Mathematical Institute
Slovak Academy of Sciences

Accreditation Report of the Mathematical Institute
for the Period 2007-2011

April 30, 2012

Editors: A. Dvurečenskij, K. Nemoga
Technical Editor: M. Hyčko

Questionnaire

Summary of the main activities of a scientific Organisation
of the Slovak Academy of Sciences

Period: January 1, 2007 - December 31, 2011

I. *Formal information on the assessed Organisation:*

1. Legal name and address

Mathematical Institute of the Slovak Academy of Sciences,
Štefánikova 49, SK-814 73 Bratislava, Slovakia

Mathematical Institute, Slovak Academy of Sciences, Bratislava

Departments:

- Department of Computer Science, Bratislava
- Department of Applied Mathematics, Bratislava
- Branch of Mathematical Institute, Košice
- Institute of Computer Science and Mathematics, joint institute of MI SAS and University of Matej Bel in Banská Bystrica, Banská Bystrica

2. Executive body of the Organisation and its composition

Directoriat	name	age	years in the position
director	prof. RNDr. Anatolij Dvurečenskij, DrSc.	62	1999 -
deputy director	doc. RNDr. Karol Nemoga, CSc.	58	1990 -
scientific secretary	doc. RNDr. Karol Nemoga, CSc.	58	1990 -

3. Head of the Scientific Board

doc. RNDr. Karol Nemoga, CSc. – until May 2011

doc. RNDr. Ľubica Holá, DrSc. – from June 2011

4. Basic information about the research personnel

i. **Number of employees with a university degree (PhD students excluded) engaged in research and development and their full time equivalent work capacity (FTE) in 2007, 2008, 2009, 2010, 2011 and average number during the assessment period**

ii. **Organisation units/departments and their FTE employees with the university degree engaged in research and development**

Research staff	2007		2008		2009		2010		2011		average	
	No.	FTE	No.	FTE	No.	FTE	No.	FTE	No.	FTE	No.	FTE
organisation in whole	51	29,23	52	30,94	52	32,36	53	31,03	52	31,02	52,0	30,92
Matematický ústav, Bratislava	25	14,11	25	13,84	25	15,81	26	14,62	25	15,00	25,2	14,68
Oddelenie informatiky MÚ SAV, Bratislava	7	4,00	7	4,00	7	4,00	7	4,08	7	4,08	7,0	4,03
Detašované pracovisko MÚ SAV, Košice	13	8,40	14	9,55	14	9,55	14	9,33	14	9,33	13,8	9,23
Oddelenie matematiky a informatiky, spoločné pracovisko MÚ SAV a UMB B. Bystrica, Banská Bystrica	6	2,72	6	3,55	6	3,00	6	3,00	6	2,61	6,0	2,98

5. Basic information on the funding

i. **Total salary budget[1] of the Organisation allocated from the institutional resources of the Slovak Academy of Sciences (SAS) in 2007, 2008, 2009, 2010, 2011 and average amount for the assessment period**

---

[1] Objem mzdových prostriedkov bez odvodov do poisťovní so započítaním sumy miezd pracovníkov THS, ktorú organizácii poskytne ETO Úradu SAV. Rozpočet v Sk prepočítajte na eurá podľa konverzného kurzu 1€ = 30,126. (Podobne aj v ďalších tabuľkách.)

Salary budget	2007	2008	2009	2010	2011	average
total salary budget (milions of EUR)	0,478	0,497	0,534	0,550	0,524	0,517

6. URL of the Organisation's web site

http://www.mat.savba.sk

II. General information on the research and development activity of the Organisation:

1. Mission Statement of the Organisation as presented in its Foundation Charter

Mathematical Institute of the Slovak Academy of Sciences, is a scientific organization with the budgetary economy. It was founded on March 1, 1959. The Institute is concentrating to the basic research in mathematics (mainly logic and set theory, number theory, algebraic and topological structures, quantum structures, discrete mathematics, real and functional analysis, dynamical systems, differential equations, probability theory and mathematical statistics). In computer science theory, the research is focused to theory of algorithms and computing complexity and to theory of formal languages, automata and numerical systems.

The Institute provides advisory and expert analysis concerning the main scientific activity in area of applications of mathematical methods. It could according to Act 133/2002 *On Slovak Academy of Sciences* perform enterprise activity with respect to its main scientific activity like performing program tools, their sale and updating in area of applied mathematics, and to organize specialized seminars and conferences, and publishing publications in area of applied mathematics.

The Institute participates on pedagogical process at PhD studies according to valid legal regulations.

The Institute ensures publications of results concerned with research activity through the mathematical journals.

2. Summary of R&D activity pursued by the Organisation during the assessed period, from both national and international aspects and its incorporation in the European Research Area (max. 10 pages)

In period 2007-2011, the mathematical research was concentrated to the following groups.

- **Number theory and cryptography**
- **Uncertainty modeling by statistical methods, quantum structures, and fuzzy sets**
- **Ordered algebraic structures and discrete structures**
- **Dynamical systems, real and functional analysis, and topology**
- **Computer science and data processing**
- **Applications of mathematical research in praxis**

The most important results

2007

a. Results of Pure Mathematics

Congruence lattices of algebras

A congruence is an equivalence relation on such structure, which enables to identify some elements and consequently to create a simplified image of an originally complicated object. That is why congruencies are among the main tools of research in this area.

A given structure may have many congruencies, which can be ordered in a natural way. A natural question arises, how can such congruence systems look like, for various types of algebraic structures. For example, it is well known that the congruencies of any lattice form a so called distributive algebraic lattice. A question open for 60 years asks, if the converse of this is true, i.e. if every distributive algebraic lattice can be represented by congruencies of some lattice. A negative solution was achieved in 2005 by F. Wehrung. Our result substantially generalizes this solution and allows to prove the non-representability of various other distributive algebraic lattices.

author: M. Ploščica, (MÚ SAV KE)
project: VEGA 2/7141/27,
reference: M. Ploščica, *Non-representable distributive semilattices, Journal of Pure and Applied Algebra*, **212**, (2008), 2503-2512 .

Generalizations of continuity

A characterization of the set of all continuity points of an arbitrary function is well-known: a set A is the countable intersection of open sets if and only if there is a real function for which A is the set of all continuity points. Similarly, we can find characterizations of quasicontinuity points and cliquishness points. In the paper the quadruplet (A,B,C,D) is characterized: conditions on the sets A, B, C and D are obtained such that there is a real function for which A is the set of all continuity points, B is the set of all quasicontinuity points, C is the set of all cliquishness points and D is the set of all both upper and lower quasicontinuity points.

author: J. Borsík (MÚ SAV KE)
project(s): VEGA 2/6087/27, APVT-51-006904
reference: J. Borsík, *Points of continuity, quasicontinuity, cliquishness and upper and lower quasicontinuity*, Real. Anal. Exchange, **33** (2008), 339-350.

Magic Numbers and Finite Automata

Finite automata are the simplest devices that are used to describe some formal languages. In our research, we deal with the question of what values in the range from n to 2^n, where n is the size of a given minimal nondeterministic finite automaton, can be reached as the size of the equivalent minimal deterministic finite automaton. We show that all such values can be reached, and to describe the witness automata we use a fixed four-letter alphabet. The values that cannot be reached in the way described above are called magic numbers in the literature. Using this terminology our result can be stated as follows: In the case of a four-letter alphabet, there are no magic numbers.

authors: J. Jirásek (PF UPJŠ, KE), G. Jirásková (MÚ SAV KE), A. Szabari (externý doktorand na MÚ SAV)
project: VEGA 2/6089/26 **reference:** J. Jirásek, G. Jirásková, A. Szabari, *Deterministic blow-ups of minimal nondeterministic finite automata over a fixed alphabet.* In: Proc. 11th International Conference on Developments in Language Theory (DLT 2007), T. Harju, J. Karhumäki, A. Lepistö (eds.), Lecture Notes in Computer Science 4588, Springer, Berlin, 2007, pp. 254-265.

b. Results of Applied Mathematics

Leak detection and localization in natural gas transport

The leak detection and location model for gas transit pipelines and its software implementation were developed in cooperation with company CSE-Servelec, s.r.o for Yemen LNG Company Ltd. The leak detection model is based on numerical simulations of gas flow in the pipeline. After the site acceptance tests the software will be installed at the control room at Bal Haf (Yemen) and used as a part of the Main Line Supervision System.

authors: M. Bayer, R. Hajossy, A. Huček, M. Kontriš, K. Nemoga, P. Somora, M. Spál, M. Tryzňa, T. Žáčik (head).
Projects: 1235 The optimization model of natural gas transportation ESF Project 13120200037 - Creation of a stable work group for a development and an application in a gas dynamic research

c.   Results of International Projects

Covers of the class of MV-algebras in the class of generalized MV-algebras

MV-algebras appeared as an algebraic description of many-valued logics, i.e., logics attaining more than two values 0-1. In 1999, non-commutative generalizations of MV-algebras, GMV-algebras, were presented, and A. Dvurečenskij has found for them a basic representation by intervals in lattice ordered groups. Due to this result, we have found cover varieties of the class of MV-algebras (i.e. a cover variety is a variety where no other variety is in between). GMV-algebras have in general two negations and we have shown, this class is too reach because it contains uncountably many cover varieties of MV-algebras, and these were described in details.

authors: A. Dvurečenskij (MÚ SAV KE), Charles W. Holland (Bowling Green Univ., USA)
projects: Center of Excellence -Physics of Information I/2/2005, VEGA 2/6088/26, APVV-0071-06
reference: A. Dvurečenskij, Ch. W. Holland, Covers of the Abelian variety of generalized MV-algebras, Communications in Algebra **37** (2009), 3991--4011.

On k-planar crossing numbers

The classical combinatorial problem of drawing of networks in the plane with minimum number of crossings of links between nodes was generalized for the case of drawing of a network into k parallel planes, with minimum total number of crossings on all planes. New algorithms for the problem were designed. Methods for estimating this network parameter for arbitrary network were derived. Tight bounds for typical networks were archived. Exact values for an infinite family of complete bipartite graphs were determined.

authors: F. Shahrokhi (Uni. North Texas, USA), O. Sýkora (MÚ SAV), L.A. Szekely (Uni. Loughborough, UK), I. Vrťo (MÚ SAV)
project: EPSRC, no. GR/S7/6694/01
reference: Shahrokhi, F., Sýkora, O., Szekely, L.A., Vrťo, I., *On k-planar crossing numbers*, Discrete Applied Mathematics **155** (2007), 1106-1115.

2008

a.   Results of Pure Mathematics

The existence of chaos in infinite dimensional non-resonant systems

One of fascinating behaviour of nonlinear dynamical systems is their possible chaotic oscillation, which in fact means their unpredictable character. A typical such example in the engineering literature, the Galerkin method, is the buckling of the beam modeled by a nonlinear partial differential equation, which presents an infinite system of ordinary differential equations. Nowadays there is already well elaborated theory of chaos for ordinary differential equations, which can be successfully applied to our reduced system. We have developed an abstract theory of the chaos which we then applied to several concrete partial differential equations on buckling of the beam. This result is a flashing-point of our several years lasting effort in the investigation of chaotic behaviour of nonlinear dynamical systems.

Authors: M. Fečkan, J. Gruendler (Univ. North. Carolinia)
Project: VEGA-SAV 2/7140/27.
Reference: M. Fečkan, J. Gruendler, The existence of chaos in infinite dimensional non-resonant systems, Dynamics of Partial Differential Equations 5 (2008), 185-209.

Pointwise convergence of quasicontinuous mappings and Baire spaces

The notion of quasicontinuity was introduced by Kempisty in 1932, however the property of quasicontinuity was perhaps the first time used by Baire in 1899 in the study of points of continuity of separately continuous functions. Quasicontinuous functions have found their applications in the theory of semitopological groups and in the theory of selections of multifunctions. The pointwise limit of quasicontinuous functions need not be quasicontinuous. Using the Choquet game for Baire spaces X, we gave a complete answer to the question when the pointwise limit of the sequence of real-valued quasicontinuous functions defined on X is also quasicontinuous.

Authors: Ľ. Holá, D. Holý
Project: VEGA-SAV 2/7139/27
Reference: Ľ. Holá, D. Holý, Pointwise convergence of quasicontinuous mappings and Baire spaces, Rocky Mountains Mathematical Journal **41**(2011), 1883-1894.

Models of uncertainty: a categorical approach

Uncertainty modeling represents an important area of human knowledge. It covers various fields, for example quantum physics, informatics, but also psychology, medical diagnostics and decision making processes in general. Modern mathematical methods provide a suitable apparatus for such models. We utilize category theory and nontraditional mathematical structures. The advantage is a universal language and universal constructions, leading to more visual and straightforward proofs of mathematical theorems. The main results concern the transition from the classical model of probability to a fuzzy model and utilize the good categorical properties of D-posets of fuzzy sets.

Author: Roman Frič
Projects: APVV-0071-06, VEGA-SAV 2/6088/26, Centrum of excellency CEPI I/2/2005
Reference: Frič, R., *Extension of domains of states*, Soft Computing **13** (2009), 63-70.

b. Results in Applied Mathematics

Transit gas pipeline system optimization according to preset line pack

Continuing the cooperation with eustream, a.s. (former SPP – Tranzit, a.s.), the project of optimization of the settings of compressor stations according to various parameters and the condition of a preset total amount of gas has been successfully realized. New modules for the leak detection was developed for the gas pipeline system in Yemen.

Authors: M. Bayer, R. Hajossy, K. Nemoga, P. Somora, M. Spál, T. Sedláková, P. Vadovič, T. Žáčik
Projects: 1235 The optimization model of natural gas transportation. ESF Project 13120200037.

c. Results of International Projects

Spectral resolution on generalized quantum structures

Physical quantities in quantum mechanics need not be simultaneously measurable. Bounded self-adjoint, i.e. Hermitian operators on a separable Hilbert space admit the structure of a real Jordan algebra which we call a Hermitian algebra. We studied generalizations of the latter algebra and have found conditions under which elements of an order unit space admit spectral resolutions and a spectrum as a nonempty subset of the real line. We have shown that their unit interval is an effect algebra and projections form a sigma-complete orthomodular lattice.

Authors: Sylvia Pulmannová, , David J. Foulis, Department of Mathematics and Statistics, University of Massachusetts, Amherst
Projects: APVV-0071-06, VEGA 2/6088/26, 2/0032/09, CEPI I/2/2005
References: D. Foulis, S. Pulmannová, Spectral resolution in an order-unit space. Reports Math. Phys. **62** (2008), 323-344.

State-morphism MV-algebras

Nowadays many valued reasoning is modeled by MV-algebras. To model a probabilistic reasoning we use a notion of a state. In our result we have asked what does happen when we include into the language of MV-algebras also a special homomorphism, a morphism. Such MV-algebras are said to be state-morphism MV-algebras and they form a variety and thus a state is now an internal notion. The basic result was a full description of all fundamental elements of this variety that are subdirectly irreducible algebras.

Authors: A. Dvurečenskij, A. Di Nola (Univ. Salerno)
Projects: APVV-0071-06, VEGA-SAV 2/6088/26, Centrum excelencie CEPI I/2/2005
Reference: A. Di Nola, A. Dvurečenskij, *State-Morphism MV-algebras,* J. Pure Appl. Logic, **161** (2009), 161--173.

2009

a. Results of Pure Mathematics

Edge coloring of cubic graphs on orientable surfaces

We solved a 40 years old edge-coloring problem of Grunbaum. By a classical result of Tait from 1880, the

four Color Theorem (every planar map is 4-colorable) is equivalent to the statement that edges of every 3-regular 2-connected planar graph can be colored by three colors. By Grunbaum, this edge-coloring property can be extended to 3-regular graphs with so called polyhedral embeddings (with forbidden nonnatural configurations) in orientable surfaces. We disproved this conjecture.

Author: M. Kochol
Project: VEGA-SAV 2/7037/7
Reference: M. Kochol, 3-Regular non 3-edge-colorable graphs with polyhedral embeddings in orientable surfaces, in: Graph Drawing 2008, Editors: I.G. Tollis, M. Patrignani, Lecture Notes in Computer Science, Vol. 5417, Springer-Verlag, Berlin, 2009, str. 319-323.

Monounary algebras

This book deals with monounary algebras. After introducing the basic concepts and definitions it deals with standard concepts of universal algebra, namely homomorphisms, congruencies, subalgebras and direct products. Further deals with retracts and with lattices of retracts of monounary algebras. There are studied three types of classes of (partial) monounary algebras: varieties, retract varieties and convexities. There are also studied some types of structures corresponding to monounary algebras (grupoids, graphs, globals, bottleneck algebras).

Authors: D. Studenovská-Jakubíková (UPJŠ Košice), J. Pócs (MÚ SAV, Košice)
Projects: VEGA 1/3003/06, VEGA 1/0423/03
Reference: Studenovská-Jakubíková, D.-Pócs, J.: Monounary Algebras, P. J. Šafárik University, Košice, 2009.

Arzela's Theorem and strong uniform convergence on bornologies

In 1883 Arzela gave a necessary and sufficient condition via quasi-uniform convergence for the pointwise limit of a sequence of real valued continuous functions on a compact interval to be continuous. A milestone was the P.S. Alexandroff convergence introduced in 1948 to tackle the question for a sequence of continuous functions from a topological space (not necessarily compact) to a metric space. In 2009, in the realm of metric spaces, Beer and Levi found another necessary and sufficient condition through the novel notion of strong uniform convergence on finite sets. We offer a direct proof of the equivalence of Arzela, Alexandroff and Beer-Levi conditions. We also study the main properties of the bornology of strong uniform convergence of functions on bornologies.

Authors: A. Caserta, G. Di Maio, Ľ. Holá
Project: VEGA 2/7139/27
Reference: A. Caserta, G. Di Maio, Ľ. Holá, Arzela's Theorem and strong uniform convergence on bornologies, J. Math. Anal. Appl. **371** (2010), 384-392.

b. **Results of Applied Mathematics**

Methods for leak detection and localization

Methods for leak detection and localization were developed. The methods were utilized, within the continuing cooperation with the CSE-Controls, Ltd. company, in a software application designed for the detection and localization of leaks from gas pipeline systems transporting natural gas or other technical gases, e.g. ethylene. The system is working in real time and uses telemetric data measured along the pipeline. It has been successfully tested for a pipeline system in the United Kingdom and is already installed on a pipeline in Yemen.

