

HABILITATION BOARD DECISION ON THE NOMINATION FOR APPOINTMENT TO ASSOCIATE PROFESSOR

Masaryk University

Faculty

Procedure field

Applicant

Applicant's home unit, institution

Habilitation thesis

Faculty of Science

Mathematics - Geometry

Yaroslav Bazaikin, Ph.D., D.Sci.

University of Hradec Králové, Faculty of Science

Non-compact Riemannian manifolds with special holonomy

Board members

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Faculty of Science, Masaryk University

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doc. Pasha Zusmanovich, Ph.D.

Faculty of Science, University of Ostrava

Evaluation of the applicant's scholarly qualifications

Yaroslav Bazaikin, Ph.D., D.Sci., born 13.1.1974 in Osinniki, Russian Federation, received his Ph.D. in 1999 at the Sobolev Institute of Mathematics, Novosibirsk, based on the dissertation devoted to positively curved biquotients of Lie groups. His rich academic career in the last two decades includes diverse areas of fundamental and applied research at the Sobolev Institute of Mathematics in Novosibirsk (since 1995), Novosibirsk State University (since 1995), Trofimuk Institute of Petroleum Geology and Geophysics in Novosibirsk (since 2016), and Faculty of Science, University of Hradec Králové (since 2016). He also supervised three successful Ph.D. students.

Bazaikin's main contribution in pure Mathematics research deals with constructions of examples of Riemannian manifolds with special holonomies, including his crucial early paper "On a certain family of closed 13-dimensional Riemannian manifolds of positive curvature, Siberian Mathematical Journal (1996) vol 37, 6, 1068-1085". The impact of this paper is seen on many important citations in absolutely top journals by several exceptional mathematicians (e.g., Inventiones Mathematicae, Duke Mathematical Journal, Acta Mathematica, Journal of European Mathematical Society, or even 5 times Journal of Differential Geometry – all of them belong to top 5% journals in Mathematics). A series of important papers followed in the next decade, six of them are collected in the submitted habilitation thesis. After 2011, Bazaikin's interests expanded into very applied areas, in particular exploiting the methods of computational geometry and topology in chemical engineering and geology. In recent years,

after joining the geometry group in Hradec Kralove, he co-authored several papers coming back to problems relating holonomy and foliations (two of them are available on arxiv.org).

So far, Yaroslav Bazaikin is the author of 32 original research articles (20 of them in journals in WOS, 7 in conference proceedings, the number of citations without self-citations on WOS is 92 and his h-index is 6).

Although the history of the efforts to find examples of Riemannian metrics with special holonomies goes many decades back, this is still a very active research area and the numerous invitations to lectures at conferences witness that Bazaikin belongs to the international community (e.g. conferences and research groups in Germany, Japan, Poland).

The Habilitation Board is of the opinion that Yaroslav Bazaikin is a mature researcher with wide experience in both pure and applied Mathematics. His work in pure mathematics provides significant contributions to the theory of metrics of special holonomy with impacts in a significant area of differential geometry that has important interactions with physics. At the same time, he can smartly apply mathematical tools in solving practical engineering problems.

Conclusion: The applicant's scholarly capabilities **meet** the requirements expected of applicants participating in a habilitation procedure in the field of Mathematics - Geometry.

Evaluation of the applicant's pedagogical experience

Since 2000, Yaroslav Bazaikin is regularly teaching at the Novosibirsk State University in degree programmes Mathematics and Applied Mathematics, including bachelor, master, and doctoral levels. His lectures were mainly devoted to Differential Geometry, Algebraic Topology, Computational Geometry, Computational Topology. He also supervised three successful doctoral students.

Bazaikin's teaching skills were also demonstrated during his public lecture "On constructions of cohomogeneity one $\text{Spin}(7)$ -holonomy Riemannian metrics" where, among others, the further recent developments related to results collected in his habilitation thesis were explained in a wide international context (answering the main question by the reviewer Swann).

Bazaikin wrote 2 textbooks, one of them devoted to computational topology, a very hot topic without much educational literature available worldwide yet.

Conclusion: The applicant's pedagogical capabilities **meet** the requirements expected of applicants participating in a habilitation procedure in the field of Mathematics - Geometry.

Habilitation thesis evaluation

Dr. Yaroslav Bazaikin submitted the habilitation theses "Non-compact Riemannian manifolds with special holonomy" which consists of short introduction and the collection of six original research papers published in the years 2004 – 2011. Two of them are co-authored by one of the doctoral students of the applicant, the other ones are single authored. This collection provides a compact piece of work, focusing on original methods of creating highly symmetric examples of metrics with special holonomies. Although the topic is of high importance and interest, the necessary techniques are extremely complicated, and the Board had an uneasy task to find strong, independent, and knowledgeable reviewers for this task. Finally, the following three top experts agreed: professor Andrew Swann of Aarhus, Denmark, professor

Lorenz Schwachhöfer, Technical University Dortmund, and professor Yuri Nikonorov, Vladikavkaz Science Center, Russian Academy of Sciences.

In particular, Lorenz Schwachhöfer is one of the most celebrated personalities in the area of special holonomy constructions. His report provides an impressively detailed description and evaluation of the novelty of ideas in the collection of papers and he finally states: "... I consider this Habilitation thesis to be an impressive work of mathematics. The presentation of the introduction is a very well readable introduction into the field, giving an excellent summary of the background material needed to appreciate the reading of the articles [1] - [6]. In my opinion, this thesis demonstrates technical strength and the ability to carry out good independent research in an important area of modern geometry". Similarly, Andrew Swann concludes his report by: "... the thesis demonstrates significant contributions to the theory of Ricci-flat metrics of special holonomy and the construction of solutions. This fits in to and contributes to a significant area of differential geometry that has import interactions with physics".

As noticed by all reviewers and the Board, there are numerous misprints in the introduction text, including the abstract. Irrespective of that, all three reviewers fully support, without any doubts, the appointment of the applicant associate professor in the field Mathematics – Geometry.

Conclusion: The applicant's habilitation thesis **meets** the requirements expected of habilitation theses in the field of Mathematics - Geometry.

Secret ballot results

Number of board members		5
Number of votes cast		5
of which	in favour	5
	against	0

Board decision

Based on the outcome of the secret vote and following an evaluation of the applicant's scholarly or artistic qualifications, pedagogical experience and habilitation thesis, the board hereby submits a proposal to the scientific board of the Faculty of [faculty name] of Masaryk University to

☒ appoint the applicant associate professor of Mathematics - Geometry.

☐ terminate the procedure.

In Brno on 2.11.2020

prof. RNDr. Jan Slovák, DrSc.

signature