4.5 Mathematics, scientific specialty Computational Mathematics, announced for the needs of the Department of Applied Mathematics and Modeling at the Faculty of Mathematics and Informatics.

In order to participate in the announced competition, a set of paper materials was submitted in accordance with the Rules for the development of the academic staff of the PS, which includes the following documents:

1. application to the Rector for admission to the competition;
2. a CV in European format;
3. diploma for educational and qualification degree "Master";
4. diploma for educational and scientific degree "doctor";
5. work certificate;
6. documents related to scientific works:
    - 6.1 a complete list of scientific papers;
    - 6.2 list of scientific papers for participation in the competition;
    - 6.3 annotation of the materials in Bulgarian;
    - 6.4 annotation of the materials in English;
    - 6.5 full list of cited observations in the last 5 years;
    - 6.6 list of quotations for participation in the competition;
    - 6.7 self-assessment of contributions in Bulgarian;
    - 6.8 self-assessment of contributions in English.

7. documents related to the minimum national requirements:
    7.1 a reference for meeting the national minimum requirements;
    7.2 list of scientometric indicators by groups according to the minimum national requirements;
8. documents for teaching workload
    8.1 a reference for auditorium and extra-curricular employment;
    8.2 annotation of the developed and conducted courses;
9.Documents for research work:
    9.1 a list of research and education projects;
    9.2 an official note from the Scientific and Applied Activity division of the PI for participation in projects;
    9.3 list of talks given at conferences;
10. scientific papers (full texts);
11. study aids;
12. abstract of the PhD thesis;
13. reference for compliance with the additional faculty requirements of FMI at the PU;
14. declaration of originality and authenticity of the enclosed documents;
15. set of hard copy documents (received 1 copy)
16. set of documents in electronic format (received 1 disk)

The candidate, Dr. Atanasova, has provided for the competition a total of 22 publications: 19 scientific papers, of which 3 papers have been already used in the competition for Chief Assistant Professor position; 3 study aids to the lectures held at the FMI-PU; a list of 6 research projects, of which 2 projects are completed in cooperation with a team based in JINR-Dubna. I accept for reviewing all 22 items published after the PhD defense. In the final assessment, I take into account all study aids and the 6 research projects. I do not review the 13 scientific papers included in the PhD thesis but I take into account the abstract of the thesis provided in the documents.

Comment: the good organization of the materials is noticeable.

2. Short CV of the applicant

Dr. Atanasova holds a Master's Degree in Mathematics, specialization Computer Science and a PhD Ddegree (2011), both degrees awarded by the Paisii Hilendarski University of Plovdiv. The dissertation for the doctorate degree is on the topic Numerical methods and algorithms for the study of nonlinear parametric problems in physics with the scientific adviser Prof. Todor Boyadzhiev, DSc.

Dr. Atanasova has been working at the University of Plovdiv on a basic employment contract since November 2010, and for seven years and 6 months has been the Chief Assistant Professor at the FMI-PU.

Dr. Atanasova has many years of cooperation with the JINR-Dubna Laboratory for Information and Communication Technologies, within which she has achieved excellent scientific results and high professional qualifications.

3.General characteristics of the applicant's research and pedagogical activities

Assessment of educational and pedagogical activity

The presented materials allow me to appreciate the high educational and pedagogical activity of the candidate - there are 10 teaching aids – 9 of them are electronic and one is a published notebook.

The published Laboratory Notebook supplementing the subject *Software Systems in Mathematics*, is accompanied by a separation protocol indicating the equal contribution of each of the five authors.

Dr. Atanasova has developed 8 lecture courses, which she conducts at FMI-SU. Access to e-learning materials (only authored by Dr. Atanasova) allows students to prepare independently when hindered from being on campus. Efforts to prepare the lectures are great, and Dr. Atanasova must be congratulated for the successful presentation of the course material.

Under her supervision, 6 bachelor's and one master's theses were defended. She currently advises a doctoral student.

With these performance indicators, Dr. Atanasova fully satisfies the average national requirements for the first habilitation (dozent / Associate Professor), as well as the specific requirements of the FMI-PU.