Authors: M. Babic, M. Bayer, R. Hajossy, K. Nemoga, P. Somora, M. Sedliak, T. Sedláková, P. Vadovič, T. Žáčik (head).
Project: 1235 The optimization model of natural gas transportation
Reference: HAJOSSY, R. - BABIC, M. - NEMOGA, K. - ŽÁČIK, T.: Chvatit li odin datchik dlja lokalizaciji mesta razryva magistralnogo truboprovoda, DISCOM 2009, Moscow, Russia, 28.-30. 4. 2009.

c. Results in International Projects

The existence and stability of periodic and symmetric solutions for weakly nonlinear differential equations

The averaging method of Krylov-Bogoliubov-Mitropolskii is rather powerful mathematical tool for investigation of qualitative properties of nonlinear differential equations. It is an asymptotic and constructive method, which means that solutions of differential equations can be explicitly approximated. The cited works contributed for the further development of this theory by showing that if the differential equation has a symmetric property then the averaging method can be used while existing approaches fail. This new approach is used for proving the existence and stability of periodic solutions for nonlinear differential equations with numerous concrete examples.

Authors: prof. RNDr. Michal Fečkan, DrSc. (MÚ SAV), Nataliya Dilna (Institute of Mathematics of the National Academy of Sciences of Ukraine, Kiev)
Grants: National Scholarship Program of the Slovak Republic; Grant No. 0108U004117, Grant No. GP/F26/0154 (Dilna) VEGA 2/7140/27 (Fečkan)

References: 1. N. Dilna, M. Fečkan. About the uniqueness and stability of symmetric and periodic solutions of weakly nonlinear ordinary differential equations. Dop. Nats. Akad. Nauk Ukrainy, (2009), No. 5, pp. 22-28 (in Russian).
2. N. Dilna, M. Fečkan. On the uniqueness and stability of symmetric and periodic solutions of weakly nonlinear ordinary differential equations. Miskolc Mathematical Notes. Vol. 10 (2009), 11-40.
3. N. Dilna and M. Fečkan. Weakly non-linear and symmetric periodic systems at resonance. Journal Nonlinear Studies, **16** (2009), 23-44.

The first digit problem

Benford empirically found that the frequencies of occurrence of the first digits in a random sequence are not equal, they depend on logarithm of a concrete digit with base in which the sequence is expressed. We are proved that a sequence from the unit interval satisfies Benford's law only for finitely many bases. It follows from that the Benford law is equivalent to some functional equation for distribution functions of the sequence.

Authors: V. Baláž (TU Bratislava), K. Nagasaka (Hosei University, Tokyo), O. Strauch (MI SAS)
Project: VEGA 2/7138/27
Reference: Baláž, V., Nagasaka, K., Strauch, O. Benford's law and distribution functions of sequences in (0,1). Math. Notes **88**, (2010), 449-463 and Mat. Zametki **88**, (2010), 485-501.

Central decompositions of effect algebras and generalization of Loomis dimensional theory

We studied generalizations to EAs of the hull mapping featured in L. Loomis's dimension theory for complete orthomodular lattices, and developed a theory of direct decompositions for EAs with a hull mapping. A. Sherstnev and V. Kalinin have extended Loomis's dimension theory to orthocomplete OMPs, and we extended it further to orthocomplete EAs; moreover, a corresponding direct decomposition into types I, II and III is obtained using the hull mapping induced by the dimension equivalence relation.

Authors: S. Pulmannová (MI SAS), D. J. Foulis (Univ Massachusetts)
Projects: APVV-0071-06, VEGA 2/0032/09
References: Foulis, D. J.-Pulmannová, S.: Centrally orthocomplete effect algebras, Alg. Universalis, **64** (2010), 283-307.
Foulis, D. J., Pulmannova, S.: Type decompositions of an effect algebra, Found. Phys., **40** (2010), 1543-1565.
Foulis, D. J. -Pulmannova, S.: Hull mappings and dimension effect algebras, Math. Slovaca, **61** (2011), 155-172.

2010

c.   Results of Pure Mathematics

Unique solvability of a non-linear non-local boundary-value problem for systems of non-linear functional differential equations.

General conditions for the unique solvability of a non-linear nonlocal boundary-value problem for systems of non-linear functional differential equations are obtained under the assumption that the nonlinearities can be

estimated by using certain linear operators that generate uniquely solvable boundary-value problems with positive Green operators. The conditions obtained are optimal in a certain sense.

Authors: N. Dilna (MÚ SAV), A. Ronto (Institute of Mathematics Academy of Sciences of the Czech Republic, Brno)
Grants: VEGA 2/0124/10 (Dilna)
Grant No. 0108U004117, FRSF, Grant No. GP/F26/0154, AS CR, Institutional research plan AV0Z10190503, and GA CR, Grant No. 201/06/0254 (Rontó)

Reference:
N. Dilna and A. Rontó. Unique solvability of a non-linear non-local boundary-value problem for systems of non-linear functional differential equations. Mathematica Slovaca, **60** (2010), 327–338.

Fractal and semifractal lattice ordered groups

The motivation of this investigation can be shortly described as follows. G. Czédli [Algebra Universalis 60 (2009), 107—124; 60(2009), 217—230] has been dealing with the notions of fractal, quasi-fractal and semi-fractal lattices. He expressed the conjuncture that there exists a lattice which is quasi-fractal but fails to be fractal. J. Jakubík [Math. Slovaca 60 (2010), 189—194] proved that there exist infinitely many mutually non-isomorphic lattices having the mentioned property. Further, J. Jakubík a J. Lihová [Acta scientiarum mathematicarum 76 (2010), 353—358] described a proper class of mutually non-isomorphic lattices with the properties mentioned above. We proved that there exists a proper class of mutually non-isomorphic lattice ordered groups each of which is semifractal but fails to be fractal.

Authors: J. Jakubík, J. Lihová
Project: VEGA 2/0194/10, project Center of Excellence Slovak Academy of Sciences - Physics of Information (grant I/2/2005).

Reference: J. Jakubík, J. Lihová: On some types of homogeneity of lattice ordered groups and of Boolean algebras. Acta Scientiarum **76** (2010), 353-358.

Strong additivity and Markov property on the CAR algebra

Strong subadditivity of entropy is a remarkable property of states on three-fold tensor products of Hilbert spaces. The states saturating strong subadditivity, so-called strongly additive states, are exactly the states with the Markov property. Strong subadditivity of entropy holds also for the CAR algebra, but strong additivity is equivalent with the Markov property only for even states. We proved that any state (not necessarily even) is strongly additive if and only if its density matrix can be factorized with respect to the local algebras AB and BC, and is Markov if and only if one of the factors is even. For even Markov states a detailed description of the density matrix was given.

Author: A. Jenčová
Projects: VEGA 2/0032/09, meta-QUTE ITMS 26240120022
Reference: A. Jenčová, The structure of strongly additive states and Markov triplets on the CAR algebra, J. Math. Phys. **51**, 112103 (2010).

A special case of the antidilation problem

The antidilation problem consists of a mapping of one network into another one such that the distance of neighbouring nodes of the first network is maximized in the second network. This reflects in an abstract way several practical problems including the obnoxious facility location problem. A special case was studied when the networks are identical. For several typical networks like meshes and Hamming graphs, the best possible mappings where proved. As a byproduct, a surprising connection to classical Latin squares was shown.

Autors: Ľ. Török, I. Vrťo
Project: VEGA 2/0111/09
Reference: Ľ. Török, I. Vrťo: *A special antidilation problem for meshes and Hamming graphs,* Discrete Applied Mathematics, submitted.

b.   Results of Applied Mathematics

Fire Simulation in Tunnels

We have simulated the origin and spread of a fire in tunnels. Our computations showed that these simulations are very time-consuming so that the whole simulation has to be performed using parallel, highly efficient computers. Two fans were installed inside the tunnel with variable speed of the air at their outputs. With a resolution of 10cm in each dimension, the serial computation on one processor required about 7 days, whereas the parallel computation using 24 processors took only 42 hours. Such numerical experiments can be done using one serial processor only in a very limited way. Our maximal resolution was 10cm x 5cm x 10cm, whereby the length 5cm was used in the direction of the airflow through the tunnel. This computation required 94 hours using 48 processors. Further reduction of the computational time is possible only by using up-to-date powerful parallel computers with modern hardware and software.

Authors: G. Okša, M. Bečka, L. Halada (ÚI SAV)
Projects: APVV-0532-07
Reference: An article is in preparation.

c. **Results of International Projects**

Loomis-Sikorski Theorem and Stone Dualities for MV-algebras with Internal State

In the last period, the notion of probability measure was algebraized for MV-algebras introducing an MV-algebra with internals state. We generalized the Loomis—Sikorski Theorem for sigma-complete MV-algebras with a sigma-complete state-morphism-operator showing that every such an MV-algebra is a sigma-homomorphic image of a tribe of functions with an internal state induced by a function where all the MV-operations are defined by points.

We have established Stone Duality Theorems for (i) the category of Boolean algebras with a fixed state-operator and the category of compact Hausdorff topological spaces with a fixed idempotent continuous function, and for (ii) the category of weakly divisible sigma-complete state-morphism MV-algebras and the category of Bauer simplices whose set of extreme points is basically disconnected and with a fixed idempotent continuous function.

Authors: A. Dvurečenskij, A. Di Nola (Univ. Salerno), A. Lettieri (Univ. Naples)
Projects: Center of Excellence SAS - Quantum Technologies, ERDF OP R&D Projects CE QUTE ITMS 26240120009 and meta-QUTE ITMS 26240120022, the grant VEGA No. 2/0032/09 SAV, and by Slovak-Italian APVV project SK-IT 0016-08.

References: (1) A. Di Nola, A. Dvurečenskij, A. Lettieri, Erratum ``State-morphism MV-algebras" [Ann. Pure Appl. Logic 161 (2009) 161-173], Ann. Pure Appl. Logic **161** (2010), 1605—1607.
(2) A. Di Nola, A. Dvurečenskij, A. Lettieri, On the Loomis—Sikorski theorem for MV-algebras with internal state, J. Austral. Math. Soc., **89** (2010), 317--333.
(3) A. Di Nola, A. Dvurečenskij, A. Lettieri, Stone duality type theorems for MV-algebras with internal state, Comm. Algebra **40** (2012), 327--342.

Type-decomposition of a pseudo effect algebra

We further developed the basic theory of centrally orthocomplete pseudoeffect algebras, we generalize the notion of a type-determining set to pseudoeffect algebras, and show that they induce decompositions of centrally orthocomplete pseudoeffect algebras into direct summands.

Authors: S. Pulmannová, E. Vinceková, D.J. Foulis (Univ. Amherst, USA)
Projects: APVV LPP-0199-07; grant VEGA 2/0032/09, Center of Excellence SAS - Quantum Technologies; ERDF OP R&D Project CE QUTE ITMS 26240120009 and meta-QUTE ITMS 26240120022.
References: S. Pulmannová, E. Vinceková, D.J. Foulis, Type-decomposition of a pseudo effect algebra, J. Austral. Math. **89** (2010), 335-358.

2011

d. **Results of Pure Mathematics**

Dirichlet sets, Erdös-Kunen-Mauldin sets and their applications

We proved strengthening of two well-known theorems related to the Lebesgue measure and additive structure of the real line. The first one is a theorem of Erdös, Kunen, and Mauldin stating that for every perfect set there exists a perfect set of measure zero such that their algebraic sum is the whole real line. The other is

Laczkovich's theorem saying that every proper analytic subgroup of the real line is included in an Fσ set of measure zero. Using the strengthened theorems we generalize the fact that permitted sets for families of trigonometric thin sets are perfectly meager.

Author: Peter Eliáš
Project: VEGA 1/0032/09
Reference: P. Eliáš, Dirichlet sets, Erdös-Kunen-Mauldin theorem, and analytic subgroups of the reals, Proc. Amer. Math. Soc. 139, (2011), 2093–2104.

Another proof of Hurewicz theorem,

Hurewicz theorem says that every analytic set is either F_σ or its complement contains a relatively closed set homeomorphic to the set of rational numbers. Recently M. Staš improved this dichotomy using separation by F_σ sets. We have found another proof based on a certain property of continuous mappings, which enables generalization for κ-analytic sets where κ is an arbitrary cardinal number smaller than the covering of the Baire category. As a corollary, under Martin's axiom a Σ^1_2 set in a Polish space is the union of a system of closed sets of cardinality less than the continuum if and only if its complement does not contain a relatively closed set homeomorphic to the set of rational numbers.

Authors: Miroslav Repický
Projects: VEGA 1/0032/09

Reference: Miroslav Repický, *Another proof of Hurewicz theorem*, Tatra Mountains Mathematical Publications, 49 (2011), 1–7.

Reversibility conditions for quantum operations

A subset of states of a quantum mechanical system can be viewed as carrying some information. If such a subset undergoes a quantum operation, for example, restriction to a subsystem, then usually some information is lost. But, in some cases, the operation is reversible for the particular set of states and the information can be recovered. Conditions in terms of Radon-Nikodym derivatives and factorization conditions for the density operators of the states were also formulated, where the latter are analogical to the factorization criterion for sufficient statistics in classical statistics.

Author: Anna Jenčová
Projects: VEGA 2/0032/09, meta-QUTE ITMS 26240120022

Reference: Anna Jenčová, *Reversibility conditions for quantum operations*, arXiv:1107.0453

b. Results of Applied Mathematics

Parallelization of calculations in gas transit networks

New parallel algorithms were developed for the purpose of gas transit networks calculation acceleration. The calculation of maximal flow in a gas network using evolution strategies was established based on the parallel utilization of several processor cores. A significant acceleration of simulation calculations of thermodynamic quantities in gas-dynamics modelling was achieved using massively parallel computations on new types of computer graphic cards designed for scientific calculations.

Authors: M. Babic, M. Bayer, R. Hajossy, K. Nemoga, P. Somora, M. Sedliak, T. Sedláková, P. Vadovič, T. Žáčik (head of the department).
Project: 1235 Gas transport optimization through transit pipelines
References: Contract no. 1235/01/10/MU between the Mathematical institute of the Slovak Academy of Sciences and eustream, a.s., 2010, project stage 3.2.
Igor Mračka, Peter Somora, Tibor Žáčik: GPGPU calculations of gas thermodynamic quantities. Proceedings of the Federated Conference on Computer Science and Information Systems, IEEE Digital Library, ISBN 978-83-60810-22-4, 2011, pp. 451–458.

c. Results of International Projects
Optimal simulation of self-verifying automata by deterministic automata

In self-verifying nondeterminism, computation paths can give three types of answers: yes, no, and I do not know. Furthermore, on the same string, two paths cannot give contradictory answers. Self-verifying automata are as powerful as deterministic finite automata. We found the exact value of the function g(n) describing the

numbers of states that are sufficient and necessary in the worst case for deterministic automata to simulate self-verifying automata of n states. We proved the optimality of the upper bound by describing worst-case examples over a two-letter alphabet.

Authors: G. Jirásková (MI SAS), G. Pighizzini (Univ. Milano, Italy)
Projects: VEGA 2/0111/09, MIUR under the project PRIN "Aspetti matematici e applicazioni emergenti degli automi e dei linguaggi formali: metodi probabilistici e combinatori in ambito di linguaggi formali"

Reference: G. Jirásková, G. Pighizzini, *Optimal simulation of self-verifying automata by deterministic automata*, Information and Computation **209** (2011), 528-535

MV-algebras with Internal State

The notion of a probability measure on MV-algebras can be characterized as a finitely additive measure, and in the last time also as an MV-algebra with internal state. For such classes we have characterized criteria of stone bricks of the theory of MV-algebras with internal state - subdirectly irreducible MV-algebras with internal state as well as for MV-algebras with state morphism. We have solved an open problem that the unit square MV-algebra with the diagonal projection operator generates the lattice of subvarieties of the variety of MV-algebras with state morphism and it is uncountable. We have shown how generators of some varieties state morphism MV-algebras can be defined.

Authors: A. Dvurečenskij (MI SAS), F. Montagna (Univ. Siena, Italy), T. Kowalski (Univ. Melbourne, Australia)
Projects: Center of Excellence SAS - Quantum Technologies, ERDF OP R&D Projects CE QUTE ITMS 26240120009 and meta-QUTE ITMS 26240120022, the grant VEGA No. 2/0032/09 SAV, and by Slovak-Italian APVV project SK-IT 0016-08.

Reference: A. Dvurečenskij, T. Kowalski, F. Montagna, *State morphism MV-algebras*, Inter. J. Approx. Reasoning **52** (2011), 1215-1228.

Hilbert space with reproducing kernel and uniform distribution preserving maps

In this paper we study the relation between uniform distribution preserving maps and the worst error of integration of the functions from the Hilbert space with reproducing kernel. Using the Fourier-Walsh expansion, we have found some new numerical results, from which follows that the error depends on the choice of the number of terms of the sequence.

Authors: V. Baláž (TU Bratislava), O. Strauch (MÚ SAV) , J. Fialová (MÚ SAV), V. Grozdanov (Univ. Neophit Rilsky, Blagoevgrad,), S. Stoilova (Bulgarian Academy of Sciences, Sofia,)
Project: SK-BG-0019-08.

Reference: Baláž, V. – Fialová, J. – Grozdanov, V. – Stoilova, S. – Strauch, O.: Hilbert space with reproducing kernel and uniform distribution preserving maps, pp. 28 (submitted to Numerische Mathematik).

The Exocenter of a generalized effect algebra

Elements of the exocenter of a generalized effect algebra (GEA) correspond to decompositions of the GEA as a direct sum and thus the exocenter is a generalization to GEAs of the center of an effect algebra. The exocenter of a GEA is shown to be a boolean algebra, and the notion of a hull mapping for an effect algebra is generalized to a hull system for a GEA. We study Dedekind orthocompleteness of GEAs and extend to GEAs the notion of a centrally orthocomplete effect algebra.

Authors: David J. Foulis (Univ. Amherst, USA), Sylvia Pulmannová (MI SAS)
Projects: Center of Excellence SAS, ERDF OP R&D Projects meta-QUTE ITMS 26240120022;

the grant VEGA No. 2/0059/12 SAV; the Slovak Research and Development Agency under the contract LPP-0199-07.
Reference: D.J. Foulis, S. Pulmannová, *The exocenter of a generalized effect algebra*, Rep. Math. Phys., to appear.

Besides theses representative results, the collaborators of MI SAS achieved a lot of other results which are note presented in this report and they can be found in annual reports for individual years 2007-2011. In addition, many results were obtained in a close collaboration with domestic but also with important mathematical centers in Europe and the whole world. We are also glad that we have a long-year scientific collaboration with Slovak Gas Company.

3. Concept of R&D activity of the Organisation for the next four years (max. 5 pages)

i. Present state of knowledge and status of ongoing research related to the subject of the Concept, from both international and national perspective

Mathematics forms an organic unit. All its parts and their development are mutually interacting. Impulses for mathematical research accrue from the needs to solve problems appearing in mathematics itself in interaction with growth of new information as well as from interaction between mathematics and other scientific areas.

