

**Report of the Habilitation Committee for the promotion of  
RNDr. Matúš Dirbák, PhD.  
to the rank of Docent in the area of Mathematics – Mathematical Analysis**

On March 3, 2022, and in the later per rollam vote on March 17 – 21, 2022, the Scientific Council of the Mathematics Institute of the Silesian University in Opava approved the Habilitation Committee consisting of

Prof. RNDr. Miroslav Engliš, DrSc., Silesian University in Opava – chair  
Prof. dr. hab. Tomasz Downarowicz, Wrocław University of Science and Technology, Poland  
Prof. RNDr. Július Korbaš, CSc., Comenius University in Bratislava, Slovakia  
Prof. dr. hab. Piotr Oprocha, AGH Krakow, Poland  
Doc. RNDr. Artur Sergyeyev, DSc., Silesian University in Opava.

The Committee was subsequently appointed as approved. The Committee observed that the proposal fulfills all the requirements as stated in § 72 of the Czech Republic Law no. 111/98 Coll. (the Higher Education Act), as well as all other conditions. The Committee recommended to continue the habilitation process and appointed the following referees for the evaluation of the habilitation thesis “First cohomology groups of minimal flows”:

Prof. Ethan Akin (City University of New York, U.S.A.)  
Prof. dr. hab. Tomasz Downarowicz (Wrocław Univ. of Science and Technology, Poland)  
Dr. hab. Andrzej Biś (University of Lodz, Poland).

After receiving referees’ reports the Committee assessed the scientific and pedagogical qualifications of the applicant. The Committee issues the report below on the outcome of this assessment.

### **1. Personal data of the applicant**

Name and surname: Matúš Dirbák  
Affiliation: Assistant Professor, Matej Bel University in Banská Bystrica, Slovakia  
Born: [REDACTED] 1983  
Address: [REDACTED]  
Citizenship: [REDACTED]

#### **Educational and professional history:**

2007 M.Sc., Mathematics and Physics, Faculty of Natural Sciences, Matej Bel University, Slovakia  
2007 RNDr., Mathematics, Faculty of Natural Sciences, Matej Bel University, Slovakia  
2013 Ph.D., Mathematics, Faculty of Natural Sciences, Matej Bel University, Slovakia  
(supervisor: Ľubomír Snoha)  
2007 – 2009 Assistant Professor, Department of Mathematics, Faculty of Natural Sciences,  
Matej Bel University, Banská Bystrica, Slovakia  
2013 – present Assistant Professor, Department of Mathematics, Faculty of Natural Sciences,  
Matej Bel University, Banská Bystrica, Slovakia.

## 2. Pedagogical activity

Since 2007 the applicant has been teaching a number of regular courses at the Faculty of Natural Sciences of Matej Bel University, including Calculus, Measure and integral, Linear algebra, Ordinary differential equations, Functional analysis, Set theory and metric spaces, Measure theory for teachers, Discrete mathematics and Sequences and functions, as well as a number of seminars and exercise sessions. His pedagogical activities have been regularly highly evaluated by students, and the report on his pedagogical activity from the department head is also very positive. He has supervised bachelor as well as master theses.

## 3. Scholarly and research activities

M. Dirbák is scientifically active in the field of dynamical systems and ergodic theory, however his expertise significantly transcends also into algebraic topology, group theory and category theory. He gave talks on his results at 20 international conferences in Slovakia, Czech Republic, Poland, China, Spain, Mexico, Austria, and Oman, including 3 invited talks (in China, Poland and Czech Republic). He was a team member in 8 grants funded from sources outside his home university.

## 4. Publications

Matúš Dirbák has authored or coauthored 7 papers in international journals. Some of them are considered fairly prestigious, like Ergodic Theory and Dynamical Systems, Nonlinearity or Israel Journal of Mathematics. His papers earned 18 citations in Web of Science so far (excluding self-citations of the author or coauthors), including three so-called qualified citations, where the citing author uses the cited work in an essential way (the citing authors of these include e.g. Eli Glasner). The submitted habilitation thesis "First cohomology groups of minimal flows" is actually the 206-page (sic!) paper of the applicant (without coauthors) published in the respected periodical *Dissertationes Math.* 562 (2021), 1 – 206, complemented by a 20-page summary.

