

OPINION

**on a competition for academic credibility
Associate Professor
in the professional field 4.1 Physical Sciences,
for the needs of Sofia University "St. Kliment Ohridski" (Sofia University),
Faculty of Physics (FZF), announced in Government Bulletin no. 65 of 08/16/2019**

This opinion was prepared by: Prof. Radoslav Christov Rashkov, Dr. Habil,
Sofia University Faculty of Science, as a member of the scientific jury of the competition:
4.1. Physical Sciences (Gravity, Theory of Relativity) according to Order No. RD 38-572 / 02.10.2019
of the Rector of Sofia University.

Only one candidate has submitted documents for participation in the announced competition:
Assistant Dr. Petya Georgieva Nedkova, Faculty of Physics of Sofia University "St. Kliment Ohridski".

I. General description of the materials presented

1. Details of the application

- The documents submitted by the applicant according to the competition comply with the requirements of ZRASRB, RAPRRRB and the Regulations on the conditions and procedure for acquiring academic degrees and occupying academic positions at Sofia University "St. Kliment Ohridski" (PURPNSZADU).

In order to participate in the competition, candidate Petya Georgieva Nedkova presented a list of 20 papers published in prestigious international scientific journals and scientific forums, as well as one monograph "Mathematical aspects of static and stationary higher dimensional spacetimes". 16 other documents (in the form of notes and certificates from an employer, project manager, project sponsor or sponsor, references and reviews, awards and other relevant evidence) supporting the applicant's achievements were also presented.

- Additional remarks and comments – None.

2. Details of the applicant

Short professional and biographical details of the applicant.

Studying: Petya Nedkova started her higher education as a student in Scandinavian languages, Faculty of Classical and Modern Philology, Sofia University (2000-2002). Motivated by Physics she interrupts her humanitarian education and earned her Bachelor of Science degree in Physics (2003-2007) at the Sofia University. She continued her education as Master of Theoretical and Mathematical Physics (2007-2008) in the Faculty of Physics of Sofia University where she graduated in 2008.

Doctoral Degree: Petya Nedkova started her doctoral studies at the Faculty of Physics of the Sofia University in 2009 under the supervision of Prof. Stoycho Yazadzhiev. She defended a Ph.D. thesis in professional field 4.1 Physical Sciences (Theoretical and Mathematical Physics) in 2012. The title of her dissertation thesis is "Exact solutions of Einstein-Maxwell equations describing black holes in spacetime with extra dimensions".

Dr. Petya Nedkova applied for and won a competition in 2014 for the Assistant Professor in the Department of Theoretical Physics of the Faculty of Physics of the Sofia University. She specialized as a postdoctoral fellow in 2012-2013 at the University of Oldenburg. She has international experience as a visiting scholar at the Universities of Oldenburg and Tübingen, Germany. As an proof of her international standing, I would like to mention the attached 16 selected conference reports.

3. General characteristics of the applicant's scientific work and achievements

Dr. Petya Nedkova's scientific subject is in one of the hottest areas of modern theoretical and mathematical physics. Driven by recent achievements, important problems of gravity in space-time with more than the standard four dimensions became an arena of intensive investigations. The motivation for this type of exploration is drawn from fundamental questions in modern high energy physics - the Grand Unification theories in the context of Kaluza-Klein compactifications, as well as string theory, which is consistently defined in spaces with more than 4 measurements. If we have to classify thematic issues of the research of Dr. Petya Nedkova, these are:

- i) the systematic derivation of new exact solutions in the black hole Physics in space-time with an additional dimension and a detailed study of their main physical characteristics;
- ii) study of the physical properties of compact astrophysical objects in modified theories of gravity - generalizations beyond the classical Einstein General theory of relativity.

Analyzing the materials presented, it can be reasonably and definitely stated that:

- a) the scientific works exceed by far the minimum national requirements (under Art. 2b, para. 2 and 3 of ZRARB) and accordingly the additional requirements of Sofia University "St. Kliment Ohridski" for the academic position of Associate Professor in the scientific field and professional direction of the competition;
- b) the scientific papers submitted by the applicant do not repeat those of previous procedures for the acquisition of a scientific title and academic position;
- c) there is no proven plagiarism in the scientific works presented at the competition.