Institute of Mathematics SAS is one of the most important mathematical centers in Slovakia which is studying development of theoretical mathematical questions having its source of inspiration in natural sciences (physics, biology, chemistry, astronomy, meteorology), technology (electro engineering, civil engineering, chemistry, transport, measurement, statistics, linguistic, nuclear technology), informatics (cryptography, IT), economy and banking, and applications of mathematical methods for optimizing, prevention and detection of defects of gas transport pipe line system, atomic power plants.

On the other side there is a non-substitutable role of the Institute of Mathematics SAS in increasing qualifying level of population via PhD study and participating at the education process in mathematics at our universities. The development of the information society and knowledge economy is temperamentally connected with usage of mathematical methods and extending its pieces of information. Its development will be inspired by new stimulus coming from spreading IT and its security items, quantum information, biological and medical systems, development of nanotechnologies and new materials, environment protection, as well as from social laws and economical knowledge. The level of other branches will be given by the level of their "mathematization". Simulation and optimizing of technological, biological, pharmaceutical, geological, meteorological and other techniques via mathematical methods allow them to minimize financial costs of their own research.

It is worth noticing in February 2006, the American president Mr. G. Bush decided to give 20 milliards USD from the resources assigned primary for experimental biology to development of mathematics and physics. This unexpected decision indicates that American mathematicians and physicists assured Mr. G. Bush that without serious development of both these branches it is not possible to expect serious results and development in other scientific branches. This is in opposite to the decision of the Slovak Ministry of Education to reduce the number of education hours of mathematics and physics at Slovak basic and secondary schools. But a mathematical and physical education is useful for any country, not only for USA.

ii. Organisation's role or significance in the overall research effort within the field of the Concept on both the national and international scales

Mathematical Institute of the Slovak Academy of Sciences during whole his history belongs to top mathematical research centres in our country, whose results are comparable with the best mathematical tradition in the world. Namely in number theory and algebra, statistics, graph theory, quantum structures, topology, mathematical analysis, and computer science, etc. According to the last accreditation, the research programs of the Institute participate at the determination of world mathematical trends. According to the result of the accreditation of the Institute for the period 2003-2006, the Institute of Mathematics was evaluated by the highest accreditation mark **A*** as an outstanding organisation whose bigger part of its research satisfies international standards.

The methods of our research are modern and at a high international level. Our colleagues are very active in the World Mathematical Research Space which is confirmed by a large number of joint publications, activity in international research projects, invitations at prestige scientific meetings and universities, and visits of prominent mathematicians at our Institute. For example, in 2011 **doc. RNDr Sylvia Pulmannová, DrSc.** and **prof. RNDr. A. Dvurečenskij, DrSc.** were recognized by an analytical project ARRA, Slovakia, *Identification of top scientific teams and their members in the Slovak Academy of Sciences*, as a **top team** from 22 teams (and of 17 above-average teams) of SAS who achieve the world parameters.
The high credibility of our Institute is confirmed also by successful doctorial studies of young mathematicians from EU countries (Italy, Germany, Malta). Our Institute of Mathematics SAS is a fixed and important integral

part of Math and has large number winners of Štefan Schwarz Fund of the Slovak Academy of Sciences for the best PhD students. Many outstanding foreigners are addressing their talks at our seminars.

iii. Objectives of the Concept

The aim of our Institute for the next five years is to continue in basic mathematical research in all areas in which we gained important results. We will concentrate to the following fields:

1. Number theory and cryptography

Number theory belongs to the oldest mathematical fields and it has its origin already in antic Greece. Nevertheless it is one of the most important mathematical subjects which also today in time of informatics boom lives over its great development and it is its integral part. Extension and advanced technology of modern computers brought also a new and unexpected development of number theory. Nowadays security of information data, banking or cryptography is staying on results of number theory.

Mathematical Institute SAS traditionally belongs among top Slovak mathematical centers of number theory, and its results belong among important world recognized results.

Number theory will belong among basic trends of the mathematical research with the following directions:

- Analytical number theory and probabilistic number theory
- Algebraic and elementary number theory, diophantic equations
- Criteria of pseudo randomness
- Cryptography

2. Uncertainty modeling by statistical methods, quantum structures, and fuzzy sets

Uncertainty modeling is one of the basic problems of measurement in many scientific and technological areas having practical applications in every-day life, including economy. The notion of uncertainty is developing according to width and deep of our knowledge. Modeling is based on deep theoretical results, mainly mathematical statistics, algebraic structures, fuzzy and many-valued logic, and topological and categorical views. Mathematical Institute succeeds top results comparable with the highest world results namely in applications of statistical methods for example in medicine, metrology and linguistic. Measurement of observables in quantum mechanics is based on results of quantum structures, here MI SAS plays a leading role in worldwide scale. Results of our protagonists were published already in three monographs. Today fuzzy theory is a base of many modern fuzzy technologies. The results of our colleagues showed that there is an intimate connection between many-valued logic and algebraic structures, like MV-algebras, pseudo MV-algebras, pseudo effect algebras, and lattice ordered groups.

Our colleagues achieved excellent results in those directions and MI SAS is collaborating with many domestic and foreign centers.

Envisaged directions for this area are:
- Statistical methods in measurement, linguistic, and medicine
- Quantum structures as a mathematical base for quantum mechanics, quantum computing and soft computing
- Fuzzy sets as a mathematical base for modern fuzzy technologies

3. Ordered algebraic structures and discrete structures

In area of ordered algebraic and discrete structures and graph theory, Mathematical Institute SAS has a long-year and successful tradition which goes back the beginning of our Institute. Ordered structures like partially ordered sets and ordered groups are studying on many important mathematical centers. The problem nowadays is related with computational complexity, optimizing dissimilation and combining of many substructures. This is characteristic for microchip construction or for description of very complicate molecules or graphs coloring problems.
Envisaged planes for this research are:

- Ordered sets and algebraic structures

- Graphs and optimizing algorithms
- Algebraic combinatorics

4. Dynamical systems, real and functional analysis, and topology

Very complex processes in technological branches, dynamical systems, as well as in biological milieu need description via nonlinear differential systems. A chaotic behavior of these systems requests qualitative study between a discretization and original differential equations understood from dynamical theory point of view. Study of modern trends of both analytical and topological methods to boundary problems has at MI SAS a long tradition. Developed methods of convergence processes are basic for use of temporary computer facilities. For calculating and optimizing compound systems we are developing algorithms that are used with a great success in gas pipeline transport systems, as well as in tone systems.

Applications of these methods have a very large variety of applications in technology, national economy, environment protection, and make a large base of knowledge for practical use.

We are planning concentrate to the following directions:

- Periodic and chaotic solutions of nonlinear systems
- Numerical methods
- Integration in vector, topological and ordered spaces
- Topological methods

5. Computer science and data processing

Computer science and data processing is a new paradigm in the area of data processing using Internet or WWW. In this conception we suppose access to globally distributive computational means as well as to information and knowledge. It is important that Slovakia will participate at this research.

Envisaged subvarieties of the research

- New algorithms for extensive numerical and non-numerical problems for large systems of high effective computers and for a finding minor cut number
- Distributive calculations in modern communication systems
- Theoretical problems with accent to linear network decomposition
- Parallelization of a two-sided Kogletlian and a one-side Jacobi methods for SVD calculations

6. Applications of mathematical research in praxis

Mathematical Institute SAS understands very well that *nothing is more practical than a good theory.* We are planning to continue with a successful collaboration with important Slovak enterprises and institutions. It will deal mainly with application in the following areas:

- Cryptographic methods in state administration and for National Security Bureau
- Applications in optimizing methods to Slovak Gas Company
- Prevention and detection of defects in gas pipeline system
- Mathematical methods for Nuclear Power Plant Research Institute

The scientific activity in above outlined directions is important not only to implement our Institute in a strategic area of development in IT, but the achieved results will represent also our concrete contribution to the knowledge society and the knowledge economy in Slovakia.

7. Participation at PhD studies and pedagogical activities

To achieve the envisaged plans is possible only in a collaboration with all generations in our Institute. The main ask will be dedicated to the preparation of young colleagues for their mathematical career, and the best way is to incorporate them into research teams. This is possible in a close cooperation with Slovak and foreign

universities. Many of our colleagues has a long-year experience with teaching activities, because according to us, the best applications of mathematical methods is to learn students the newest mathematical approaches at our Universities. We are also interesting in an active propagation of mathematical results in public media (newspaper, journal, TV, radio, internet) and in organization of the Weeks of Science for students from secondary schools.

iv. Proposed strategies and methods to be applied, and time schedule

The project of the mathematical research at the Mathematical Institute of the Slovak Academy of Sciences for the next four years presents a very courageous but realistic project which rise up from the best mathematical traditions of the Institute, and the newest trends and needs in mathematics. To perform this project we will collaborate with all mathematical centers at Slovak Academy of Sciences and at universities in Slovakia. We have some active scientific contracts with universities, as well our industry, and we have to continue in this direction. Here it is necessary to mention Institute of Measurement SAS, Faculty of Math., Phys., Infor. Comenius Univ. Bratislava, Faculty of Natural Sciences of P.J. Šafárik Univ. Košice, Slovak University of Technology Bratislava, Matej Bel Univ. B. Bystrica, Žilina Univ., Technical Univ. Košice, etc.

The development of the knowledge economy of Slovakia will depend also on fact how it will be possible to implement mathematical research also into new companies in Slovakia (Peugeot, Volkswagen, Kia) and in domestic strategic enterprises. Therefore, it will grow also the number of students of mathematics at universities, it is necessary to profound their mathematical education and to found mathematical teams there.

The economical power of USA depends also in their ability how they are able to incorporate mathematics into needs of technology and praxis. The mathematical level of USA increased also due to immigration of famous mathematicians from the former Soviet Union. Therefore, we need technical and economical conditions for mathematicians, as well as for any young researcher, to reverse brain storm back to Slovakia. We are glad that at also in our Institute, we have a perspective and young researcher from Ukraine.

This is possible to do only in a very narrow collaboration with famous mathematical centers in Europe, and in the whole world. The mathematics cannot be divided to Slovak, German, or Russian one, only to good mathematics and to other one. Mathematical Institute is collaborating with many foreign mathematical centers in abroad. We have many signed collaborations but also many informal but very active ones, and we will continue in looking for a new possibilities to be involved in projects in Framework Programs, COST, ESF, APVV, VEGA, etc. and in applications of mathematical methods in society and economy. The crucial key will be in our possibility in involving young mathematicians, Slovak and foreign ones, into research teams via doctoral and post doctoral studies.

In number theory and cryptology we are planning to collaborate with Prof. Pierre Liardet, Marseille, CMI, Prof. S. Porubský, Inst. Inform. Czech. Acad. Sci, Prague, prof. Georges Grekos, Univ. Saint-Etienne, France, Prof. F. Marko, Univ. Pennsylvania, USA, Prof. K. Györy, Debrecen Univ., Hungary, V. Fischer, Univ. Saint Etienne, France, E. Tromer, Tel-Aviv Univ., Israel, S. Magliveras, Florida St. Univ., USA..

Topological methods will be studied in an active collaboration with Prof. R.A. McCoy, USA, Prof. U. Marconi, R. Moresco, G. Artico, Padova, R. Ceppitteli, S. Caterino, Perugia, Italy, L. Zsilinszky, USA, etc.

Graph theoretical research will be performed in a collaboration with Pohang Uni. of Science and Technologies, Korea, Univ. Ljubljana, Univ. Koper, Slovenia, Auckland University, New Zeeland, Sobolev Inst. of the Russian Acad. Sci., Charles Univ. Prague, Univ. Southampton, U.K.

Many-valued logic, quantum structures will be studied with Profs. C. Holland, Bowling Green Univ. C. Tsinakis, Univ. Vanderbilt, D. Foulis Univ. Mass. USA, Univ. Boston (Prof. Ruskai, M. Guta), Prof. A. Di Nola, Univ. Salerno, Prof. P. De Lucia, Prof. A. Lettieri, Univ. Naples, Prof. F. Montagna, Univ. Siena, Prof. T. Kowalski, Univ. Melbourne, Prof. R. Giuntini, Univ. Cagliari,   Prof. D. Petz, Budapest, Prof. P. Klement, Univ. Linz, Prof. A. Amann, Unif. Innsbruck, Austria, Prof. D. Buhagiar, Dr. E. Chetcuti, Univ. Malta, Dr. Xie Y., China, Univ. Olomouc (Profs. J. Rachunek, I. Chajda, Halaš, J. Kuhr, M. Botur), Univ. Brno (Dr. J. Paseka), etc.

For example in area of computer science we are intended to collaborate with such important experts as Prof. L.A. Szekely, Univ. South Carolina, USA, Prof. D. Bokal, Univ. Ljubljana, Slovenia, Prof. A. Raspaud, Univ.

Bordeaux, France, Prof. Z. Strakos, Inst. Informatics AV CR, Prague, Prof. V. Hari, Univ. Zagreb, Croatia, Prof. L. Grigori, Univ. d'Orsay, France, Prof. T. Sorevik, Univ. Bergen, Norway, Univ. Salzburg, Austria, etc.

The envisaged development plan of activity for Mathematical Institute in 2012-2015 is a typical example of an interdisciplinary project where problems of different areas of mathematics, as well as physics and logics are met. We will use mainly methods of algebras, probability theory, theory of l-groups and partially ordered groups, Hilbert spaces, functional analysis, many-valued logic, methods of fuzzy set theory, methods of quantum logics, t-norms, aggregation operators, graph theory and discrete mathematics, number theory and algebra, computer science, mathematical analysis, etc.

The envisaged methodology will outgoing from the interdisciplinarity of the plans where we use the newest methods known in the literature, respectively obtained by the investigators in the previous activities of the Institute and we suppose continuous solving the envisaged plans.

Progress of the given plans will follow the basic approaches of the mathematical research: that is, determination of hypotheses, formulation of the main assertions and their proofs, and founding the conditions when the assertions hold or not. Presentations of the obtained results on seminars and conferences and the publications in prestigious journals are assumed. We are planning to organize international conferences, and to participate at the most important scientific events to present the results of our own research, to publish the achieved results in the best scientific journals, and in monographs. A very important role is put also to a propagation of mathematical results in public media (newspaper, journal, TV, radio, internet) and in organization of the Week of Sciences for students.

We are sure that also a small Slovakia could contribute to the world mathematical treasury with their own contributions in a narrow collaboration with colleagues from the whole world.

III. *Partial indicators of the main activities:*

1. Research output

   i. **List of the selected publications documenting the most important results of basic research. Total number of publications in the whole assessed period should not exceed the average number of the research employees**

2007:

[1]   CONDER, M.— **NEDELA, R.**: *Symmetric cubic graphs of small girth*, Journal of Combinatorial Theory B **97** (2007), 757-768. IF2006: 0,792. (ADCA)

[2]   **DVUREČENSKIJ, A.**: *Aglianò-Montagna type decomposition of linear pseudo hoops and its applications*, Journal of Pure and Applied Algebra **211** (2007), 851-861. IF2006: 0,470. (ADCA)

[3]   **DVUREČENSKIJ, A.**— HOLLAND, W. C.: *Top varieties of generalized MV-algebras*, Communications in Algebra **35** (2007), 3370-3390. IF2006: 0,268. (ADCA)

[4]   **FEČKAN, M.**— MA, R.— THOMPSON, B.: *Weakly coupled oscillators and topological degree*, Bulletin des Sciences Mathématiques **131** (2007), 559-571. IF2006: 0,637. (ADCA)

[5]   FOULIS, D.— **PULMANNOVÁ, S.**: *Polar decompositions in e-rings*, Journal of Mathematical Analysis and Applications **333** (2007), 1024-1035. IF2006: 0,758. (ADCA)

[6] GUTA, M.— **JENČOVÁ, A.**: *Local Asymptotic Normality in Quantum Statistics*, Communications in Mathematical Physics **276** (2007), 341-379. IF2006: 2,077. (ADCA)

[7] **HOLÁ, Ľ.**— MCCOY, R.A.: *Cardinal invariants of the topology of uniform convergence on compact sets on the space of minimal usco maps*, Rocky Mountain Journal of Mathematics **37** (2007), 229-246. IF2006: 0,183. (ADCA)

[8] **JENČOVÁ, A.—PULMANNOVÁ, S.**: *How sharp are PV measures?*, Reports on Mathematical Physics **59** (2007), 257-266. IF2006: 0,495. (ADCA)

[9] **MESIAROVÁ, A.**: *k-lp-Lipschitz t-norms*, International Journal of Approximate Reasoning **46(3)** (2007), 596-604. IF2006: 1,262. (ADCA)

[10] SHAHROKHI, F.— SÝKORA, O.— SZÉKELY, L.A.— **VRŤO, I.**: *On k-planar crossing numbers*, Discrete Applied Mathematics **155** (2007), 1106-1115. IF2006: 0,577. (ADCA)

2008:

[11] DI NOLA, A.—**DVUREČENSKIJ, A.**—TSINAKIS, C.: *On perfect GMV-algebras*, Communications in Algebra **36** (2008), 1221-1249. ISSN: 0092-7872. (0.297 - IF2007) (ADCA)

[12] **DOBREV, S.**—KRÁLOVIČ, RASTISLAV—KRÁLOVIČ, RICHARD—SANTORO, N.: *On fractional dynamic faults with thresholds*, Theoretical Computer Science **399** (2008), 101-117. ISSN: 0304-3975. (0.735 - IF2007) (ADCA)

[13] **DVUREČENSKIJ, A.**: *On n-perfect GMV algebras*, Journal of Algebra **319** (2008), 4921-4946. ISSN: 0021-8693. (0.630 - IF2007) (ADCA)

[14] **FEČKAN, M.**: *Note on convolution equations*, Proceedings of the American Mathematical Society **136** (2008), 453-459. ISSN: 1088-6826. (0.520 - IF2007) (ADCA)

[15] **JENČOVÁ, A.—PULMANNOVÁ, S.—VINCEKOVÁ, E.**: *Sharp and fuzzy observables on effect algebras*, International Journal of Theoretical Physics **47** (2008), 125-148. ISSN: 0020-7748. (0.489 - IF2007) (ADCA)

[16] **JIRÁSKOVÁ, G.**—OKHOTIN, A.: *State complexity of cyclic shift*, RAIRO Theoretical Informatics and Applications **42** (2008), 335-360. ISSN: 0988-3754, 1290-385X (El). (0.493 - IF2007) (ADCA)

[17] JONES, G.—**NEDELA, R.**—ŠKOVIERA, M.: *Complete bipartite graphs with a unique regular embedding*, Journal of Combinatorial Theory, Series B **98** (2008), 241-248. ISSN: 0095-8956. (1.017 - IF2007) (ADCA)

