OPPONENT OPINION

Competition for holding of academic position "Professor", gazetted on 26 July 2019, No 59

One candidate: Assoc. Professor Pencho Marinov PhD

Procedure Notifier: Section of Parallel Algorithms, Institute of Computational and Communication Technologies, BAS

Professional direction: 4.5. Mathematics

Scientific Subject: Mathematical Modeling and Application of Mathematics

Juri Member: Prof. Michail Todorov, PhD, Department of Applied Mathematics and Informatics (FAMI) by the Technical University of Sofia, Section of Numerical Methods and Mathematical Modeling, nominated by the Director of Institute of Computational and Communication Technologies - BAS, Sofia, by order 241/01 October 2019.

1. Short biographical record of the applicant

Dr Pencho Marinov was born in 1955. He graduated Faculty of Mathematics and Mechanics by the St. Kliment Ohridski University of Sofia in 1980, subject Mathematical Modeling. In the next five years (1980-1985) he consecutively occupied positions of mathematician and researcher in Central Space Research Laboratory, BAS. Since 1985 he has been consecutively researcher and senior research fellow (Associate Professor) (in 2001) in the Institute of Information and Communication Technologies, BAS. He took his PhD degree in Mathematics in 1993, thesis title *Theory of Approximations and Extremal Problems, Housedorff Approximations by Rational Functions.* In 1993 he visited Columbia University in South Carolina (duration 4 months) and made a speciality of image compression and processing. He trained successfully 1 PhD student and 3 postgraduated.

2. General description of the competition documents

The applicant filed following compulsory documents: CV, full list of the works with their IF and selected indexed citations, author information for the scientific contributions related to the given competition supplied by PDF copies of all the articles, summaries of the works in Bulgarian and English, copies of PhD and Assoc. Professor diplomas, lists of research projects and scientific conferences where the applicant took part in, certificate about length of scientific service in BG, and affidavit against plagiarism.

3. General characterization of the research, teaching and applied activities

The applicant presents 33 works for the competition, all of them published after 2003, i.e. after getting his academic position Assoc. Professor. After the habilitation in 2001 Assoc. Prof. Marinov has totally 62 publications all of them with IF and/or SJR. The interdisciplinary and international research involves all the works to be co-authored – 2, 3 and more authors. Since 2006 the applicant has taken part (including as a scientific leader) in 20 granted projects, 7 of them international. They are granted by BG Scientific Foundation (FNI), BG Ministry of Education and Science (MON), 7th Framework Program, AOARD, EOARD, Horizon 2020, etc. Along with his research activity the applicant co-supervises together with Corr.Member Krassimir Atanassov one postgraduate student (so far) – Velichka Traneva (Institute of Biophysics and Biomedical Engineering, BAS, 2017). The applicant does not announce any teaching activity.

4. Analysis of the scientific and applied contributions

Assoc. Professor Marinov presents impressive author information where he claims his scientific and applied contributions. The problems into consideration can be grouped in 5 main directions:

- **Development of algorithms for best approximations with rational functions and their application for problems containing fractional derivatives.** The investigations are keeping on under grant of Bulgarian NSF (FNI). An object of investigation is a class of methods based on the best rational approximation (BURA) of given scalar function in the segment [0,1]. An alternative method based on BURA for uniform rational approximation (URA) is proposed. Elaborate numerical tests for the computational efficiency and stability of BURA and URA are conducted. Two papers belonging to quartile Q1 (*Journal of Computational and Applied Mathematics*, *Computers and Mathematics with Applications*) are published;

- **Collaboration with Institute of Biophysics and Biomedical Engineering, BAS for intercriterion analysis and index matrices.** Clasical correlation analysis as well as intercriterion analysis is used. Two papers are published – one of them belongs to quartile Q1 (*Biochimica et Biophysica Acta - General Subjects*) and one more – to quartile Q4 (*Comptes Rendus de L'Academie Bulgare des Sciences*);

- **Processing of brain data records.** This is another interdisciplinary investigation this time with the Institute of Neurobiology, BAS aiming to

predict and localize of epileptic attacks on the base of records and subsequent processing of bioempirical data. The signals are processed and compared together by using of Discrete Fourier Transform. Two pares belonging to quartile Q2 (*Brain Research Bulletin*, IF>3) are published;

- ***In silico* modeling of plasma in thermo-nuclear synthesis reactors by using of the grid-infrastructure.** The harmful influence of a high-temperature plasma and prevention upon reactor wall is investigated *in silico*. The conducted computer PIC simulations for the 3D velocity assume that it is governed by the basic equations for the charged particles in their own field. The electric intensity field is computed by the Poisson equation, while the magnetic induction is supposed to be constant and perpendicular to the direction of the main drift. Extra conditions guarantying high enough plasma density on the reactor edge and not extremely high temperature are determined. The results of the investigation are published in 2 papers with quartile Q4 (*Comptes Rendus de L'Academie Bulgare des Sciences*);