4. Characterization and evaluation of the applicant's teaching activity

I would summarize P. Nedkova's teaching activity as follows: She has taken a number of lecture courses such as: Mathematics 1, Mathematical Methods of Physics, Theoretical Astrophysics, Partial Differential Equations, Introduction to Black Hole Physics, etc.

Dr. Petya Nedkova also conducted seminars in the above lectures and also in Theoretical Mechanics. The academic workload of Chief Assistant Professor Dr. Petya Nedkova is equivalent to 7 years of full-time teaching load at Sofia University.

She has supervised two graduate students, with one defended by publishing research paper in a prestigious international journal.

In view of my long-standing observations on the applicant, I commend the quality of teaching and activity.

5. Substantive analysis of the scientific and applied scientific achievements of the candidate contained in the materials for participation in the competition

Without giving a detailed description of the scientific contributions of Dr. Petya Nedkova, I would make the following classification:

- Starting with her investigations mainly in the standard 4-dimensional theories, the highlighted

contributions are the construction and study of relativistic images of accretion disks in space-time of compact objects. Another group of studies is devoted to obtaining and investigating exact solutions to gravitational field equations. These studies suggest solutions and interpretations of space-time tunnels - wormholes, scalarized black holes in the generalized scalar-tensor theories of gravity, and others.

- Investigation of the thermodynamic properties of compact objects in higher-dimensional space-time is another important area in which the applicant made significant contributions. I would note here the study of black holes and gravitational instants.

- The classification of solutions describing space-time tunnels ("wormholes") within Einstein-Maxwell-dilaton gravity is also worthy of appreciation. It is important to note that the uniqueness theorem for static passable wormhole solutions is proved in the presence of phantom scalar and / or electromagnetic fields.

- The presented monograph represents a modern book combining pedagogical presentation and the high expert level. Written in English, the monograph would also have an international impact.

The applicant's scientometric indicators are well above the national minimum requirements: 17 publications in journals in the most renowned journals classified with Q1 and h-index = 6. These publications are accompanied by 8 papers in Proceedings of International Impact Rank Conferences. I think it is important to note the participation in three consecutive 12th, 13th and 14th "Marcel Grossmann Meetings on Recent Developments in Theoretical and Experimental General Relativity, Astrophysics, and Relativistic Field Theories".

159 independent citations have been noted so far, with a tendency to increase.

This does not exhaust Dr. P. Nedkova's achievements. Impressive is her involvement in a total of 14 national and international contracts, through participation in major projects funded by the National Research Fund and participation in two particularly prestigious multinational European scientific networks funded under the COST Action MP1210 program "The String Theory Universe" (2013-2017) and COST Action CA16214 (PHAROS) "The Multi-Messenger Physics and Astrophysics of Neutron Stars" (2017-2021).

6. Critical notes and recommendations

Essentially, I have no critical remarks about the candidate.

7. Personal impressions of the applicant

I have known the candidate since her student years. I have witnessed the growth of Petya Denkova from student to PhD and Chief Assistant Professor. In the course of time we also have joint participation in projects under the National Research Fund (Contract DO 02-257 of December 18, 2008 and Contract DFI T02 / 6 of December 14, 2014). Throughout this time, I have witnessed Petya's dedication to physics and science, with which she has linked her professional realization. I can say that competence and professionalism are well deserved.

8. Conclusion on the application

Having become acquainted with the materials and scientific works presented in the competition and on the basis of the analysis of their importance and the scientific and applied contributions contained therein, I confirm that the scientific achievements meet the requirements of the ZRASRB, the Regulations for its implementation and the corresponding Regulations of Sofia University "St. Kliment

Ohridski "for the position of the candidate in the academic position of Associate Professor in the scientific field and professional direction of the competition. In particular, the applicant not only meets the minimal national requirements in the professional field, but substantially exceeds them. The scientific works submitted for the competition plagiarism has not been established.

I am convinced of my positive assessment of the application.

II. Overall Conclusion

Based on the above, **I recommend** that the Scientific Jury to propose to the Faculty Council of the Faculty of Physics at Sofia University "St. Kliment Ohridski "to select Assistant Professor Dr. Petya Nikolaeva Nedkova to take the academic position of "**Associate Professor**" in the professional field 4.1 Physical Sciences (Gravity, Theory of Relativity).

28.11.2019

Signature:

(Prof. Radoslav Rashkov, Dr. Habil.)