[18] MESIAR, R.—**MESIAROVÁ, A.**: *Fuzzy Integrals—What Are They ?*, International Journal of Intelligent Systems **23** (2008), 199–212. ISSN: 0884-8173. (0.667 - IF2007) (ADCA)

[19] **PLOŠČICA, M.**: *Non-representable distributive semilattices*, Journal of Pure and Applied Algebra **212** (2008), 2503-2512. ISSN: 0022-4049. (0.666 - IF2007) (ADCA)

[20] **REPICKÝ, M.**: *Cardinal invariants and the collapse of the continuum by Sacks forcing*, Journal of Symbolic Logic **73** (2008), 711-727. ISSN: 0022-4812. (0.609 - IF2007) (ADCA)

[21] **WIMMER, G.**—WITKOVSKÝ, V.: *Linear comparative calibration with correlated measurements*, Kybernetika **43** (2007), 443-452. ISSN: 0023-5954. (0.552 - IF2007) (ADCA)

2009:

[22]   CONDER, M. - **NEDELA, R**.: *A refined classification of symmetric cubic graphs*. In Journal of Algebra, 2009, vol. 322, s. 722-740. (0.630 - IF2008). (2009 - Current Contents). ISSN 0021-8693. (ADCA)

[23]   DI NOLA, A. - **DVUREČENSKIJ,. A**.: *State-morphism MV-algebras*. In Annals of Pure and Applied Logic, 2009, vol. 161, s. 161-173. (0.551 - IF2008). (2009 - Current Contents). ISSN 0168-0072. (ADCA)

[24]   **DVUREČENSKIJ, A.** - HOLLAND, W.C.: *Covers of the Abelian variety of generalized MV-algebras.* In Communications in Algebra, 2009, vol. 37, s. 3991-4011. (0.337 - IF2008). ISSN 0092-7872. (ADCA)

[25]   FOULIS, D.J. - **PULMANNOVÁ, S**.: *Spin factors as generalized Hermitian algebras. In Foundations of Physics,* 2009, vol. 39, s. 237-255. (0.829 - IF2008). (2009 - Current Contents). ISSN 0015-9018. (ADCA)

[26]   **HOLÁ, Ľ.** - HOLÝ, D. *Minimal usco maps, densely continuous forms and upper semicontinuous functions.* In Rocky Mountain Journal of Mathematics, 2009, vol. 39, no. 2, s. 545-562. (0.354 - IF2008). (2009 - Current Contents). ISSN 0035-7596. (ADCA)

[27]   **JAKUBEC, S.:** *On some new estimates for h(-)(Q(zeta(p))).* In Acta Arithmetica, 2009, vol. 137, no. 1, s. 43-50. (0.467 - IF2008). (2009 - Current Contents). ISSN 0065-1036. (ADCA)

[28]   **JENČOVÁ, A. - PULMANNOVÁ, S**.: *Characterizations of commutative POV measures.* In Foundations of Physics, 2009, vol. 39, s. 613-624. (0.829 - IF2008). (2009 - Current Contents). ISSN 0015-9018. (ADCA)

[29]   MESIAR, R. - **MESIAROVÁ-ZEMÁNKOVÁ, A**. - AHMAD, Khurshid.: *Level-dependent Sugeno integral.* In IEEE Transactions on Fuzzy Systems, 2009, vol. 17, no. 1, s. 167-172. (3.624 - IF2008). (2009 - Current Contents). ISSN 1063-6706. (ADCA)

[30]   **PLOŠČICA, M.:** *Congruence lifting of semilattice diagrams.* In International Journal of Algebra and Computation, 2009, vol. 19, s. 911-924. (0.421 - IF2008). (2009 - Current Contents). ISSN 0218-1967. (ADCA)

[31]   SOREVIK, T. - BIRKELAND, T. - **OKŠA, G**.: *Numerical solution of the 3D time dependent Schroedinger equation in spherical coordinates: Spectral basis and effects of split-operator technique.* In Journal of Computational and Applied Mathematics, 2009, vol. 225, no. 1, s. 56-67. (1.048 - IF2008). (2009 - Current Contents). ISSN 0377-0427. (ADCA)

2010:

[32]   CASERTA, A. - DI MAIO, G. - **HOLÁ, Ľ.:** *Arzela's theorem and strong uniform convergence on bornologies.* In Journal of Mathematical Analysis and Applications, 2010, vol. 371, s. 384-392. (1.225 - IF2009). (2010 - Current Contents). ISSN 0022-247X. (ADCA)

[33]   DI NOLA, A. - **DVUREČENSKIJ, A.** - LETTIERI, A.: *On varieties of MV-algebras with internal states.* In International Journal of Approximate Reasoning, 2010, vol. 51, s. 680-694. (2.090 - IF2009). (2010 - Current Contents). ISSN 0888-613X. (ADCA)

[34]   **DVUREČENSKIJ, A**.: *Every states on interval effect algebra is integral*. In Journal of Mathematical Physics, 2010, vol. 51, 083508-12. (1.318 - IF2009). (2010 - Current Contents). ISSN 0022-2488. (ADCA)

[35]   **FEČKAN, M.** - ROTHOS, V.: *Travelling waves of discrete nonlinear Schrödinger equations with nonlocal interactions.* In Applicable Analysis, 2010, vol. 89, s. 1387-1411. (0.613 - IF2009). (2010 - Current Contents). ISSN 0003-6811. (ADCA)

[36]   HALAŠ, R. - **LIHOVÁ, J.:** *On weakly cut-stable maps.* In Information Sciences, 2010, vol. 180, s. 971-983. (3.291 - IF2009). (2010 - Current Contents). ISSN 0020-0255. (ADCA)

[37] **CHOVANEC, F. - FRIČ, R**.: *States as morphisms.* In International Journal of Theoretical Physics, 2010, vol. 49, s. 3050-3060. (0.688 - IF2009). (2010 - Current Contents). ISSN 0020-7748. (ADCA)

[38] **JAKUBEC, S.:** *On the class number of some real abelian number fields of prime conductors.* In Acta Arithmetica, 2010, vol. 145, no. 4, s. 315-318. (0.508 - IF2009). (2010 - Current Contents). ISSN 0065-1036. (ADCA)

[39] **JENČOVÁ, A.** - RUSKAI, M.B. *A unified treatment of convexity of relative entropy and related trace functions, with conditions for equality.* In Reviews in Mathematical Physics, 2010, vol. 22, no. 9, s. 1099-1121. (1.190 - IF2009). (2010 - Current Contents). ISSN 0129-055X. (ADCA)

[40] **KOCHOL, M.:** *Smallest counterexample to the 5-flow conjecture has girth at least eleven.* In Journal of Combinatorial Theory, Series B, 2010, vol. 100, s. 381-389. (1.155 - IF2009). (2010 - Current Contents). ISSN 0095-8956. (ADCA)

[41] **PULMANNOVÁ, S. - VINCEKOVÁ, E.:** *Congruences and ideals in pseudo effect algebras as total algebras.* In Soft Computing, 2010, vol. 14, s. 1209-1215. (1.328 - IF2009). (2010 - Current Contents). ISSN 1432-7643. (ADCA)

[42] **JAKUBÍK, J.:** *On the distributive radical of an archimedean lattice ordered groups.* In Czechoslovak Mathematical Journal, 2010, vol. 59, s. 687-693. (0.306 - IF2009). ISSN 0011-4642.

2011:

[43] BATTELLI, F. - **FEČKAN, M.:** *On the chaotic behaviour of discontinuous systems.* In Journal of Dynamics and Differential Equations, 2011, vol. 23, no. 3, s. 495-540. (1.375 - IF2010). (2011 - Current Contents). ISSN 1040-7294. (ADCA)

[44] BOKAL, D. - CZABARKA, E. - SZEKELY, L.A. - **VRŤO, I.:** *General lower bounds for the minor crossing number of graphs.* In Discrete and Computational Geometry, 2010, vol. 44, s. 463-483. (0.935 - IF2009). (2010 - Current Contents). ISSN 0179-5376. (ADCA)

[45] CIUNGU, L.C. - **DVUREČENSKIJ, A. - HYČKO, M.:** *State BL-algebras.* In Soft Computing, 2011, vol. 15, s. 619-634. (1.512 - IF2010). (2011 - Current Contents). ISSN 1432-7643. (ADCA)

[46] DI NOLA, A. - **DVUREČENSKIJ, A.** - LETTIERI, A.: *On the Loomis–Sikorski theorem for MV-algebras with internal state.* In Journal of the Australian Mathematical Society, 2010, vol. 89, s. 317-333. (0.348 - IF2009). (2010 - Current Contents). ISSN 1446-7887. (ADCA)

[47] **DILNA, N. - FEČKAN, M**.: *On symmetric and periodic solutions of parametric weakly nonlinear ODE with time-reversal symmetries.* In Bulletin of the Belgian Mathematical Society, 2011, vol. 18, no. 5, s. 896-923. (0.341 - IF2010). (2011 - Current Contents). ISSN 1370-1444. (ADCA)

[48] **DVUREČENSKIJ, A.:** *Subdirectly irreducible state-morphism BL-algebras.* In Archive for Mathematical Logic, 2011, vol. 50, s. 145-160. (0.414 - IF2010). (2011 - Current Contents). ISSN 1432-0665. (ADCA)

[49] **ELIAŠ, P.:** Dirichlet sets, *Erdős-Kunen-Mauldin theorem, and analytic subgroups of the reals.* In Proceedings of the American Mathematical Society, 2011, vol. 139, s. 2093-2104. (0.601 - IF2010). (2011 - Current Contents). ISSN 0002-9939. (ADCA)

[50] FOULIS, D.J. - **PULMANNOVÁ, S. - VINCEKOVÁ, E**.: *Type Decompositions of a pseudoeffect algebras.* In Journal of the Australian Mathematical Society, 2011, vol. 89, s. 335-358. (0.488 - IF2010). (2011 - Current Contents). ISSN 1446-7887. (ADCA)

[51] **FRIČ, R. – PAPČO, M.**: *On probability domains* II. In: International Journal of Theoretical Physics, 2011, vol. 50, 3778–3786. (0.670 – IF2010). (2011 - Current Contents). ISSN: 0020-7748. (ADCA)

[52] **JENČOVÁ, A.:** *The structure of strongly additive states and Markov triplets on the CAR algebra.* In Journal of Mathematical Physics, 2010, vol. 51, art. no. 12103. (1.318 - IF2009). (2010 - Current Contents). ISSN 0022-2488. (ADCA)

[53] **JIRÁSKOVÁ, G.** - MASOPUST, T. *Complexity in union-free regular languages.* In International Journal of Foundations of Computer Science, 2011, vol. 22, s. 1639-1653. (0.459 - IF2010). (2011 - Current Contents). ISSN 0129-0541. (ADCA)

ii. List of the selected publications documenting the most important results of applied research

[1] HALADA, L. - WEISENPACHER, P. - **OKŠA, G.** - GLASA, J. - **BEČKA, M.:** Počítačová simulácia požiarov v rizikových priestoroch. In IX. medzinárodná konferencia FIRECO 2011: Ochrana pred požiarmi. - Bratislava : Požiarnotechnický a expertízny ústav MV SR, 2011, p. 93-102. ISBN 978-80-89051-11-3.

[2] **MRAČKA, I.** - **SOMORA, P. -ŽÁČIK, T**.: GPGPU calculations of gas thermodynamic quantities. Proceedings of the Federated Conference on Computer Science and Information Systems, IEEE Digital Library, ISBN 978-83-60810-22-4, 2011, pp. 451–458.

[3] **HAJOSSY, R. – MRAČKA, I.: Technická správa:** Algoritmus merania a výpočtu spotreby techhnologického plynu na preplachy turbodúchadiel technológie R27MW, T23MW, ES25MW a TS6MV. I. Etapa, Stanovenie spotreby technologického plynu na preplachy turbodúchadiel technológie R27MW, T23MW, ES25MW a TS6MW. Matematický ústav SAV, 2011, 129 p.

[4] **HAJOSSY, R. – MRAČKA, I.: Záverečná technická správa:** Overenie algoritmu výpočtu spotreby reálnym meraním technológie TS6MW a T27MW. II. Etapa riešenia výskumnej úlohy, Matematický ústav, SAV, 2011, 41 p.

iii. List of monographs/books published abroad

[1] KWAK, J. H.— **NEDELA, R.**: *Graphs and Their Coverings*, Pohang University of Science and Technology, Pohang, 2007.

[2] **NEDELA, R.:** *Maps, Hypermaps and Related Topics*, Pohang University of Science and Technology, Pohang, 2007.

[3] **RIEČAN, B.** - BOCCUTO, A. - VRÁBELOVÁ, M.: *Kurzweil- Henstock Integral in Riesz Spaces*. Bentham Science Publishers, Ltd, 2009. 224 s. ISBN 978-1-60805-003-1.

[4] TROBEC, R. - **VAJTERŠIC, M.** - ZINTERHOF, P.: *Parallel Computing: Numerics,* Applications, and Trends. London : Springer - Verlag, 2009. 520 p. 169 illus. ISBN 978-1-84882-408-9.

[5] **HAJOSSY, R.** - MAČURA, P.: *Fyzika a matematika úspešnej streľby v basketbale.* Brno, Masarykova univerzita, 2011. ISBN 978-80-210-5585-8.

[6] **KOCHOL, M.:** *Flows in Graphs and Related Problems. Saarbrucken,* Lambert Academic Publishing, 2010. 255 s. ISBN 978-3-8433-7654-9.

[7] **KOCHOL, M.:** *Counting Methods for Nowhere-Zero Flows. Saarbrucken,* Lambert Academic Publishing, 2011. 120 s. ISBN 978-3-8443-2462-4.

[8] **HAJOSSY, R. –** MAČURA, P.: Physics and Mathematics of Succesful Shooting in Basketball. University of Oradea, 2011. ISBN: 978-606-10-0376-1.

Chapter in Handbooks:

[9]   BUHAGIAR, D. - CHETCUTI, E.- **DVUREČENSKIJ, A.**: *Algebraic and measure-theoretic properties of classes of subspaces of an inner product space,* In: Handbook of Quantum Logic and Quantum Structures, Quantum Structures, Eds. K. Engesser, Dov M. Gabbay, D. Lehmann, Elsevier, 2007, pp. 75--120.

[10]   **KORBAŠ, J.**: *Distributions, vector distributions, and immersions of manifolds, Chap. 13 (p. 665-724, 1214) in: Handbook of Global Analysis (Krupka D., Saunders D., eds.)*, Elsevier B.V., Amsterdam, Oxford, 2008. ISBN: 978-0-444-52833-9.

[11]   **GRENDÁR JR., M.** - JUDGE, G.: *Large deviations theory and econometric information recovery.* In Handbook of Empirical Economics and Finance. - New York : CRC Press, 2010. ISBN 978-14-200-7035-4.

iv. List of monographs/books published in Slovakia

[1]   **HALUŠKA, J.**: *Hľadanie harmónie*, VEDA, Bratislava, pp. 295, 2006. ISBN: 80-224-0918-9. (In Slovak)

[2]   JAKUBÍKOVÁ-STUDENOVSKÁ, D. - **PÓCS, J.:** *Monounary Algebras*. 1. vydanie. Košice: Prírodovedecká fakulta UPJŠ v Košiciach, 2009. 304 s. ISBN 978-80-7097-763-7.

[3]   **DVUREČENSKIJ, A., NEMOGA**, K.: *Matematický ústav, 50 rokov od založenia*, VEDA, 2009, ISBN: 978-80-968374-2-7.

v. List of other scientific outputs specifically important for the Organisation (normalization, standardization, maps, etc.)

For the Mathematical Institute SAS, the most important part of its publishing activity is in publishing mathematical monographs, where results of many-year activity are concentrated. Nevertheless they are not listed at CC/WOS databases, for us they present the highlight of our activity.

vi. Table of research outputs

*Table **Research outputs** shows research outputs in number of specified entries; these entries are then divided by FTE employees with a university degree (from Tab. Research staff) for all Organisation at the respective year; finally these entries are divided by the total salary budget (from Tab. Salary budget).*

(and the name of research organisations appears in the list of author)

Research outputs	2007			2008			2009			2010			2011			total			
	number	No./FTE	No./salary budget	number	No./FTE	No./salary budget	number	No./FTE	No./salary budget	number	No./FTE	No./salary budget	number	No./FTE	No./salary budget	number	averaged number per year	av. No./FTE	av. No./salary budget
chapters in monographs, books published abroad	6	0,205	12,54	2	0,065	4,03	5	0,155	9,37	1	0,032	1,82	2	0,064	3,82	16	3,2	0,104	6,19
chapters in monographs, books published in Slovakia	0	0,000	0,00	0	0,000	0,00	2	0,062	3,75	1	0,032	1,82	0	0,000	0,00	3	0,6	0,019	1,16
CC publications	24	0,821	50,17	31	1,002	62,39	29	0,896	54,36	32	1,031	58,15	40	1,289	76,37	156	31,2	1,009	60,40
scientific publications indexed by other databases (WOS, MR, Zbl Math, SCOPUS)	41	1,403	85,71	41	1,325	82,51	35	1,082	65,60	40	1,289	72,68	42	1,354	80,18	199	39,8	1,287	77,05
scientific publications in other journals	5	0,171	10,45	6	0,194	12,08	0	0,000	0,00	0	0,000	0,00	0	0,000	0,00	11	2,2	0,071	4,26
publications in proc. of international scientific conferences	13	0,445	27,18	24	0,776	48,30	14	0,433	26,24	10	0,322	18,17	14	0,451	26,73	75	15,0	0,485	29,04
publications in proc. of nat. scientific conferences	0	0,000	0,00	1	0,032	2,01	5	0,155	9,37	3	0,097	5,45	2	0,064	3,82	11	2,2	0,071	4,26
active participations at international conferences	55	1,882	114,98	62	2,004	124,78	62	1,916	116,21	52	1,676	94,49	58	1,870	110,73	289	57,8	1,870	111,89
active participations at national conferences	24	0,821	50,17	0	0,000	0,00	0	0,000	0,00	1	0,032	1,82	5	0,161	9,55	30	6,0	0,194	11,61

vii. List of registered patents

None

viii. Supplementary information and/or comments on the scientific output of the Organisation

2. Responses to the scientific output

Table **Citations** *shows specified responses to the scientific outputs; these entries are then divided by the FTE employees with a university degree (from Tab. Research staff) for all Organisation at the respective year; finally these entries are divided by the total salary budget (from Tab. Salary budget).*

