Report

by assoc. prof. Minko Marinov Markov, Faculty of Mathematics and Informatics, Sofia University „St. Kliment Ohridski"

concerning the competition for academic position Associate Professor, in the professional field 4 Natural Sciences, Mathematica and Informatics, professional subflield 4.5 Mathematics (Combinatorics and Graph Theory), announced in State Gazette No. 14/10 Feb 2023 by the Institute of Mathematics and Informatics, BAS

1. Competition information. The competition is announced by IMI-BAS on 10 February 2023 г. Within the deadline, documents are submitted by one candidate – Danila Dmitrievich Cherkashin, a postdoctoral fellow at IMI-BAS. The set of application documents is complete. The Scientific Jury for the competition is appointed with order 185/07.04.2023 of the Director of IMI.

2. Candidate information. Danila Cherkashin has earned academic degree Mathematician in the Mathematics programme at the Saint-Petersburg University, Saint Petersburg, Russia, on 24 June 2015. He has earned PhD at the V. A. Steklov Institute of Mathematics, Saint-Petersburg, Russia, in 2018. The title of his PhD thesis is "Extremal problems in hypergraph colorings". His graduate advisors are A. Raigorodskii and F. Petrov. He has been a postdoctoral fellow at IMI-BAS since 2022.

3. General description of the presented papers. The candidate presents eleven papers in the competition. He has filled in the form concerning the requirements for earning the academic position Associate Professor in IMI-BAS. Ten of the papers are published in journals with IF. More specifically, two papers in Q1, three papers in Q2, four papers in Q3 and one paper in Q4, and the eleventh paper is in a journal with SJR. As far as I can tell, the presented papers have not been used by the candidate in other competitions.

4. Scientific contributions. Danila Cherkashin's area of research is Combinatorics and Graph/Hypergraph Theory. One of the presented papers is in Topological Dynamics. In the following list I use the numering from the candidate's „List of publications used in application".

- [1] is the graduation thesis of the candidate from 2015, coauthored with his then supervisor. The thesis concerns compact metric spaces and the

properties of pseudotrajectories, which is related to structural stability. The thesis contains several original and highly nontrivial results with high theoretical value.

- [2, 3, 4] concern the coloring of the planar points in a minimum number of colors – a well-known problem that has been investigated by numerous prominent researchers for decades. The approach used is to construct graphs and to investigate their chromatic and independence numbers. Plenty of interesting and nontrivial results are obtained and that is remarkable, having in mind the area has been explored a lot for a long time.

- [5, 6, 7, 8, 9] concern hypergraphs. [7] and [8] prove, among other results, a conjecture by Alon about the coloring of hypergraphs. [6] achieves novel results on colorings of certain graph classes by considering hypergraphs with big discrepancy. [5] improves the known upper bound for a well-known function on hypergraphs. [9] is a review paper on colorings of graphs and hypergraphs. The paper contains a detailed and well-written introduction into that are and presents the major results.

- [10] concerns ordinary graphs with edge weights from $\{-1, 1\}$ and improves the known lower bound for a certain famous funtion. The paper introduces and investigates graphons---symmetric measurable functions from $[0,1]^2$ to $[0,1]$---in order to demontrate certain approximations on graphs.

- [11] concerns the eventown problem – a problem of maximising certain families over a ground set under certain restrictions. The paper uses algebraic methods for achieving new lower bounds.

All those paper are top-level papers in a world scale. The results are impressive to the experts in the respective areas, which is attested to by the top status of the publishing journals.

5. Approbation of the scientific contributions. The candidate presents a lits of the citations of his papers (file `11-Citations_for_application.pdf`). It mentions five papers authored or coauthores by D. Cherkashin with 35 citations altogether according to WoS or Scopus. However, none of these five papers is among the eleven papers listed in the file `06-List_Publ_for_application.pdf`. I looked up in Scopus for citations of D. Cherkashin and found out the following numbers of citations of the papers that are actually used in the competition: [1]

has 1 citation, [2] has 137 citations, [3] has 14 citations, [4] has 25 citations, [5] has 8 citations, [6] has 21 citations, [7] has 0 citations, [8] has 2 citations, [9] has 10 citations, [10] has 0 citations, and [11] has 1 citation.

6. Teaching and project participation. The teaching activities of the candidate are described in Russian. As far as I understand, the only teaching activity he mentions is a teacher in a math school in 2017.

The project participation of D. Cherkashin is extensive and impressive: two projects of the Russian Science Foundation during 2016-2020 with 30 000 000 ruble budget each, and a Mega Grant (I have no idea who organises this project) in 2018-2020 with 60 000 000 ruble budget.

7. Conclusion. My conclusions, based on the documents presented by the candidate, and presented above, as well as the fact that they fulfill the minimal national requirements and these of BAS and IMI-BAS, allow me to propose Danila Dmitrievich Cherkashin to be elected for the academic position „Associate Professor" in scientific area 4. „Natural sciences, mathematics and informatics", professional subflield 4.5 Mathematics (Combinatorics and Graph Theory).

Sofia, 30.05.2023 г.   Signed:

                               assoc. prof. Minko Marinov Markov, PhD