Self-assessment report

on the scientific activity of the Mathematics Institute in Opava for the period 2012 – 2017

Silesian University in Opava
Mathematics Institute in Opava

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Mathematics Institute in Opava
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Introduction. Mathematics Institute of the Silesian University in Opava was founded as a stand-alone university institute on January 1, 1999. Its predecessor was the Department of Mathematics, which had been one of the constituents of the Faculty of Philosophy and Science since the founding of the faculty in 1991, and which had, thanks to its qualified academic personnel, demonstrated a very rapid development. This was the reason why the Silesian University acquired a doctoral programme as early as in 1994, followed in 1995 by the authorization to perform habilitations and full professor appointments in the field of Mathematical Analysis. At present, Mathematics Institute in Opava is an established and internationally recognized scientific institution. Roughly two thirds of its budget are alloted for research activity, and for the most part come from funding distributed on the basis of open competition; similarly, roughly two thirds of its academic staff has parts of their workload alloted to research activity. The main scientific projects in the period 1999-2011 were the so-called Institutional Research Plans MSM4781305904 „Topological a analytical methods in dynamical systems theory and mathematical physics" (2005-2011) and MSM192400002 „Global analysis" (1999–2005). Since 2012, the institute is one of the four members of the joint seven-year project „Eduard Čech Institute for algebra, geometry and mathematical physics", the only center of excellence in the area of mathematics in the Czech Republic. The institute carries out a total of 12 study fields in the bachelor, master and doctoral study programme Mathematics in Czech as well as English languages, and is authorized to perform habilitations and full professor appointments in two areas of mathematics.

a) Orientation and strategic goals. To maintain high level and international renown of the scientific activity of the institute in the areas of basic research, and to do so in all the areas of mathematics cultivated so far, particularly in the theory of dynamical systems, theory of integrable systems, differential geometry and mathematical physics, functional analysis, complex analysis and theory of differential equations. It will be imperative to continually strive to obtain funding from publicly open sources (grant competitions and similar).

b) Management of scientific activity. Since 2005, three-day evaluation sessions are organized twice a year (May and November) for all academic personnel whose salary is at least partly covered from the funds for research, and all doctoral students. The participants report on their scietific activity and results obtained, their envisaged research projects and, if applicable, problems coped with. An integral concluding part of the sessions is also a substantiated public assessment of the academic staff and doctoral students (grades used: outstanding recognition, very satisfactory, satisfactory, partly satisfactory, unsatisfactory).

c) Measures adopted to support the development of scientific activity. The outcomes of the evaluation sessions are used as a basis for salary bonuses from the budget for scientific activity. Additionally, every faculty member or doctoral student can claim a bonus or scholarship, respectively, in the amount of 10.000 CZK for every paper published in an impact-factor journal, irrespective of the number of coauthors. It must be noted that this scheme is not abused.

d) Interconnection of the scientific activity with the educational activity. Analogous to what is standard in the area of mathematics on good-quality tertiary educational institutions abroad. This is witnessed e.g. by impact-factor publications of doctoral, and even some master, students. Publications without coauthors are especially a priority. Since 2012, there were 35 papers by students (mostly doctoral) published in this way, as well as 5 so-called post-master thesis („rigorózní práce").

e) Academic personnel structure and career advancement. There are 25 academic employees with full-time workload, comprising of 2 full professors, 7 associate professors („docents", i.e. after habilitation) and 16 assistant professors with the degree of Ph.D. or equivalent; and there are 3 part-time (0.35 – 0.7) employees. This represents a fairly above-average personnel structure within Czech universities. During the period under evaluation, 2 faculty members successfully completed habilitation. Any faculty member who satisfies the criteria required for habilitation or full professor appointment is encouraged to apply for the corresponding procedure. This especially applies to talented early-stage academic personnel. Within the extent applicable under Czech law, it is a rule that only full professors and those who have completed habilitation (associate professors) can obtain permanent work contract.

f) Scientific activity of students, especially doctoral students. Achieves high level. During the comprehensive evaluation of doctoral degree programmes in the Czech Republic by the former Accreditation Commission in 2012, the doctoral programme of the Mathematics Institute in Opava was evaluated highly favourably. For additional information about this topic, please see above.

g) University, national and international scientific projects. During the period under evaluation, there were in total 8 projects of the Grant Agency of the Czech Republic (GACR) carried out in the institute; among these, in 4 cases the principal investigator was from the institute (M. Engliš 2x, M. Štefánková, M. Mlíchová). The combined funding acquired in these projects in 2012 – 2017 was 16.5 mil. CZK.

P201/12/G028 Eduard Čech Institute for Algebra, Geometry and Mathematical Physics, project for the years 2012–2018, total funding for the institute 11.291 mil. CZK, principal co-investigator M. Engliš.

16-25995S Function theory and operator theory in Bergman spaces and their applications II, project for the years 2016–2018, total funding 924 thd. CZK, pincipal investigator M. Engliš.