Citations	2006			2007			2008			2009			2010			total			
	number	No. / FTE	No. / salary budget	number	No. / FTE	No. / salary budget	number	No. / FTE	No. / salary budget	number	No. / FTE	No. / salary budget	number	No. / FTE	No. / salary budget	number	averaged number per year	av. No. / FTE	av. No. / salary budget
Web of Science	234	8,0	489,2	263	8,5	529,3	409	12,6	766,6	448	14,4	814,0	468	15,1	893,5	1822	364,4	11,8	705,4
SCOPUS	7	0,2	14,6	43	1,4	86,5	36	1,1	67,5	36	1,2	65,4	66	2,1	126,0	188	37,6	1,2	72,8
other databases, or without source	130	4,4	271,8	51	1,6	102,6	56	1,7	105,0	60	1,9	109,0	12	0,4	22,9	309	61,8	2,0	119,6
in monographs, conf. proceedings and other publications abroad	36	1,2	75,3	125	4,0	251,6	77	2,4	144,3	24	0,8	43,6	19	0,6	36,3	281	56,2	1,8	108,8
in monographs, conf. proceedings and other publications in Slovakia	0	0,0	0,0	2	0,1	4,0	3	0,1	5,6	10	0,3	18,2	0	0,0	0,0	15	3,0	0,1	5,8

[1] List of 10 top-cited publications from staff members since the establishment of the Organisation up to 2010 and number of their citations in the period 2006 - 2010

[1] **DVUREČENSKIJ, A.— PULMANNOVÁ, S.:** *New Trends in Quantum Structures,* Kluwer, Academic Publishers, Ister Science, Dordrecht/Boston/London, Bratislava, 2000. ISBN: 07923-64716. (AAA) **187 citations**

[2] **DANČÍK, V.**— ADDONA, T. A.— CLAUSER, K. R.— VATH, J. E.— PEVZNER, P. A.: *De novo peptide sequencing via tandem mass spectrometry.* In: Journal of Computational Biology, vol. **6**, 1999, pp. 327—342 **122 citations**

[3] **A. DVUREČENSKIJ**, Pseudo MV-algebras are intervals in l-groups, J. Austral. Math. Soc. **72** (2002), 427--445. **63 citations**

[4] **ROSA, A.:** On certain valuations of the vertices of graph. In Theory of Graphs, International Symposium, ICC Rome. - Paris : Dunod-Gordon and Breach, 1967, s. 349-355. **44 citations**

[5] **PÁZMAN, A**.: *Foundations of Optimum Experimental Design.* Dordrecht : Reidel Publ. Comp, 1987. 286 s. **37 citations**

[6] **RIEČAN, B.** - MUNDICI, D.: *Probability on MV-algebras.* In Handbook of Measure Theory, Volume II. - Amsterdam, 2001, s. 869-900. ISBN 978-0-444-50263-6 **34 citation**s

[7] **A. DVUREČENSKIJ**, Gleason's Theorem and Its Applications, Kluwer Academic Publisher, Dordrecht/Boston/London, 1993, 325+xv pp. **30 citations**

[8] **A. DVUREČENSKIJ**, States on pseudo MV-algebras, Studia Logica 68 (2001), 301--327. **30 citations**

[9] **STRAUCH, O.** - PORUBSKÝ, Š.: *Distribution of Sequences: A Sampler.* Frankfurt am Main : Peter Lang, 2005. ISBN 3-631-54013-2. **30 citations**

[10] **BOSÁK, J**.: *Decompositions of Graphs.* Dordrecht : Kluwer Academic Publishers, 1990. 272 s. ISBN 978-0-7923-0747-1. **28 citations**

[2] List of 10 top-cited publications from staff members published 2000 - 2010 and number of their citations in the period 2006 – 2010

[1] **DVUREČENSKIJ, A.— PULMANNOVÁ, S.:** New Trends in Quantum Structures, Kluwer, Academic Publishers, Ister Science, Dordrecht/Boston/London, Bratislava, 2000. ISBN: 07923-64716. (AAA) **187 citations**

[2] **A. DVUREČENSKIJ**, Pseudo MV-algebras are intervals in l-groups, J. Austral. Math. Soc. **72** (2002), 427--445. **63 citations**

[3] **RIEČAN, B.** - MUNDICI, D.: *Probability on MV-algebras.* In Handbook of Measure Theory, Volume II. - Amsterdam, 2001, s. 869-900. ISBN 978-0-444-50263-6 **34 citation**s

[4] **A. DVUREČENSKIJ**, States on pseudo MV-algebras, Studia Logica 68 (2001), 301--327. **30 citations**

[5] **STRAUCH, O.** - PORUBSKÝ, Š.: *Distribution of Sequences: A Sampler.* Frankfurt am Main : Peter Lang, 2005. ISBN 3-631-54013-2. **30 citations**

[6] **DVUREČENSKIJ ,A. - VETTERLEIN, T.:** *Pseudoeffect Algebras. I. Basic properties*. In International Journal of Theoretical Physics, 2001, vol. 40, s. 685-701. ISSN 0020-7748. **25 citations**

[7] **JIRÁSKOVÁ, G.:** *State complexity of some operations on binary regular languages.* In Theoretical Computer Science, 2005, vol. 330, s. 287-298. ISSN 0304-3975. **25 citations**

[8] SHAHROKHI, F. - **SÝKORA, O.** - SZEKELY, L.A. - **VRŤO, I**. *On bipartite drawings and the linear arrangement problem.* In SIAM Journal on Computing, 2001, vol. 30, s. 1773-1789. ISSN 0097-5397. **25 citations**

[9] **DVUREČENSKIJ, A. - VETTERLEIN, T**.: *Pseudoeffect algebras. II. Group representation.* In International Journal of Theoretical Physics, 2001, vol. 40, s. 703-726. ISSN 0020-7748. **15 citations**

[10] JIRÁSEK, J. - **JIRÁSKOVÁ, G**. - SZABARI, A. *State complexity of concatenation and complementation.* In International Journal of Foundations of Computer Science, 2005, vol. 16, s. 511-529. ISSN 0129-0541 **14 citations**

[3] List of top-cited authors from the Organisation (at most 10 % of the research employees) and their number of citations in the period 2006 - 2010

[1] A. Dvurečenskij **642 citations**
[2] S. Pulmannová **307 citations**
[3] I. Vrťo **210 citations**
[4] G. Wimmer **130 citations**

[5] V. Dančík **127 citations**

[6] B. Riečan **125 citations**

[4] Supplementary information and/or comments on responses to the scientific output of the Organisation

The following paper since 2006 is still according to SCI the most frequently quoted mathematical paper in database SCI written in Slovakia with 70 citations (in total it has 128 citations).

DVUREČENSKIJ, A.: *Pseudo MV-algebras are intervals in l-groups*, J. Austral. Math. Soc. **72** (2002), 427--445.

3. Research status of the Organisation in the international and national context

- **International/European position of the Organisation**

i. **List of the most important research activities documenting international importance of the research performed by the Organisation, incl. major projects (details of projects should be supplied under Indicator 4). Provide the arguments why the selected projects are particularly important and represent the international position of the Organisation).**

[1] Breath-gas analysis for molecular-oriented detection of minimal diseases - BAMOD (Analýza vydychovaných plynov pre molekulovo orientovanú detekciu zriedkavých chorôb), LSHC-CT-2005-019031, 2/2006 – 1/2008, =0, EUR, G. Wimmer – investigator. This is a joint project between Institute of Measurement SAS & Institute of Mathematics SAS and Universitity of Innsbruck, supported by 6th Frame Programme EU

[2] Universal algebra and lattice theory (Univerzálna algebra a teória zväzov), INTAS 03-51-4110, 4/2004 – 3/2007, =664,- EUR, M. Ploščica – investigator. A multilateral international project supported by INTAS

[3] Graphs and Algorithms (GRAAL), COST 293, 10/2004 – 10/2008, =0,- EUR, I. Vrťo – investigator. A multilateral international project (30 partners) supported by COST 293.

[4] Geometric representations and symmetries of graphs, maps and other discrete structures and applications in science (Geometrické reprezentácie a symetrie grafov, máp a iných diskrétnych štruktúr s aplikáciami vo vede), EUROGIGA, ESF-EC-0009-10, 5/2011 – 4/2014, =4 000,- EUR, R. Nedela – investigator. A multilateral international project supported by European Science Foundation.

ii. **List of international conferences (co-) organised by the Organisation**

[1] 18th Czech and Slovak International Conference on Number Theory, 27. 8. 2007 - 31. 8. 2007, Kongresové centrum SAV, Smolenice

[2] TATRACRYPT 2007, 22. 6. 2007 - 24. 6. 2007, Kongresové centrum SAV, Smolenice

[3] Design Theory of Alex Rosa, 2. 7. 2007 - 6. 7. 2007, Bratislava

[4] 12th International Summer School in Global Analysis and Applications, 20. 8. - 24. 8. 2007, FMFI UK, Bratislava

[5] Summer School on General Algebra and Ordered Sets, 2. 9. - 7. 9. 2007, Tále

[6] Workshop on IFS, 26. - 29. 4. Sofia, Bulharsko

[7] EUSFLAT, 9. - 14. 9. 2007 Ostrava, Česká republika

[8] Workshop on IFS, 4. - 6. 10. 2007, Warszawa, Poľsko

[9] Mathematics and Music (Matematika a hudba) 3. 10. 2007, Seminár, Banská Bystrica, Slovenská republika

[10] 18-th TIES 2007, 16. 8. 2007 - 20. 8. 2007, Mikulov, ČR

[11] 22nd Summer Conference on Real Functions Theory, 31. 8. 2008–5. 9. 2008, Stará Lesná

[12] FSTA Fuzzy Set Theory and Applications, 4. 2. 8. 2. 2008, Liptovský Ján

[13] 9th Biennial IQSA Meeting, Quantum Structures '08, 5. 7. 2008–13. 7. 2008, Sopot, Poľsko

[14] Future in Scientific Publishing, 2nd New Members Forum 10. 11. 2008 10. 11. 2008, Bratislava

[15] Winter Workshop on Mathematical Statistics 2008, 15. 12. 2008–16. 12. 2008, Bratislava

[16] Association for Symbolic Logic, annual meeting 2008, 27. 3. 2008–30. 3. 2008, Irvine, USA

[17] International Seminar dedicated to 50th anniversary of Institute of Mathematics, 18.06.-19.06. 2009, Kongresové centrum SAV, Smolenice.

[18] XXIII international summer conference on real functions theory, 30.08.-04.09.2009, Niedzica, Poľsko

[19] Summer School on General Algebra and Ordered Sets, 05.09.-11.09.2009, Stará Lesná

[20] Bratislava Topology Symposium Group Actions and Homogeneous Spaces, 07.09.-11.09.2009, Bratislava.

[21] Parallel Numerics 2009, 27.10.-29.10.2009, Smolenice

[22] FSTA 2010 – 10, International Conference of Theory of Fuzzy Sets and Their Applications, 01.02.-05.02.2010, Liptovský Ján.

[23] 10th Biennial IQSA Meeting Quantum Structures Boston 2010, 21.06.-26.06.2010, Boston, USA.

[24] 2nd Plenary Conference Development of Norwegian-Slovak collaboration in Cryptology, 23.08.-26.08.2010 , Smolenice.

[25] 24th Conference of Theory of Real Functions, 29.08.-03.09.2010, Stará Lesná.

[26] Future Features of Economic Systems, 25.11. 2010, Bratislava.

[27] Parallel Numerics 2011, 05.07.-07.07.2011, Schloss Retzhof, Austria

[28] 25. Summer Conference on Real Functions Theory, 15. 5. - 20. 5.2011, Złoty Potok, Poľsko.

[29] The 3rd International Workshop Quantum Structures 2011, 16. 5. - 20. 5. 2011, Kočovce.

[30] 20th International Czech-Slovak Conference of Number Theory, 5. 9. - 9. 9. 2011, Stará Lesná.

iii. List of international journals edited/published by the Organisation

[1] **Mathematica Slovaca**, founded 1951, large spectral journal, since 2007 published with Springer-Versita, indexed in SCI, SCOPUS, IF(2009)= 0,308, IF(2010)=0,316, http://maslo.mat.savba.sk, http://www.springer.com/mathematics/journal/12175, http://www.springerlink.com/content/120745/

[2] **Tatra Mountains Mathematical Publications,** founded 1991, each volume is focused to a special topic, since 2008 it is indexed in WOS (Web of Science) and CPCI (Conference Proceedings Citation Index), since 2011 it is indexed in SCOPUS. http://tatra.mat.savba.sk

[3] **Uniform Distribution Theory,** founded 2006, focused to Number Theory, http://udt.mat.savba.sk, http://www.boku.ac.at/MATH/udt

[4] **Zentralblatt MATH, Slovak Unit,** responsible for reviewing Slovak mathematical journals.

iv. List of edited proceedings from international scientific conferences and other proceedings

[1] **MORAVIACRYPT '05.** *Editors:* D. Cvrček, V. Matyáš, **K. Nemoga**, Š. Porubský, 2007. Tatra Mountains Mathematical Publications vol. 37, 2007.

[2] CDDEA'06, Tatra Mountains Mathematical Publications (**Duchoň, M.,** Diblik, Ružičková, eds.), vol. 38, MÚ SAV, Bratislava, 2007.

[3] PROBASTAT'06, Tatra Mountains Mathematical Publications (**Duchoň, M.,** Pázman, A, Volaufová, J., Witkovský, V., eds.), vol. 39, MÚ SAV, Bratislava, 2008.

[4] Real Functions'07, Tatra Mountains Mathematical Publications (**Duchoň, M., Borsík, J.**, Jendrzejewski, eds.), vol. 40, MÚ SAV, Bratislava, 2008.

[5] **TATRACRYPT '07.** *Editors:* O. Grošek, **K. Nemoga**, M. Vojvoda, Tatra Mountains Mathematical Publications vol. 41, 2008.

[6] **A. Dvurečenskij, S. Pulmannová**, *Proceedings of the 8th* Biennial Meeting of the International Quantum Structure Association, Malta, July 2006, In: Inter. J. Theor. Phys. **47**, 2008.

[7] **Real Functions '07 Topology, Measures, Integration and Harmonic Analysis.** *Editors:* J. Borsík, J. Jędrzejewski, Tatra Mountains Mathematical Publications vol. 42, 2009.

[8] **Real Functions '08 Functional Equations, Measures, Integration and Harmonic Analysis.** *Editors:* **J. Borsík,** Tatra Mountains Mathematical Publications vol. 44, 2009.

[9] **NILCRYPT '10.** *Editors:* O. Grošek, **K. Nemoga**, Tatra Mountains Mathematical Publications vol. 44, 2010.

[10] **Real Functions '09 Measures, Integration, Harmaonic Analysis, Topology and Mathematical Economics.** *Editors:* **J. Borsík**, J. Jędrzejewski, Tatra Mountains Mathematical Publications vol. 46, 2010

[11] **CECC '09. 9th Central European Conference on Cryptography — Třebíč.** *Editors:* O. Grošek, **K. Nemoga**, Š. Porubský, Tatra Mountains Mathematical Publications vol. 47, 2010.

[12] **A. Dvurečenskij, S. Pulmannová**, *Proceedings of the 10th Biennial Meeting of the International Quantum Structure Association*, Boston, June 20-28, 2011. In: Inter. J. Theor. Phys. No. 12 **50**, 2011.

[13] **Real Functions '10.** *Editors:* **J. Borsík**, Tatra Mountains Mathematical Publications vol. 49, 2011.

- ## National position of the Organisation

ii. List of selected most important national projects (provide the arguments why the selected projects are particularly important and represent the international position of the Organisation)

(abbreviations: A – leading organization, B – partner organization)

[1] Creation of a stable work group for a development and an application in a gas dynamic research (Vytvorenie stabilnej pracovnej skupiny pre rozvoj a aplikáciu výskumu v oblasti dynamiky plynu), JPD3 200,13120200037, 10/2005 – 9/2008, =116 710,- EUR, Role A. **Project supported by ESF**

[2] QUTE - Center of excellency of quantum technologies (QUTE - Centrum excelentnosti kvantových technológií), IMTS 26240120009, 5/2009 – 3/2011, =44 861,- EUR , Role B. The project financed with Structural Foundations, joint project with Instititute of Physics SAS, Prof. Bužek is the PI.

[3] meta-QUTE Center of excellency of quantum technologies (meta-QUTE - Centrum excelentnosti kvantových technológií), IMTS 26240120022, 3/2010 – 2/2012, =45 190,- EUR, Role B. The project financed with Structural Foundations, joint project with Instititute of Physics SAS, Prof. Bužek is the PI.

[4] Probabilistic and algebraic methods of uncertainty and quantum structures (Pravdepodobnostné a algebraické metódy neurčitosti a kvantových štruktúr), APVV-0071-06, 01/2007 – 06/2010, =138 252,- EUR, Role A. The project was evaluated as outstanding with many publications.

[5] Topological structures on function spaces and hyperspaces, integration in ordered vector spaces, continuous and positive operators (Topologické štruktúry na funkcionálnych priestoroch a hyperpriestoroch, integrovanie v usporiadaných vektorových priestoroch, spojité a pozitívne operátory), APVT-51-00690, 1/2005 - 12/2007, =15 900,- EUR, Role A. The project was evaluated as outstanding.

[6] Colouring Problems in Graph Theory (Problémy farbenia v teórii grafov), APVT-51-027604, 1/2005 – 12/2007, =32 331,- EUR, Role A. Joint project with FMFI UK.

[7] Discrete structures in algebra and geometry (Diskrétne štruktúry v algebre a geometrii), APVV-51-009605, 3/2006 – 3/2009, =68 880,- EUR, Role A. The joint project with UMB B. Bystrica was evaluated as outstanding.

[8] Networks and Mobile Computations: Communication, Structure and Complexity (Siete a mobilné výpočty: komunikácia, štruktúra a zložitosť), APVV-0433-06, 2/2007 – 06/2010, =19 334,- EUR, Role B. Joint project with FMFI UK.

[9] Personal motor car fires, fires computer simulation and their experimental verification (Požiare osobných motorových vozidiel, počítačová simulácia požiarov a ich experimentálne overenie), APVV053207, 9/2008 – 12/2010, =18 119,- EUR, Role B. Joint project with Institute of Informatics, with great application potential.

[10]   Algebraic approach to noncommutative probability (Algebrický prístup k nekomutatívnej pravdepodobnosti), LPP019907, 6/2008 – 11/2011, =27 185,- EUR, Role A. Postdoc project APVV.

[11]   Nonlinear phenomena in continuous and discrete dynamical systems (Nelineárne javy v spojitých a diskrétnych dynamických systémoch), APVV-0134-10, 5/2011 – 5/2014, =5 119,- EUR, Role B. New APVV project with FMFI UK.

[12]   Algorithms, automatons and discrete data structures (Algoritmy, automaty a diskrétne dátové štruktúry), APVV-0035-10, =8 815,- EUR, Role B. New project with UPJŠ Košice.