Assessment of the applicant's scientific and applied scientific activity

Dr. Atanasova is the co-author and author of a total of 51 scientific publications. In order to participate in the competition, the candidate submitted 19 articles, of which 4 publications in the country and 15 abroad; 13 of the articles are in Impact Factor (WoS) or SJR (SCOPUS) scientific journals. With three of the articles, the candidate has been elected as the Chief Assistant Professor. These papers are published in the scientific journal of PU. Two of the articles have Dr. Atanasova as a single author.

The remaining 16 articles are co-authored: 2 articles with another author, with Atanasova being the first author in both articles; 6 articles are with three authors, in 4 articles Dr. Atanasova is the first author; eight articles are co-authored by more than three co-authors, with two articles with Dr. Atanasova being the first author. With these indicators, Dr. Atanasova meets the minimum national requirements for the academic position of Associate Professor, as well as the specific requirements of the PU-FMI for this position.

In the articles presented for the competition, the main contributions are in the field of nonlinear private differential equations, where solutions under different boundary conditions and states of the systems studied are numerically determined. The research is intimately intertwined with physics, which can be

viewed as the basis on which the mathematical approaches in consideration are built.

In superconductivity, a Long Josephson Junction (LJJ) is a function of both time and one or two spatial coordinates {the short Josephson contacts/junctions depend only on time.} The simplest and most commonly used model to describe the dynamics of the Josephson phase in LJJ is the perturbed sine-Gordon equation. Abrikosov vortices - fluxons appear in superconductors of second type and are extremely interesting from both a theoretical and practical point of view. More than 3 decades had passed since their theoretical prediction in 1957 until the exciting experiments with scanning SQUID (Superconducting Quantum Interference Device) microscopy were performed. Nowadays both theoretical and experimental results related to the Abrikosov vortices are in the textbooks.

Dr. Atanasova's research is up-to-date precisely because of the modern technological development, which gives an insight into numerical solutions that are relatively easy to use.

The analysis of the individual publications by Dr. Atanassova is made in the next section.

Dr. Atanasova gave talks and presented posters at 15 international and 2 national scientific conferences in the field of this competition - Computational Mathematics. Interesting applications of computational mathematics in education are presented in several reports.

She worked on and successfully completed 17 research and educational projects, implementing some of her own research results.

Contributions (scientific, applied, applied) and citations

The contributions of applicant’s research are categorized as fundamental and applied science. The candidate has provided a list of citations to her work.

This is a place to comment on the fact that international databases (WoS, SCOPUS) include only citations in journals and books that are included in the respective databases – not a surptise. Therefore, citations in journals, dissertations and books that are not part of the bases are not reported. For this reason, the list of quotations provided by Dr. Atanasova differs significantly from the list provided by SCOPUS/WoS (5 citations after excluding the self-citations of all authors).

Contributions from papers published in the Russian language are also significant but have remained outside the WoS/SCOPUS classifiers for reasons other than scientific. In my assessment of the contributions, I give a positive sign to these studies as well.

Characterization of major achievements in the research papers

Papers # 1 and # 2 are devoted to representations of generalized polynomials in the light of interpolation theory. The series of papers (# 3 - 14, 16, 19) is applicable to the physics of long Josephson junction (LJJ). In these papers, the stability and bifurcations of magnetic fluxes in LJJ were investigated; flux solutions are also numerically investigated depending on the boundary conditions.

The methods developed in the papers #4 - #11 in the ICT laboratory in JINR-Dubna, co-authored by Dr. Atanasova, use a digital approach and, importantly, show the cases in which the digital approach has advantages over the analytical solutions, like in bifurcation studies.

Paper # 12 (Existence of continuous solutions of a perturbed Linear Voltera Integral Equations) proves the existence of continuous solutions on a compact interval of Voltera perturbed linear integral equations, then proposes a numerical method and shows that the numerical scheme is convergent. Because the work was not published in a journal of the WoS/Scopus, it went unnoticed.

Papers # 15-19 show interesting results published in the last year (2018). In 15, the concept of L-solutions of linear differential equations with impulses in Banach spaces is introduced. In # 16, the phase dynamics of a stack of long Josephsin contacts were investigated, observing the coexistence of the driving wave of the charge and the flux state. In # 17, it is shown that the polaron model applied to hydrated electronic states in water gives aligned (agreed) numerical and experimental data. In # 18, custom software was introduced to investigate a model of Josephson contact with magnetic pulses. In #19, the effectiveness of two numerical approaches in the Wolfram Matematika package is analyzed and the advantage of the implicit method over the explicit scheme is proved. The publications are new, and thus not yet cited by other research groups.