15-12227S Analysis of mathematical models of multi-functional materials with hysteresis, project for the years 2015–2017, total funding for the institute 975 thd. CZK, principal co-investigator J. Kopfová.

P201/12/0426 Function theory and operator theory in Bergman spaces and their applications, project for the years 2012–2015, total funding 1.404 mil. CZK, principal investigator M. Engliš.

P201/10/0887 Discrete dynamical systems, project for the years 2010–2014, total funding 3.145 mil. CZK, principal investigator M. Štefánková.

P201/10/2315 Mathematical modelling of processes in hysteresis materials, project for the years 2010–2014, total funding for the institute 950 thd. CZK, principal co-investigator J. Kopfová.

P201/11/0356 Riemann, pseudo-Riemann a afinne differential geometry, project for the years 2011–2013, total funding for the institute 1.800 mil. CZK, principal co-investigator M. Marvan.

201/09/P198 Chaos in discrete dynamical systems, project for the years 2009–2012, total funding 872 thd. CZK, principal investigator M. Mlíchová.

Additional projects carried out in the institute during the period under evaluation include those funded by the European Commission ("OPVK" programme), by the Student Grant Competition of the Silesian University in Opava ("SGS"), by the Internal Grant System of the Silesian University in Opava ("IGS"), etc. The combined

funding from all these projects in 2012 – 2016 amounted to 45.5 mil. CZK. Further details about these projects are available from the webpage of the institute and in the annual reports of the institute for respective years.

h) National and international collaboration in scientific activity. Very broad, as witnessed by publications of the academic staff of the institute with co-authors from abroad. From the period under evaluation 2012 – 2017 there are about 50 of these in impact-factor journals, with co-authors from more than 10 countries (such as Chile, France, Italy, Germany, Poland, Portugal, Austria, Russia, Greece, or Spain). Further details are available in annual reports. The institute also systematically tries to create temporary visiting positions to host researchers from abroad; during the period under evaluation, these included 5-30 months positions that attracted 6 long-term scientific visitors.

i) Societal relevance of the scientific activity. The activity mostly belongs to basic research in the areas specified in the point a). From the citations of the published outputs it is apparent that the research has been bringing high quality results, which affect scholarly activity both within the country and abroad.

j) Most important results obtained. During the period 2012 – 2017 there have been published more than 110 publications in impact-factor journals.

In the area of dynamical systems and their applications (34 publications): from the results obtained we have to mention the completion of Sharkovsky's programme of classification of triangular mappings of the square from the late 80's, deep results about distributional chaos on compact metric spaces, exploration of properties of non-autonomous dynamical systems, or results on dynamical systems on graphs and dendrites.

In the area of integrable systems, differential geometry and mathematical physics (27 publications): from the results obtained we have to mention the discovery of a new class of integrable partial differential systems with four independent variables. New methods have been found and applied for searching for recursion operators of integrable systems, including multi-dimensional ones. A number of exact solutions of the constant astigmatism equation has further been found, with significance for plasticity theory.

In the area of functional and complex analysis (26 publications): from the results obtained we have to mention a partial proof of the Arveson-Douglas conjecture, descriptions of boundary singularities of harmonic and weighted holomorphic Bergman kernels, and results on Dixmier traces of Hankel and Toeplitz operators, with applications in non-commutative geometry.

In the area of differential equations (12 publications): from the results obtained we have to mention applications of PDE with hysteresis for modelling deformations of construction elements, e.g. beams and plates, and properties of slowly oscillating wavefronts or travelling waves.

k) Methods and results of internal evaluation of the scientific activity by the unit evaluated. Methods are specified in the point b). The results for the whole institute are available to all the academic personnel and doctoral students of the institute.

Guide to Annexes

More details about the activity of the institute can be found in the annual reports of respective years 2012 – 2017, which are attached as separate annexes. The reports are in Czech, but is it hoped that due to their simple structure most of the data can be understandable for anyone; a short glossary of chapter headings is given below.

Zpráva o vědecké činnosti	Report on scientific activity
Vědecká rada Matematického ústavu	Scientific Council of the MI
Předseda, Místopředseda, Členové	Chair, Vice-chair, Members
Programy zasedání	Programs of meetings
Kvalifikační a věková struktura	Qualification and age structure
Publikace pracovníků a studentů ústavu	Publications of MI faculty and students
Ohlas prací kmenových pracovníků....	Citations of papers of faculty & students
Grantová a rozvjová úspěšnost	Grants and projects obtained
Vědecké konference a zahraniční ...	Scientific conferences and international collaboration
Další údaje o vědecké spolupráci...	Additional information on scientific activities of the faculty
Institucionální výzkum	Institutional research support
Vybrané publikace	Selected publications
Mezinárodní spolupráce	International collaboration

Note: The reports contain, in particular (in section III), also complete lists of publications by members of the Mathematics Institute for each year.

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