[13]   Statistical methods for uncertainty analysis in metrology (Štatistické metódy pre analýzu neistôt v metrológii), APVV-0096-10, =5 639,- EUR, Role B. New joint project APVV with Institute of Measurement.

Institute of Mathematics SAS was a partner organisation in the project Centre of Excellence of the Slovak Academy of Sciences, the principal organization is Institute of Physics SAS:

[1] **Centre of Excellence Physics of Information,** I/2/2005   1.2005—12.2008, 18 588,60 Eur

[2] **Centre of Excellence SAS- Quantum Technologies,** 1.2009-12.2012, = 15 975,00 Eur

iii. List of national scientific conferences (co)-organised by the Organisation

[1] **2007:** workshop Mathematical Structures 2007 (Matematické štruktúry) 2007, MÚ SAV, Košice, 29.-30.11.2007.

[2] **2008:** 40th Conference of Slovak Mathematicians and Physicists (konferencia Slovenských matematikov a fyzikov) v Jasnej pod Chopkom

[3] **2008** Spiritual values for today (Duchovné hodnoty pre dnešok), Rožňava

[4] **2008** Seminar Mathematics & Music   (Seminár Matematika a hudba), Banská Bystrica

[5] **2008:**   Workshop of the Slovak Association for the Club of Rome: 40 years of Club of Rome (40 rokov Rímskeho klubu), Bratislava

[6] **2009:** 41th Conference of Slovak Mathematicians and Physicists (konferencia Slovenských matematikov a fyzikov) v Jasnej pod Chopkom

[7] **2009:** Winter school of PhD students (Zimná škola doktorandov), Remata

[8] **2009:** Memorial workshop dedicated to 50th anniversary of Prof. Jur Hronec death, Bratislava

[9] **2010:** Seminár CRYPTO, Podkylava

[10] **2010:** Workshop of the Slovak Association for the Club of Rome: Future features of economic systems,   (Rímskeho klubu), Bratislava

[11] **2011:** Workshop of the Slovak Association for the Club of Rome: Roads to a more sustainable future, Bratislava

iv. List of national journals published by the Organisation

[1] Institute is a co-publisher of *Obzory matematiky, fyziky a informatiky*, which is a 30 years journal oriented to mathematical teaching of mathematics at elementary and secondary schools.

v. List of edited proceedings of national scientific conferences/events

[1] FECKO, M.— **KORBAŠ, J.**—NIEPEL, M.—ŠEVERA, P.: Zimná škola zo symplektickej geometrie (Winter School on Symplectic Geometry), elaborated lecture notes, 89 pages http://www.dnp.fmph.uniba.sk/esf-cepos/esf-sympozium-sk.php, Bratislava, 2007.

- ## International/European position of the individual researchers

In 2011, **prof. RNDr. A. Dvurečenskij, DrSc.** and **Prof. RNDr. M. Vajteršic, DrSc.** became members of the European Academy of Sciences and Arts (M. Vajteršic was nominated from the Austrian side).

In 2011 doc. **doc. RNDr Sylvia Pulmannová, DrSc.** and **prof. RNDr. A. Dvurečenskij, DrSc.** were recognized by an analytical project ARRA, Slovakia, *Identification of top scientific teams and their members in the Slovak Academy of Sciences*, as a **top team** from 22 teams (and of 17 above-average teams) of SAS who achieve the world parameters. They in recent past were presidents of International Quantum Structures.

Since 2007, **A. Dvurečenskij** is a member of Panel for grants of the European Research Council for young mathematicians.

K. Nemoga is a member of
(i) NATO Science for Peace and Security Committee, Information and Communications Security Panel, Brussels 2008-10;
(ii) Independent Scientific Evaluation Group, NATO, Brussels 2011.

Many of our colleagues are invited to be a key speaker at important conferences, or address a talk at universities in abroad. They are referees of articles or projects or members of journal editorial boards or conference boards.

i. List of invited/keynote presentations at international conferences, documented by an invitation letter or programme

[1] A. Dvurečenskij*, On perfect GMV-algebras and covers of MV-algebras*, International Conference of Order, Algebra, and Logic, Nashville, USA, 2007

[2] A. Jenčová, *Weak convergence of quantum experiments and quantum local asymptotic normality,* Operator Structures in Quantum Information Theory, BIRS, Banff, Alberta, Canada, 10. 2. 2007 - 17. 2. 2007

[3] A. Jenčová, *On quantum statistical experiments and quantum local asymptotic normality,* 28th Conference on Quantum Probability and Related Topics, Guanajuato, Mexico 2. 9. 2007 - 8. 9. 2007

[4] S. Pulmannová, *Polar decompositions in e-rings*, QTRF - Quantum Theory Reconsiderations of Foundations, Vaxjo, Švédsko, 2007

[5] G. Wimmer, *Matematické modelovanie v jazykovede*, STAKAN 2007, Rusava, ČR

[6] A. Dvurečenskij, *States on algebraic structures*, FSTA '08, Liptovský Ján

[7] A. Dvurečenskij, *New Trends on GMV-algebras*, Residuated Structures: Algebra and Logic, Buenos Aires, Argentina, 2008

[8] A. Dvurečenskij, *From commutative MV-algebras to noncommutative GMV-algebras*, Order in Algebra and Logic, Univ. Florida, Gainesville, USA, 2008

[9] A. Dvurečenskij, *On states on MV-algebras and their applications*, Many Val´08, Milano, Italy, 2008

[10] R. Frič, *Measures, sequences, epireflections*, Advances in Set-Theoretic Topology, Conference in Honour of Tsugunori Nogura on his 60th Birthday, Erice, Italy, 2008

[11] M. Kochol, *Counterexample to the Conjecture of Grunbaum*, Discrete Mathematics Day 2008, Northampton, MA, USA

[12] M. Kochol, *Snarks with Polyhedral Embeddings in Orientable Surfaces*, Univ. Nashville, TN, USA, 2008

[13] R. Nedela, *Maps, subgroups of Fuchsian groups of finite index and their enumeration*, Algebraic Combinatorics on the Adriatic Coast III, 2008, Koper, Slovenia

[14] K. Nemoga, *Aplikácie algebry v kryptológii*, FPV Univ. Ostrava, ČR, 2008

[15] O. Strauch, *Distribution functions of ratio sequences*, International Conference on Uniform Distribution, Marseilles, France, 2008

[16] O. Strauch, *Distribution functions and sequences*, International Conference on Uniform Distribution, Marseilles, France, 2008

[17] M. Ploščica, *Lifting diagrams by congruence lattices*, Univ. Caen, France, 2008

[18] S. Pulmannová, *Spectral resolutions in order unit spaces and generalized Hermitian algebras*, IQSA 2008, Sopot, Poland

[19] A. Dvurečenskij, *States on Effects and MV-algebras, Algebra and Probability in Many-Valued Logics,* Darmstadt, May, 6-10, 2009.

[20] K. Nemoga – L. Satko: *Secret Sharing Schemes in Z_m.* Norwegian-Slovak Cryptology Conference, Bergen, August 24 - 27, 2009

[21] A. Dvurečenskij, *On GMV-algebras*, AAA79, Olomouc, ČR, 11.2.-14.2. 2010.

[22] A. Dvurečenskij, *MV-algebras with Internal State and their Applications*, Lattice ordered groups and MV-algebras: Interaction and Impact on Algebras of Logic, Buenos Aires, Argentína, 11. 7. - 17. 7. 2010.

[23] M. Grendár: *Empirická vierohodnosť,* Robust 2010, Králiky, Slovensko, 31. 1. - 5. 2.2010.

[24] J. Haluška, *On Lebesgue type integration in locally convex topological vector spaces,* FAV 2010 Intenational Functional Analysis Meeting on the ocasion of the 80th Birthday of Prof. Manuel Valdivia, Valencia, June 7-11, 2010.

[25] K. Nemoga, *Finite Fields and their Applications in Cryptology*, 4. Konferencie PhD. študentov z Českej republiky, 24. 10. - 26. 10. 2010.

[26] K. Nemoga, *Sequences over Finite Fields*, 4. Konferencie PhD. študentov z Českej republiky, 24. 10. - 26. 10. 2010.

[27] Ľ. Török, *The Antibandwidth problem*, Československá konferencia z teórie grafov, Grafy 2010, Lednice, ČR, 31.5.-4.6.2010.

[28] S. Dobrev, *Algorithmics of Directional Antenae: strong Connectivity with Multiple Antennae*, 9th Annual Conference on Communication Networks and Services Research Conference 2011, Ottawa, 1-5. 5.2011.

[29] A. Dvurečenskij, *Common look to state-morphism MV-algebras and state-morphism algebras*, Ordered Groups and Lattices in Algebraic Logic, Tbilisi, 20-23. 9. 2011.

[30] A. Dvurečenskij, *A General Approach to State-Morphism MV-Algebras*, Algebraic Semantics for Uncertainty and Vagueness, Salerno – Italy, Palazzo Genovese, 18-20. 5. 2011.

[31] A. Dvurečenskij, *The Recent Progress on Pseudo Hoops and BL-algebras*, Algebra and Proof Theory, amplified by Frames and Category Theory. Honoring Jorge Martinez on the occasion of his retirement, Vanderbilt University, Nashville, 11-13. 3. 2011.

[32] Dvurečenskij, A.— Motagna, F.: *State morphism MV-algebras*, Algebra and Proof Theory, amplified by Frames and Category Theory. Honoring Jorge Martinez on the occasion of his retirement, Vanderbilt University, Nashville, 11-13. 3. 2011.

[33] J. Haluška, *Mathematics of tones*, Letnia Szkola Matematyki, Gdansk, Poland, 19-24. 9. 2011, a series of 3 invited lectures.

[34] G. Wimmer— V. Witkowský.— G. Wimmer, JR.: *Continuation of Professor Kubáček's Research Work: Some Miscellaneous Examples*, ODAM 2011, Olomouc, 26-28. 1. 2011.

ii. List of employees who served as members of the organising and/or programme committees for international conferences

(Used abbreviations: P – member of programme committee, O member of organizer committee, PO member of both ones)

[1] J. Borsík (**2008:** 22nd Summer Conference on Real Functions Theory, Stará Lesná – PO; **2009:** 23rd Summer Conference on Real Functions Theory, Niedzica, Poland – P; **2010:** 24th Summer Conference on Real Functions Theory, Stará Lesná – PO)

[2] E. Drobná (**2008:** FSTA 2012, Liptovský Ján – PO; **2010:** FSTA 2010, Liptovský Ján – PO)

[3] M. Duchoň (**2008:** 22nd Summer Conference on Real Functions Theory, Stará Lesná – P)

[4] A. Dvurečenskij (**2008:** FSTA 2012, Liptovský Ján – P; IQSA Meeting, Quantum Structures '08, Sopot, Poland – P; **2009:** Medzinárodný seminár pri príležitosti 50. výročia založenia Matematického ústavu, Smolenice – PO; **2010:** FSTA 2010, Liptovský Ján – PO; IQSA Meeting '10, Boston, USA – P; **2011:** QS2011, Kočovce –P)

[5] R. Frič (**2008:** 22nd Summer Conference on Real Functions Theory, Stará Lesná – P; **2009:** 23rd Summer Conference on Real Functions Theory, Niedzica, Poland – P; **2010:** 24th Summer Conference on Real Functions Theory, Stará Lesná – P)

[6] I. Geriaková (**2007:** 18th Czech and Slovak International Conference on Number Theory, Smolenice – O; TATRACRYPT 2007, Smolenice - O)

[7] M. Hyčko (**2007:** 18th Czech and Slovak International Conference on Number Theory, Smolenice – O)

[8] F. Chovanec (**2008:** FSTA 2012, Liptovský Ján – O; **2010:** FSTA 2010, Liptovský Ján – O)

[9] M. Jurečková (**2008:** FSTA 2012, Liptovský Ján – O; **2010:** FSTA 2010, Liptovský Ján – O)

[10] J. Korbaš (**2007:** Zimná škola zo symplektickej geometrie, Bratislava - PO; **2009:** Bratislava Topology Symposium Group Actions and Homogeneous Spaces, Bratislava - PO)

[11] F. Kôpka (**2008:** FSTA 2012, Liptovský Ján – O)

[12] K. Nemoga (**2007:** 18th Czech and Slovak International Conference on Number Theory, Smolenice – PO; TATRACRYPT 2007, Smolenice – PO; **2008:** Future in Scientific Publishing, 2nd New Members Forum - PO; **2009:** Medzinárodný seminár pri príležitosti 50. výročia založenia Matematického ústavu, Smolenice – PO; **2010:** 2. Plenárna konferencia, Rozvoj nórsko-slovenkej spolupráce v kryptológii, Smolenice – PO; Budúce podoby ekonomických systémov, Bratislava – O; **2011:** 20. medzinárodná česko-slovenská konferencia z teórie čísel - PO)

[13] G. Okša (**2007:** High Performance Computation Conference 2007, Houston, USA – P; **2009:** Parallel Numerics 2009 - PO; **2011:** Parallel Numerics 2011, Schloss Retzhof, Austria – P)

[14] M. Ploščica (**2009:** Letná škola z univerzálnej algebry a usporiadaných množín, Stará Lesná - PO)

[15] S. Pulmannová (**2008:** IQSA Meeting, Quantum Structures '08, Sopot, Poland – P; FSTA 2010, Liptovský Ján – PO; IQSA Meeting '10, Boston, USA – P; **2011:** QS2011, Kočovce – P)

[16] B. Riečan (**2007**: EUSFLAT, Ostrava, ČR – P; 11th International Conference on Intuitionistic Fuzzy Sets, Sofia, Bulgaria – P; International Workshop on Intuitionistic Fuzzy Sets and Generalized Nets, Warsaw, Poland – P; Slovak - Bulgarian Workshop on IFS, Banská Bystrica – PO; **2008:** FSTA 2012, Liptovský Ján – P; **2010:** FSTA 2010, Liptovský Ján – PO)

[17] K. Štefančíková (**2008:** 22nd Summer Conference on Real Functions Theory, Stará Lesná – O; **2010:** 24th Summer Conference on Real Functions Theory, Stará Lesná – O)

[18] M. Vajteršic (**2007:** CANA '07, Wisla, Poland – P; **2009:** Parallel Numerics 2009 - PO; **2011:** Parallel Numerics 2011, Schloss Retzhof, Austria – PO)

[19] I. Vrťo (**2007:** SOFSEM, Nový Smokovec - P)

[20] G. Wimmer (**2007:** 8-th Annual meeting of the International Environmetrics Society, Mikulov, ČR – O; **2008:** Winter Workshop on Mathematical Statistics 2008, Bratislava – PO; **2009:** 18th International Workshop on Matrices and Statistics 2009, Smolenice - PO)

[21] S. Zabadalová (**2007:** 18th Czech and Slovak International Conference on Number Theory, Smolenice – O; TATRACRYPT 2007, Smolenice – O)

[22] M. Zeman (**2008:** Association for Symbolic Logic, annual meeting 2008, Irvine, USA – O)

iii. List of employees who served as members of important international scientific bodies (e.g. boards, committees, editorial boards of scientific journals)

[1] <u>Anatolij Dvurečenskij</u>
  Acta Universitatis Palackianae Olomucensis, Facultas Rerum Naturalium (editor)
  Soft Computing (editor)

[2] <u>Michal Fečkan,</u>
  Discontinuity, Nonlinearity and Complexity (editor)
  Communications in Mathematical Analysis (editor)

Differential Equations & Applications (editor)
Dynamics of Partial Differential Equations (editor)
Electronic Journal of Qualititive Theory of Differential Equations (editor)
Journal of Applied Mathematics (editor)
Journal of Applied Mathematics, Statistics and Informatics (JAMSI) (editor)
Mathematical Notes, Miskolc University (editor)

[3] Roman Frič,
Scientific Issues of Jan Dlugosz University in Czestochowa, ser. Mathematics (editor)

[4] Juraj Hromkovič,
Grammars (editor)
RAIRO- Theoretical Information and Applications (editor)

[5] Martin Kochol,
International Journal of Combinatorics (editor)

[6] Peter Mihók
Discussiones Mathematicae, Graph Theory (editor)

[7] Roman Nedela,
Ars Mathematica Contemporanea (editor)
Mathematica Bohemica (editor)

[8] Miroslav Ploščica,
Algebra Universalis (editor)
Mathematica Bohemica (editor)

[9] Sylvia Pulmannová,
Algebra Universalis (editor)
International Journal of Theoretical Physics (editor)
Reports on Mathematical Physics (editor)

[10] Beloslav Riečan,
Czechoslovak Mathematical Journal (editor)

[11] G. Wimmer,
Applications of Mathematics (editor)
Glottometrics (editor)

Members of international committees, societies

[12] A. Dvurečenskij,

        panel of European Research Council for young mathematicians (member)
        Member of the Committee of Internation Quantum Structure Association
        Member of the European Academy of Sciences

[13] K. Nemoga,

        member of NATO Science for Peace and Security Committee, Information and
        Communications Security Panel, Brussels 2008-10
        Independent Scientific Evaluation Group, NATO, Brussels 2011
        AMS American Mathematical Society (member)
        IACR International Association for Cryptology (funkcia: člen)
        SIAM Society for Industrial and Applied Mathematics (funkcia: člen)

[14] S. Pulmannová,

        Member of the Committee of Internation Quantum Structure Association
        American Mathematical Society – member

[15] R. Frič American Mathematical Society (member)
        International Quantum Structures Association (member)

[16] M. Grendár

        American Mathematical Society (member)

[17]   M. Kochol

        American Mathematical Society (member)

[18] J. Korbaš

        American Mathematical Society (member)

[19] M. Repický

        American Mathematical Society (member)

[20] B. Riečan

         Bernoulli Society (member)
        EUSFLAT – European Society for Fuzzy Logic and Technology (member)
        Matematische Hamburg Society (member)

[21] O. Strauch

        American Mathematical Society (member)

[22] O. Šuch

        American Mathematical Society (member)

iv. List of international scientific awards and distinctions

[1] **B. Riečan,** memorial medal of the Czech Mathematical Society for long years support of the Czech-Slovak collaboration in mathematics, 2008

[2] **A. Dvurečenskij, DrSc. –** member of the European Academy of Sciences and Arts, 2011

[3] **M. Vajteršic,** member of the European Academy of Sciences and Arts, 2011, nominated by Austria

- **National position of the individual researchers**

  i.   List of invited/keynote presentations at national conferences documented by an invitation letter or programme

[1]   WIMMER, G.: *Matematické modelovanie v jazykovede*, STAKAN 2007, Rusava, 25-27.V.2007.

[2]   GRENDÁR, M.: *Bayesovská štatistika*, Prastan 2009, Kočovce, June 10-12, 2009.

[3]   DVUREČENSKIJ, A.: *Akademik Jur Hronec jeho život a odkaz*, Pozvaná prednáška na Dni akademika Jura Hronca, Bratislava,1.12.2009.