- **Models and algorithms in Space Phyisics.** Considerable results in space investigations are achieved. In particular, mathematical models of ionosphere processes in collaboration with the Space Research and Technology Institute, BAS, and the Observatory in Athens, Greece are recognized in Bulgaria and abroad. The models and their various modifications concern the mean distribution of the electron temperature (Te) at a height 1000-10000 km and 70° geomagnetic latitude. They describe the height of the transition as a function of the month, the local time, the geomagnetic latitude and longitude, the solar wind. To this end one builds polynomials of many variables containing Chebyshev basic functions as well as trigonometric base in 5-dimensional space. Each axis is divided by subintervals. To find Te in a given node a spline-interpolation between the neighbor nodes is used. The results are published in *Advances in Space Research* – 11 works, *Journal of Space Weather and Space Climate* - 5 works, *Acta Geophysica* – 2 works, *Brain Research Bulletin* – 2 works, *Comptes Rendus de L'Academie Bulgare des Sciences* – 4 works. All of these journals belong to quartiles. Let me emphasize that the essential part of scientific metrics of the applicant are achieved and formed namely by this direction.

For the given competition the applicant presents 33 works split into quartile groups as follows: Q1 – 6; Q2 – 10; Q3 – 13; Q4 – 4, all of them possess IF. The total IF = 50.462. The scientific metrics of these works after National Centre for Information and Documentation (NCID) seeing in the applied table are also impressive.

In my opinion, Assoc. Prof. Marinov holds, and can use professionally and equally well his knowledge in functional analysis (calculus) and mathematical modeling in order to study successfully a complicated interdisciplinary matter. This is the reason he to be asked collaborator and consultant in Bulgaria and abroad.

5. Importance and contribution to the science and practice. Citations by other authors

The total number of citations is 322. The applicant filtered the 143 celebrated citations, that cite 4 his works. Most cited are: works [1,2,3,4] (all of them in *Advances in Space Research*) – 49, 42, 25, 261 cites, respectively. Other cites of author works in top journals with IF belonging to quartiles are published in *Comptes Rendus de L'Academie Bulgare des Sciences, Folia Microbiologica, Studies in Computational Inteligence.* The unequivocal conclusion is that the achievements of the applicant are well known and rated highly from the international scientific community. Looking up the information in NCID and comparing clearly states that the Assoc. Prof. Marinov contributions and activities exceed the threshold values required for academic position "Professor."

6. Critical remarks and recommendations

Besides the NCID criteria Assoc.Prof. Marinov covered and exceeded the national laws, BAS and IICT regulations and administrative provisions in order to apply for academic position "Professor", namely: number of works 33 (totally 62) – all of them published in reviewed journals and issues; number of citations – 322 all of them in foreign and well-known ones; and 20 participations in research projects in BG and abroad. The actuality of the developed topics and scientific directions presuppose an attracting of more young people to this direction and training and supervising of more postgraduate students. Actually this is my main recommendation. All needed intellectual and computational resources to do that are available. The scientific and research activity, the big number of granted proejcts, sharing by invitation of scientific and program committees being a reviewer as well the big number of citations (322 against 40 required) – all that demonstrates the readiness of Assoc. Prof. Marinov to hold the academic position of Professor.

7. Personal impression

I have known Pencho Marinov since 1985. I had few discussions, seminars, and collaboration with him in FMM-SU and later in IICT. I know him as a LaTeX pioneer and expert as well as an independent and rigorous referee of AMiTaNS manuscripts. He strikes me as a high level professional deeply penetrated in complicated interdisciplinary fields of study. The results obtained in these fields are substantial for the modern space research, biochemistry, and medicine.

Conclusion

Gaining an impression for the all-round scientific and research activity of the applicant and having in mind the legal rules and criteria (LDASRB and its regulations in BAS) as well as the specific rules in IICT I **rate positively** the entire activity. On the strength of virtue of the law **I propose Assoc.**

Professor Pencho Genov Marinov for academic position Professor in IICT, Professional Direction 4.5. Mathematics, Scientific Subject: Mathematical Modeling and Application of Mathematics (Applications in Computational Physics and Biology).

JURI MEMBER:

Prof. Michail Todorov, PhD
Sec. of Numerical Methods and
Mathematical Modeling
FAMI by TU of Sofia

November 14, 2019
Sofia