Analysis of the significance of the contributions of the applicant's research

In summary, the contribution of Dr. Atanasova's publications is in the field of numerical solution of nonlinear differential equations, which contribution is of scientific interest. The works present interesting results in terms of new technologies (for example, SQUID) that may find their place in the near future, when second-order superconductors are likely to be standard materials in space research. The contributions of publications are significant to the field mentioned.

Quantitative indicators of the criteria for occupying the academic position associate professor

The candidate Dr. Atanasova participates in the competition with 19 articles, of which 4 publications in the country and 15 abroad; 13 of the articles are in

Impact Factor (WoS) or SJR (SCOPUS) journals, 3 study aids, and proof of 5 independent citations (after excluding the self-citations of all co-authors).

These materials fully meet the requirements of Paisii Hilendarski, Faculty of Mathematics and Informatics, Plovdiv University, for the academic position of Assistant Professor in the professional field 4.5. Mathematics:
- at least 8 publications, which must not be submitted for the PhD degree and for the academic post of chief assistant professor;
- of the publications submitted, at least 5 should be in international journals;
- of the publications submitted, at least 3 should be in the impacted journals;
- at least 1 textbook or study aid;
- evidence of at least 5 citations.

Assessment of the candidate's recognition among the scientific community – national and international

The candidate is well known with the good results presented at high-level specialized conferences.

4. Assessment of the applicant's personal contribution

Of the 16 papers submitted by Dr. Atanasova, published after defending her PhD degree and the election as a Chief Assistant Professor, she is the first author in 7 articles published in Impact Factor Journals (WoS/Scopus). All articles are co-authored, a detailed description was provided in Section 3 of the present review.

It is necessary to emphasize that modern scientific research is generally a collective product. Although there are no separation protocols for the percentage of co-authors, my assessment is that Dr. Atanasova has a significant personal contribution. This assessment is based on independent scientific experience as a leader of international and national research projects. The relatively large number of talks presented at professional conferences also proves the independence of Dr. Atanasova.

5. Personal impressions

My impression of Dr. Atanasova is from the conversations we had in connection with her participation in the competition. She is purposeful and responsible in her research and pedagogical activities. These qualities are especially important in today's world, where scientists often work in different environments. Only collaborative interaction with other researchers ensures sustained and productive work.

I used to know Prof. Boyadzhiev, the supervisor of Dr. Atanasova's dissertation, and I see in her face a good student of his and a follower.

CONCLUSION

The documents and materials presented by Dr. Pavlina Atanasova **meet all the requirements** of the Law on the Development of the Academic Staff in the Republic of Bulgaria (ZRARB), the Regulations for the implementation of the ZRARB and the corresponding Rules of the Paisii Hilendarski University.

The candidate submitted a sufficient number of scientific papers, published after the materials used in the defense of the PhD degree and in the competition for the chief assistant professor. The candidate's works contain original scientific contributions that have received international recognition through their publication in journals refereed in the WoS/Scopus and other international academic databases. Theoretical developments have practical applicability, and some of them are directly oriented to the educational work.

Dr. Pavlina Atanasova's scientific and teaching qualifications are beyond doubt. The results achieved by Dr. Pavlina Atanasova in the teaching and research activities fully correspond to the specific requirements of the Faculty of Mathematics and Informatics, adopted in connection with the Rules of the University for the implementation of ZRARB.

Statement: the reviewer has not found indicators for plagiarism in the materials provided.

After getting acquainted with the materials and scientific works presented in the competition, the analysis of their importance and the scientific and applied contributions contained therein, I find it justifiable to give my positive assessment and to recommend to the Scientific Jury to prepare a report proposal to the Faculty Council of Faculty of Mathematics and Informatics for the selection of Dr. Pavlina Hristova Atanasova for the academic position of "Assistant Professor" at the "P. Hilendar "by profession professional field: 4.5 Mathematics (Computational Mathematics).

31.08.2019 Sofia

Reviewer:

Prof. Dr. Ana Proykova, Doctor Habil