[4]   DVUREČENSKIJ, A.: *Vedecký a ľudský odkaz Prof. Jura Hronca*, Pozvaná prednáška na seminári Dimenzie vedy a duchovna, Bratislava,16.12.2009.

[5]   GRENDÁR, M.: *Empirická vierohodnosť*, Robust 2010, Králíky, 31. 1. - 5. 2. 2010.

[6]   PÓCS, J.: *Konvexity zväzov*, 12. Konferencia Košických matematikov, Herľany, 13-16. 4. 2011.

[7]   ŠUCH, O.: *Červeno-čierne stromy*, Zimná škola z pravdepodobnosti, Šachtičky, 7. 1. 2011.

[8]   WIMMER, G.: *Kalibrácia*, Nitrianske štatistické dni, Nitra, 12-13. 5. 2011.

  ii.   List of employees who served as members of organising and programme committees of national conferences

  (Used abbreviations: P – member of programme committee, O member of organizer committee, PO member of both ones)

[1]   R. Frič (**2007:** workshop "Matematické štruktúry 2007", MÚ SAV, Košice, 29.-30.11.2007 - PO; **2008:** 40. konferencia slovenských matematikov v Jasnej pod Chopkom – P; **2009:** 41. konferencia Slovenských matematikov v Jasnej pod Chopkom – P)

[2]   K. Nemoga (**2008:** 40 rokov Rímskeho klubu, Bratislava – PO; **2010:** Seminár CRYPTO - PO)

[3]   B. Riečan (**2008:** 40 rokov Rímskeho klubu, Bratislava - PO; Duchovné hodnoty pre dnešok, Rožňava - P; Seminár Matematika a hudba, Banská Bystrica - PO)

[4]   O. Šuch (**2009:** Zimná škola doktorandov, Remata – PO)

iii.   List of employees serving in important national scientific bodies (e.g. boards, committees, editorial boards of scientific journals)

[1]   <u>Ján Borsík</u>

        Tatra Mountains Mathematical Publications (editor)

[2]   <u>Miloslav Duchoň</u>

        Mathematica Slovaca, (editor)
        Tatra Mountains Mathematical Publications, Editor-in-Chief
        Zentralblatt Math (editor)

[3]   <u>Anatolij Dvurečenskij</u>

        Mathematica Slovaca, Managing (editor)
        Tatra Mountains Mathematical Publications (editor)
        Science & Military (editor)

[4]   <u>Michal Fečkan</u>

        Mathematica Slovaca (editor)

[5]   <u>Roman Frič</u>

        Tatra Mountains Mathematical Publications (editor)
        Studies of the University in Žilina (editor)

[6]   <u>Ján Haluška</u>

        Tatra Mountains Mathematical Publications (editor)

[7]   <u>Ľubica Holá</u>

        Mathematica Slovaca (editor for General topology)
        Tatra Mountains Mathematical Publications (editor)

[8]   <u>Juraj Hromkovič</u>

        Computing and Informatics (editor)

[9]   <u>Ferdinand Chovanec</u>

        Tatra Mountains Mathematical Publications (editor)

[10]   <u>Stanislav Jakubec</u>

        Mathematica Slovaca, člen redakčnej rady (editor)

[11]   <u>Július Korbaš</u>

        Mathematica Slovaca (editor)

[12]   <u>Karol Nemoga</u>

        Tatra Mountains Mathematical Publications Managing Editor
        Zentrallblatt Math, Managing Editor

[13]   <u>Roman Nedela</u>

        Acta Universitatis Mathaei Belii (editor)
        Tatra Mountains Mathematical Publications (editor)

[14]   <u>Miroslav Ploščica</u>

        Tatra Mountains Mathematical Publications

[15]   <u>Silvia Pulmannová</u>

        Mathematica Slovaca, Editor-in-Chief
        Tatra Mountains Mathematical Publications (editor)

[16]   Beloslav Riečan

> Mathematica Slovaca (editor)
> Tatra Mountains Mathematical Publications Editor-in-Chief
> Obzory matematiky, fyziky a informatiky (editor)
> Tvorba Managing Editor

[17]   Oto Strauch

> Uniform Distribution Theory, Managing Editor

[18]   Marián Vajteršic

> Computing and Informatics (editor)

[19]   Imrich Vrťo

> Journal od Applied Mathematics, Statistics and Informatics (editor)

[20]   Gejza Wimmer

> Mathematica Slovaca (editor)
> Tatra Mountains Mathematical Publications (editor)
> Forum Statisticum Slovacum (editor)

[21]   Tibor Žáčik

> Tatra Mountains Mathematical Publications (technical editor)
> Mathematica Slovaca (technical editor)
> Zentralblatt MATH (technical editor)

Members of national committees and societies

[22]   Martin Bečka

> Slovak Informatical Society (Slovenská informatická spoločnosť) (member)

[23]   Ján Borsík

> Slovak Union of Mathematicians and Physicists (JSMF) (member)

[24]   Miloslav Duchoň

> Slovak Union of Mathematicians and Physicists (JSMF) (member)

[25]   Anatolij Dvurečenskij

> Slovak Union of Mathematicians and Physicists (JSMF) (member)
> Slovak Mathematical Society (member)
> Learned Socierty SAS (Učená spoločnosť SAV) (memer of prezidium)
> Prezidium of Agency for Research & Development (APVV) (member)
> Commission for Mathematics at Acreditation Commsion (member)
> Humboldt Club of Slovakia

[26]   Roman Frič

> Slovak Union of Mathematicians and Physicists (JSMF) (member)
> Slovak Mathematical Society (Slovenská matematická spoločnosť) (member)

[27]   Ján Haluška

> Slovak Union of Mathematicians and Physicists (JSMF) (member)
> Slovenská matematická spoločnosť (member)

[28]   Marek Hyčko

> Slovak Union of Mathematicians and Physicists (JSMF) (secretary)

[29]   Ján Jakubík

> Slovak Union of Mathematicians and Physicists (JSMF) (secretary)
> Learned Society SAS (member)

[30]   Galina Jirásková

      Slovak Union of Mathematicians and Physicists (JSMF) (member)

[31]   Martin Kochol

      Humboldtov klub na Slovensku (member)
      Slovak Union of Mathematicians and Physicists (JSMF) (member)

[32]   Július Korbaš

      Slovak Union of Mathematicians and Physicists (JSMF) (member)

[33]   Karol Nemoga

      Slovak Union of Mathematicians and Physicists (JSMF) (member)
      SPNZ Slovenský plynárenský a naftový zväz (member)

[34]   Miroslav Ploščica

      Slovak Union of Mathematicians and Physicists (JSMF) (member)

[35]   Miroslav Repický

      Slovak Union of Mathematicians and Physicists (JSMF) (member)

[36]   Beloslav Riečan

      Slovak Union of Mathematicians and Physicists (JSMF) (member)
      Learned Society SAS (Učená spoločnosť SAV) (member)

[37]   Peter Somora

      SPNZ Slovenský plynárenský a naftový zväz (member)

[38]   Imrich Vrťo

      Slovak Union of Mathematicians and Physicists (JSMF) (member)
      Slovak Genealogical and Heraldic Society (Slovenská genealogická a heraldická spoločnosť (member)
      Slovenská informatická spoločnosť (member)

[39]   Gejza Wimmer

      Slovak Union of Mathematicians and Physicists (JSMF) (member)
      Slovenská štatistická a demografická spoločnosť (funkcia: člen výboru)

[40]   Tibor Žáčik

      SPNZ Slovenský plynárenský a naftový zväz (member)
      Slovak Union of Mathematicians and Physicists (JSMF) (member)

iv.   List of national awards and distinctions

[1]   **B. Riečan**, Golden Medal of Matej Bel University, 2007.

[2]   **P. Vadovič,** Štefan Schwarz Fund of the Slovak Academy of Sciences for the best PhD students, 2007

[3]   **A. Dvurečenskij**, Award of the Literary Fund for citation response, 2007

[4]   **A. Zemánková**, Honorary Estimation „Scholar of the Slovak Republic 2006"

[5]   **A. Zemánková,** the 2nd place in the "Contest of Young Scientific Collaborators of SAS under 35 years", 2008

[6]   **A. Dvurečenskij**, Honorory Member of the Union of Slovak Mathematicians and Physicists, 2008

[7] **E. Vinceková,** Štefan Schwarz Fund of the Slovak Academy of Sciences for the best PhD students, 2008

[8] **J. Jakubík,** the Order of Ľudovít Štúr of the Ist class, estimated by the President of the Slovak Republic by the Constitution Day. 2008

[9] **S. Pulmannová,** the Estimation of Minister of Education of SR "The personality of the science and techniques for outstanding results of R&D"2008

[10] **A. Dvurečenskij,** Honorary Plaque of Jur Hronec for Merits in Mahematical Sciences, SAS, 2009

[11] **S. Pulmannová,** Award of the Slovak Academy of Sciences, 2009

[12] **G. Wimmer**, Honorary Plaque of Jur Hronec for Merits in Mahematical Sciences, SAS, 2009

[13] **S. Jakubec**, Honorary Plaque of Jur Hronec for Merits in Mahematical Sciences, SAS, 2009

[14] **A. Dvurečenskij,** the Estimation of Minister of Education of SR "The personality of the science and techniques for outstanding results of R&D"2009

[15] **A. Dvurečenskij,** Memorial Plaque of the Academy of Armed Forces of SR, L. Mikulas, 2009

[16] **A. Dvurečenskij,** Memorial Plaque of the Faculty of Natural Sciences, UKF Nitra, 2009

[17] **M. Fečkan,** Award of Literary Fund for scientific literature, 2009

[18] **G. Wimmer,** the Golden Medal of Matej Bel University, B. Bystrica, 2009

[19] **N. Dilna,** Štefan Schwarz Fund of the Slovak Academy of Sciences for the best PhD students, 2009

[20] **M. Duchoň**, Award for Development of the Slovak Science in Inland and Abroad, Literary Fund, 2010

[21] **J. Pócs,** Štefan Schwarz Fund of the Slovak Academy of Sciences for the best PhD students, 2010

[22] **L. Török,** Štefan Schwarz Fund of the Slovak Academy of Sciences for the best PhD students, 2010

[23] **T. Žáčik,** Technologist of the Year SR 2009, 2010

[24] **N. Dilna,** Scholar of the Year SR 2009, Young Scholar, 2010

[25] **J. Pócs,** Award of Literary Fund for scientific literature, 2010

[26] **L. Török,** Award of the President of the Slovak Republic, 2010

[27] **E. Vinceková,** Štefan Schwarz Award of JSMF for Young Mathematicians, 2010

[28] **A. Zemánková**, Award of Minister of Education SR for Young Scholars, 2010

[29]   **N. Dilna,** the 2nd place in the "Contest of Young Scientific Collaborators of SAS under 35 years", 2011

[30]   **A. Dvurečenskij,** the nomination to award "Crystal Wing" 2011

v.   Supplementary information and/or comments documenting international and national status of the Organisation

The Institute is publishing three international journals. It was a center of Commission for Defenses of PhD theses in Probability Theory and Mathematical Statistics till 31.12.2010.

Profs. J. Hromkovič and G. Wimmer were the Head of the DrSc. Commissions (DrSc. is the highest scientific degree in our country) and the Institute is a site of these two DrSc. commissions: (i) Computer Science, and (ii) Measurement Theory.

It is a center of the Slovak Association for the Club of Rome.

Many of our colleagues are members of important Colleges of the Slovak Academy of Sciences or scientific boards at faculties and universities, or in commissions for defence of PhD or DrSc. Dr. Pulmannová is a member of a committee of Slovak Fundation.

We note that in the nineties 6 our colleagues gain the prestige scholarship of the Humboldt Foundation at German Universities.

Using the National Scholarship Programme via SAIA, 12 foreigner postdocs and professor visited our Institute in 2008-2011 and they spent 45 months in total.

Our colleagues regularly are reviewing scientific papers for prestigious international journals, as well as they are many-years collaborators of Zentralblatt Mathematik and Mathematical Reviews. Besides they are evaluators of many international scientific projects.

Profs. A. Dvurečenskij, J. Jakubík, and B. Riečan are members of the *Learning Society* of the Slovak Academy of Science.

4. Project structure, research grants and other funding resources

• International projects and funding

i. List of major projects within the European Research Area – 6th and 7th Framework Programme of the EU, European Science Foundation, NATO, COST, INTAS, CERN, ESA etc. (here and in items below please specify: type of project, title, grant number, duration, total funding and funding for the Organisation, responsible person in the Organisation and his/her status in the project, e.g. coordinator, work package leader, investigator)

[1] Breath-gas analysis for molecular-oriented detection of minimal diseases - BAMOD (Analýza vydychovaných plynov pre molekulovo orientovanú detekciu zriedkavých chorôb), LSHC-CT-2005-019031, 2/2006 – 1/2008, =0, EUR, G. Wimmer – investigator.

[2] Universal algebra and lattice theory (Univerzálna algebra a teória zväzov), INTAS 03-51-4110, 4/2004 – 3/2007, =664,- EUR, M. Ploščica – investigator.

[3] Graphs and Algorithms (GRAAL), COST 293, 10/2004 – 10/2008, =0,- EUR, I. Vrťo – investigator.

[4] Geometric representations and symmetries of graphs, maps and other discrete structures and applications in science (Geometrické reprezentácie a symetrie grafov, máp a iných

diskrétnych štruktúr s aplikáciami vo vede), EUROGIGA, ESF-EC-0009-10, 5/2011 – 4/2014, =4 000,- EUR, R. Nedela – investigator.

ii. List of other international projects incl. total funding and funding for the Organisation

[1] Some classes of operators in B-spaces, topologies on functions spaces, harmonic analysis and moments of vector measures and applications (Niektoré triedy operátorov v B-priestoroch, geometria B-priestorov, topológie na priestoroch funkcií, harmonická analýza a momenty vektorových mier a aplikácie), SK-CZ-07906, 1/2006 – 12/2007, =2 821,- EUR.

[2] Algebraic and Logical Systems of Soft Computing (Algebraické a logické systémy soft computingu), SK-IT-15, 1/2004 – 12/2007, =2 656,- EUR.

[3] The QR matrix factorization and its applications (Factorisation QR performante et son application dans les problems aux moindres carres), File 15521ZG, 1/2007 – 12/2009, =664,- EUR.

[4] Commutative and Non-commutative Methods of Soft Computing (Komutatívne a nekomutatívne metódy soft computing), SK-IT 0016-08, 6/2009 – 12/2011, =4 359,- EUR.

[5] Number Theory and its Applications (Teória čísel a jej aplikácie), SK-CZ-0098-07, 2/2008 – 12/2009, =1304,- EUR.

[6] Quasi-Monte Carlo integration and pseudo-random generators (Quasi-Monte Carlo integrovanie a pseudonáhodné generátory), SK-BG-0019-08, 1/2009 – 10/2010, =3 627,- EUR.

iii. List of other important projects and collaborations without direct funding

[1] Austrian Grid II (WP 7: Datagrid), 7/2007 – 9/2009 – bilateral project funded by Bundesministerium fuer Bildung, Wissenschaft und Kultur, Austria, M. Vajteršic - investigator.

[2] Integration Theory in abstract spaces (Teória integrálu v abstraktných priestoroch), 1/2007 - 12/2009, bilateral project funded by SAS, Slovakia and CNR, Italy, J. Haluška – investigator.

[3] Number theory and cryptology (Teória čísel, algebra a kryptológia), 1/2006 – 12/2008, Academic agreement between SAS, Slovakia and AV ČR (Academy of Czech Republic), Czech Republic, O. Strauch – investigator.

[4] Measures in Vector Spaces and Fuzzy Measures (Miery vo vektorových priestoroch a fuzzy miery), 1/2006 – 12/2008, Institutional cooperation between MI SAS, Slovakia and Institut de Mathématique Pure et Appliquée UCL, LovainlaNeuve, Belgium, M. Duchoň - investigator.

[5] Fuzzy Logics and Their Applications (Fuzzy logiky a ich aplikácie), 1/2006 – 12/2008, Institutional cooperation between MI SAS and UI AV ČR (Institute of Informatics of Academy of Sciences, Czech Republic), M. Duchoň – investigator.

[6] Fuzzy Systems and Their Applications (Fuzzy systémy a ich aplikácie), 1/2006 – 12/2008, Cooperation between MI SAS, Slovakia and Institute of Theory of Information and Automatization, Academy of Sciences, Czech Republic, M. Duchoň – investigator.

[7] Intuitionistic fuzzy sets theory and applications (Intuicionistické fuzzy množiny teória a aplikácie), 1/2008 – 12/2010, bilateral project funded by SAS, Slovakia and Bulgarian Academy of Sciences, B. Riečan – investigator.

[8] Number theory, algebra and cryptology (Teória čísel, algebra, kryptológia), 1/2009 - 12/2011, Academic agreement between SAS, Slovakia and AV ČR (Academy of Czech Republic), Czech Republic, O. Strauch – investigator.

[9] Measures in Vector Spaces and Fuzzy Measures (Miery vo vektorových priestoroch a fuzzy miery), 1/2008 – 12/2010, Institutional cooperation between MI SAS, Slovakia and Institut de Mathématique Pure et Appliquée UCL, LovainlaNeuve, Belgium, M. Duchoň - investigator.

[10] Fuzzy Logics and Their Applications (Fuzzy logiky a ich aplikácie), 1/2008 – 12/2010, Institutional cooperation between MI SAS and UI AV ČR (Institute of Informatics of Academy of Sciences, Czech Republic), M. Duchoň – investigator.

[11] Fuzzy Systems and Their Applications (Fuzzy systémy a ich aplikácie), 1/2008 – 12/2010, Cooperation between MI SAS, Slovakia and Institute of Theory of Information and Automatization, Academy of Sciences, Czech Republic, M. Duchoň – investigator.

[12] Research in Number Theory (Výskum v oblasti teórie čísel), since 2000, longterm cooperation between MI SAS and Univ. St. Etiene, France, O. Strauch – investigator.

[13] Measures in Vector Spaces and Fuzzy Measures (Miery vo vektorových priestoroch a fuzzy miery), 1/2010 – 12/2012, Institutional cooperation between MI SAS, Slovakia and Institut de Mathématique Pure et Appliquée UCL, LovainlaNeuve, Belgium, M. Duchoň - investigator.

[14] Fuzzy Logics and Their Applications (Fuzzy logiky a ich aplikácie), 1/2010 – 12/2012, Institutional cooperation between MI SAS and UI AV ČR (Institute of Informatics of Academy of Sciences, Czech Republic), M. Duchoň – investigator.