All three referee reports on the habilitation thesis are positive.

*From the report of Prof. Akin:* "While it is technically very demanding, this paper contains interesting and important results. Of special interest is the construction and application of free objects for various categories associated with group extensions of minimal flows. I studied carefully the long introductory chapter. My reading of the rest was necessarily more superficial, but was sufficient to make clear that this is an excellent work. ... I judge it to be a truly worthy habilitation thesis."

*From the report of Prof. Biš:* "Dr Matus Dirbak investigates minimal flows from algebraic topology point of view and applies with success cohomology theory to flows to get some properties written in the language of category and dynamics. ... The results obtained by the author are new, valuable and belong to the common part of different mathematics branches: dynamical systems, algebraic topology (in particular cohomology theory), group theory and category theory. I found no errors in the dissertation. The thesis is self-contained and well-edited, numerous examples make it easier to understand the meaning of presented theorems. Using tools from various areas of mathematics, the author developed a dynamical theory of group extensions of minimal flows (with compact abelian groups in the fibers) written in cohomology language.

In my opinion, taking into account all the above arguments, the dissertation of dr Matus Dirbak meets the requirements for habilitation theses. Therefore, I recommend to award the title of docent to the applicant."

*From the report of Prof. Downarowicz: "[...] the candidate has found himself a niche which is hardly accessible for others and works hard to fill in the gap in our understanding of the associated phenomena. The candidate has achieved fluency in operating within both topological algebra, algebraic topology, dimension theory, dynamical systems themselves and more. He shows excellency in handling homology and cohomology groups, fundamental groups (and higher homotopy groups) of manifolds. The thesis is a masterpiece of playing with these difficult notions.*

...  
It is time for a summary and a final conclusion. The thesis contains an extensive and original analysis of a very general and abstract subject-matter. The skills of the author in operating difficult tools of topological algebra and related fields are impressive. The thesis fills in a niche in our understanding of certain phenomena. On the other hand, for most of the dynamical systems community the results of the thesis will probably seem unfamiliar and hard to comprehend. The author may be one of very few (if not the only one) deeply interested in this area and fully understanding the significance of his work. These remarks are not meant as a criticism, just a simple statement of fact. The thesis is, without any doubts, a valuable piece of work. I believe that the author is a hard working mathematician with unique set of skills and as such he is very precious for the mathematical society. I fully support his efforts towards habilitation and I think he fully deserves the degree."

### **5 Scientific personality of the applicant**

Matúš Dirbák has earned international recognition in the area of mathematical analysis, especially in the theory of dynamical systems. Based on his overall profile and existing pedagogical and scientific activity, the Committee is convinced that Dr. Dirbák completely fulfills the requirements typically laid on applicants for the degree of docent.

### **Conclusion**

The Committee took into account the thesis, the referees' reports and all other documents characterizing the activities of the applicant. The Committee concludes that Matúš Dirbák fulfills all the requirements stipulated in § 72 of the Higher Education Act, as well as conditions for the promotion to the rank of Docent in mathematical disciplines set by the Scientific Council of the Silesian University in Opava. Therefore,

**the Committee unanimously recommends to promote RNDr. Matúš Dirbák, PhD.,  
to the rank of Docent in the area of Mathematics – Mathematical Analysis.**

Opava/Wroclaw/Bratislava/Krakow, July 18, 2022

Prof. RNDr. Miroslav Engliš, DrSc.

Prof. dr. hab. Tomasz Downarowicz

Prof. RNDr. Július Korbaš, CSc.

Prof. dr. hab. Piotr Oprocha

Doc. RNDr. Artur Serdyukov, DSc.