[15] Fuzzy Systems and Their Applications (Fuzzy systémy a ich aplikácie), 1/2010 – 12/2012, Cooperation between MI SAS, Slovakia and Institute of Theory of Information and Automatization, Academy of Sciences, Czech Republic, M. Duchoň – investigator.

[16] Operators in Banach spaces, geometry of Banach spaces, topology, harmonic analysis of vector measures, applications (Niektoré triedy operátorov v Banachových priestoroch, geometria Banachových priestorov, topológie na priestoroch funkcií, harmonická analýza a momenty vektorových mier a ich aplikácie), 1/2010 – 12/2012, Cooperation with Czech Academy of Sciences, M. Duchoň – investigator.

- **National projects and funding**

i. **List of projects supported by the European Social Funds (ESF) and Structural Funds of EU and the role of the Organisation**

(**abbreviations:** A – leading organization, B – partner organization)

[1] Creation of a stable work group for a development and an application in a gas dynamic research (Vytvorenie stabilnej pracovnej skupiny pre rozvoj a aplikáciu výskumu v oblasti dynamiky plynu), JPD3 200,13120200037, 10/2005 – 9/2008, =116 710,- EUR, Role A.

[2] QUTE - Center of excellency of quantum technologies (QUTE - Centrum excelentnosti kvantových technológií), IMTS 26240120009, 5/2009 – 3/2011, =44 861,- EUR , Role B.

[3] meta-QUTE Center of excellency of quantum technologies (meta-QUTE - Centrum excelentnosti kvantových technológií), IMTS 26240120022, 3/2010 – 2/2012, =45 190,- EUR, Role B.

ii. **List of projects supported by APVV and the role of the Organisation**

2007 and earlier

[1] Probabilistic ad algebraic methods of uncertainty and quantum structures (Pravdepodobnostné a algebraické metódy neurčitosti a kvantových štruktúr), APVV-0071-06, 01/2007 – 06/2010, =138 252,- EUR, Role A.

[2] Topological structures on function spaces and hyperspaces, integration in ordered vector spaces, continuous and positive operators (Topologické štruktúry na funkcionálnych priestoroch a hyperpriestoroch, integrovanie v usporiadaných vektorových priestoroch, spojité a pozitívne operátory), APVT-51-00690, 1/2005 - 12/2007, =15 900,- EUR, Role A.

[3] Colouring Problems in Graph Theory (Problémy farbenia v teórii grafov), APVT-51-027604, 1/2005 – 12/2007, =32 331,- EUR, Role A.

[4] Discrete structures in algebra and geometry (Diskrétne štruktúry v algebre a geometrii), APVV-51-009605, 3/2006 – 3/2009, =68 880,- EUR, Role A.

[5] Networks and Mobile Computations: Communication, Structure and Complexity (Siete a mobilné výpočty: komunikácia, štruktúra a zložitosť), APVV-0433-06, 2/2007 – 06/2010, =19 334,- EUR, Role B.

2008

[6] Personal motor car fires, fires computer simulation and their experimental verification (Požiare osobných motorových vozidiel, počítačová simulácia požiarov a ich experimentálne overenie), APVV053207, 9/2008 – 12/2010, =18 119,- EUR, Role B.

[7] Algebraic approach to noncommutative probability (Algebrický prístup k nekomutatívnej pravdepodobnosti), LPP019907, 6/2008 – 11/2011, =27 185,- EUR, Role A.

2011

[8] Nonlinear phenomena in continuous and discrete dynamical systems (Nelineárne javy v spojitých a diskrétnych dynamických systémoch), APVV-0134-10, 5/2011 – 5/2014, =5 119,- EUR, Role B.

[9] Algorithms, automatons and discrete data structures (Algoritmy, automaty a diskrétne dátové štruktúry), APVV-0035-10, =8 815,- EUR, Role B.

[10] Statistical methods for uncertainty analysis in metrology (Štatistické metódy pre analýzu neistôt v metrológii), APVV-0096-10, =5 639,- EUR, Role B.

iii. Number of projects supported by the Scientific Grant Agency of the Slovak Academy of Sciences and the Ministry of Education (VEGA) for each year, and their funding

VEGA	2007	2008	2009	2010	2011
number	19	16	17	16	18
funding in the year (EUR)	42488	45874	70160	77974	73920

- **Summary of funding from external resources (based on annual financial report of the Organisation)**

External resources	2007	2008	2009	2010	2011	total	average
external resources (milions of EUR)	0,287	0,118	0,222	0,057	0,378	1,062	0,212
external resources transfered to coooperating research organisations (milions of EUR)	0,041	0,043	0,019	0,004	0,004	0,111	0,022
ratio between external resources and total salary budget	0,600	0,237	0,416	0,104	0,722	–	0,416
overall expenditures from external as well as institutional resources (milions of EUR)	1,136	0.996	1,088	1,001	0,992	4,217	1,054

iv. Supplementary information and/or comments on research projects and funding resources

Institute of Mathematics SAS was a partner organisation in the project Centre of Excellence of the Slovak Academy of Sciences, the principal organization is Institute of Physics SAS:

[3] **Centre of Excellence Physics of Information,** I/2/2005   1.2005—12.2008, 18 588,60 Eur

[4] **Centre of Excellence SAS- Quantum Technologies,** 1.2009-12.2012, = 15 975,00 Eur

Unfortunately, when the Framework Program started to be more oriented to applied projects, mathematical projects were not welcome in this Program. Anyway, during the last period we participated at the 6th Framework Program, BAMOD, *Breath-gas analysis for molecular-oriented detection of minimal diseases* together with Univ. Innsbruck and Institute of Measurement SAS. We have applied also for a new project.

5. Organisation of PhD studies, other pedagogical activities

i. List of accredited programmes of doctoral studies (as stipulated in the previously effective legislation as well as in the recently amended Act on the Universities)

[1] 9-1-9 Applied Mathematics (Aplikovaná matematika) – cooperation with Faculty of Mathematics, Physics and Informatics, Commenius University, Bratislava, since 2006 under Act 131/2002

Closing PhD. programmes - until the end of 2010 - (no new students, present students were finishing their thesis and defences under Act 131/1997)

[1] 11 – 02 – 9 Algebra and Number Theory (Algebra a teória čísel)

[2]   11 – 04 – 9 Mathematical Analysis – Calculus (Matematická analýza)

[3]   11 – 06 – 9 Probability and Mathematical Statistics (Pravdepodobnosť a matematická štatistika)

[4]   11 – 80 – 9 Theoretical Computer Science (Teoretická informatika)

[5]   11 – 14 – 9 Applied Mathematics (Aplikovaná matematika)

[6]   11 – 81 – 9 Theory of Teaching Computer Science (Teória vyučovania informatiky)

ii. Summary table on doctoral studies (number of internal/external PhD students; number of students who completed their study by a successful thesis defence; number of PhD students who quitted the programme)

PhD study	31.12.2007			31.12.2008			31.12.2009			31.12.2010			31.12.2011		
number of potential PhD supervisors															
PhD students	number	defended thesis	students quitted	number	defended thesis	students quitted	number	defended thesis	students quitted	number	defended thesis	students quitted	number	defended thesis	students quitted
internal	3	1	4	6	3	0	10	2	0	8	2	0	10	0	0
external	9	0	0	8	0	2	9	1	0	2	4	1	1	0	0
supervised at external institution by the research employees of the assessed organisation	20	3	1	9	1	0	9	2	0	8	0	0	14	0	0

iii. Postdoctoral positions supported by

a) external funding (specify the source)

APVV LPP -0199-07 - 6/2008 – 11/2011 - E. Vinceková

b) internal funding - the Slovak Academy of Sciences Supporting Fund of Stefan Schwarz

P. Vadovič (2007), E. Vinceková (2008), N. Diľna (2009), Ľ. Tőrők, J. Pócs (2010)

c) Up to June 30, 2010, the Institute of Mathematics was a headquarter of the DrSc.-commisions for 11-80-0 Computer Science, 02-12-13 Metrology, 11-06-9 Probability and Mathematical Statistics.

iv. Summary table on pedagogical activities in undergraduate programmes for each year

Teaching	2007	2008	2009	2010	2011
lectures (hours/year)	951	1209	986	829	629
practicum courses (hours/year)	832	980	601	499	432
supervised diploma works (in total)	24	28	40	35	11
members in PhD committees (in total)	13	15	14	12	8
members in DrSc. committees (in total)	5	4	3	2	1
members in university/faculty councils (in total)	2	6	6	6	6
members in habilitation/inauguration committees (in total)	4	6	5	6	5

v. List of published university textbooks

vi.

[1] **ZEMÁNKOVÁ, A.**— KOMORNÍKOVÁ, M.: *Riešenie úloh lineárneho programovania pomocou programu Excel*, FM UK, Bratislava, 2007.

[2] **WIMMER, G.**— WIMMEROVÁ, S.: *Teória pravdepodobnosti*, Slovenská poľnohospodárska univerzita v Nitre, Nitra, 2007. ISBN: 978-80-8069-917-8

[3] **KOCHOL, M.** - KRIVOŇÁKOVÁ, N. Introduction to Graph Theory. Žilina : EDIS - vydavateľstvo Žilinskej univerzity, 2009. 138 s. ISBN 978-80-554-0128-7

[4] **OKŠA, G.:** Úvod do numerických metód lineárnej algebry, vydavateľstvo STU, Bratislava, 2009

[5] **RIEČAN, B.** - ČUNDERLÍKOVÁ, K. Matematika pre gymnáziá : Pravdepodobnosť a štatistika. Slovakia : Slovenské pedagogické nakladateľstvo - Mladé letá, 2009. 112 s. ISBN 978-80-10-01520-7.

[6] **HALUŠKA, J.**. Základy funkcionálnej analýzy. Žilina : EDIS - Publishing House of the University of Zilina, 2010. 206 s. ISBN 978-80-554-0177-5

[7] BACHRATÝ, H. - **GRENDÁR JR., M.** - BACHRATÁ, K.: *Ako sa počíta pravdepodobnosť?* 1. vyd. Žilina : Žilinská univerzita, 2010. 326 s. ISBN 978-80-554-0226-0.

[8] **KOCHOL, M.:** *Tension and Flow Polynomials and Orientations on Graphs*. Žilina : EDIS - vydavateľstvo Žilinskej univerzity, 2010. 92 s. ISBN 978-80-554-0210-9.

[9] **KOCHOL, M.:** *Superposition, Snarks and Flows*. Žilina : EDIS - vydavateľstvo Žilinskej univerzity, 2009. 123 s. ISBN 978-80-554-0082-2.

[10] **KOCHOL, M.:** *Integral Variants of Combinatorial Polynomials*, *EDIS - vydavateľstvo Žilinskej univerzity, Žilina*, (2009), 114 s., ISBN 978-80-554-0127-0

vii. Number of published academic course books

viii. List of joint research laboratories/facilities with the universities

[1] Laser Center – Faculty of Natural Sciences, Commenius University, Bratislava (cooperation via QUTE and meta-QUTE projects)

[2] Institute of Mathematics and Informatics, Banská Bystrica – Joint Institute of Mathematical Institute of SAS and Faculty of Natural Sciences of Matej Bel University in Banská Bystrica – it was renewed in 2008

ix. Supplementary information and/or comments on doctoral studies and pedagogical activities

According to the old system of PhD study, our Institute had rights for 6 programs in mathematics. In a new system which is performed with a strong connection with universities, we have only one, because, we could have a program if only some Slovak university has it. For examples, algebra and number theory or computer science were nowhere at our universities because they haven't any specialist in the program, therefore, it is not at our Institutes, however we have specialists.

Nevertheless that scholarships for PhD-studies in our country are very low, every year we have applicants for the doctorial study. We recall that to have applicants from Slovakia is not easy even for faculties. Due to regulations by Slovak Academy of Sciences, we could accept at most three students at our Institute. The level of our PhD-study is traditionally very high confirmed also by a fact that in the last years three young mathematicians of EU (Italy, Germany, Malta) obtained their PhD degree at our Institute.

Unfortunately, the new system of PhD study as the third grade of university study is not optimal thanks to the rule that the candidate has to finish his study including the defense within the standard length of study. This caused that the level of theses is not very high as before, but we are still paying attention to high quality. Therefore, now there is a small problem to attract PhD students to study at the Institute.

Besides of leading our own PhD-students in both forms internal and external, plenty of our colleagues are PhD-tutors of students on many Slovak universities. During the period 2007-11 we have 14 successful defenses. The Institute was the center of the whole Slovak Commission for PhD-study in Probability and Mathematical Statistics.

6. Applied research

i. List of the most important results of applied research projects and their socio-economic impact

[1]   **Leak detection and localization in natural gas transport.** The leak detection and location model for gas transit pipelines and its software implementation were developed in cooperation with company CSE-Servelec, s.r.o for Yemen LNG Company Ltd.

[2]   **Transit gas pipeline system optimization according to present line pack.** Continuing the cooperation with eustream, a.s. (former SPP – Tranzit, a.s.), the project of optimization of the settings of compressor stations according to various parameters and the condition of a preset total amount of gas has been successfully realized.

[3]   **Fire Simulation in Tunnels.** We have simulated the origin and spread of a fire in tunnels. This research is very important for everyday life and it met with great interest of state bodies that are responsible for the traffic safety. Our computations showed that these simulations are very time-consuming so that the whole simulation has to be performed using parallel, highly efficient computers.

ii. List of the most important studies commissioned for the decision-making authorities, the government and NGOs, international and foreign organisations
None

iii. List of patents issued abroad, incl. revenues
None

iv. List of the patents issued in Slovakia, incl. revenues
None

v. List of licences sold abroad, incl. revenues
None

vi. List of licences sold in Slovakia, incl. revenues
None

vii. List of contracts with industrial partners, incl. Revenues

[1] Contract with Slovak Gas Company, 2007-08, 332205 Eur

[2] Contract with eustream, a.s. Nitra   (former Slovak Gas Company) 2009-2011, 332205 Eur

[3] CSE Servolec Nitra, 2007-2011, 200037,57 Eur,

[4] National Security Bureau, -

viii. List of research projects with industrial partners, incl. revenues

ix.

Outreach activities	2007	2008	2009	2010	2011	total
studies for the decision sphere, government and NGOs, international and foreign organisations	5	5	5	5	5	25

7. Popularisation of Science

i. List of the most important popularisation activities

2007:

[1] V. Bužek–D. Čaplovič–A. Dvurečenskij: *Vedomostná spoločnosť a vedomostná ekonomika*, Beseda s novinármi v klube VTS o vede pri káve, 8. 2. 2007, 90 min.

[2] R. Frič: Prednáška na tému Vzťah náboženstva a prírodných vied, Metodicko-pedagogické centrum v Prešove, 22. 11. 2007.

[3] R. Frič: Prednáška na tému Vzťah náboženstva a prírodných vied, Košice, 4. 12. 2007.

[4] Prednáška v rámci týždňa vedy poriadanom Európskou Komisiou – J. Haluška: *Hudobná a priestorová akustika*, Konzervatórium Košice.

[5] Prednáška - M. Grendár: *Boltzmannov problém a Metóda najväčšej entropie*, Gymnázium J. G. Tajovského, Banská Bystrica.

[6] Prednáška - M. Grendár: *Boltzmannov problém a Metóda najväčšej entropie*, Gymnázium A. Sládkoviča, Banská Bystrica.

[7] Prednáška -M. Grendár: *Boltzmannov problém a Metóda najväčšej entropie*, Gymnázium Ľ. Štúra, Zvolen.

[8] J. Jakubík: Referát o latinsky písanej učebnici algebry od M. Lipschica vydanej v Košiciach r. 1738, Konferencia pri príležitosti 350. výročia založenia Košickej univerzity.

2008:

[9] A. Dvurečenskij–T. Žáčik–K. Nemoga: *Matematici SAV pomáhajú prepravovať plyn*, SAV, tlačová beseda na pôde SAV, dňa 24. 4. 2008.

[10] Prednáška – M. Grendár: *Moderné metódy aplikovanej štatistiky*, Gymnázium J. G. Tajovského v Banskej Bystrici.

[11] Prednáška – M. Grendár: *Moderné metódy aplikovanej štatistiky*, Gymnázium A. Sládkoviča v Banskej Bystrici.

[12] Prednáška – M. Grendár: *Moderné metódy aplikovanej štatistiky*, Gymnázium Ľ. Štúra vo Zvolene.

[13] Prednáška – M. Grendár: *Matematické pozadie niektorých metód modernej aplikovanej štatistiky,* Gymnázium J. G. Tajovského v Banskej Bystrici.

[14] Prednáška – M. Grendár: *Jaynesova kocka*, Matematický klube MaK, Chata pod Suchým vrchom, Banská Bystrica.

[15] Prednáška – M. Grendár: *Nazretie do modernej aplikovanej štatistiky*, 40. konferencia slovenských matematikov v Jasnej.

[16] Prednáška v rámci Európskeho týždňa vedy a techniky – J. Haluškova, Evanjelické Gymnázium J. Tranovského v Liptovskom Mikuláši.

[17] Prednáška – K. Nemoga–T. Žáčik: *Aplikácie matematiky pri optimalizácii prepravy plynu*, Snem JSMF, Nitra, 26. 8. 2008.

[18] Prednáška – G. Jirásková: *P=NP? Alebo: Ako sa stať milionárom...*, Popoludnie s informatikou, PF UPJŠ Košice, 27. 11. 2008.

[19] Prednáška v rámci Európskeho týždňa vedy a techniky – K. Nemoga: *Aplikácie matematiky v kryptológii,* Košice, november 2008.

[20] Prednáška v rámci Európskeho týždňa vedy a techniky – J. Pócs: *Ako pracujú matematici*, Gymnázium Alejová, Košice, 24. 11. 2008.

[21] Prednáška v rámci Európskeho týždňa vedy a techniky – G. Wimmer: *Odhady a testy*, FPV UMB, Banská Bystrica, 25. 11. 2008.

2009:

[22] Prednáška v rámci Európskeho týždňa vedy a Dňa otvorených dverí MÚ SAV – A. Dvurečenskij: *Matematika na Slovensku a v SAV*, MÚ SAV, Bratislava, 3. 11. 2009.

[23] Prednáška v rámci Celoslovenskej súťaže mladých organistov – J. Haluška: *Strednetónové ladenia v 17.stor. Akustické stvárnenie hudobného charakteru v Dobre temperovanom klavíri J. S. Bacha*, Štátne konzervatórium Košice,4. 11. 2009.

[24] Prednáška v rámci Európskeho týždňa vedy a Dňa otvorených dverí MÚ SAV – E. Halušková: *Matematika prevažne vážne,* Evanjelické gymnázium, Liptovský Mikuláš, 5. 11. 2009.

[25] Prednáška – G. Jirásková: *P vs NP problém,* Matematický piatok, Slezská univerzita, Opava, Česká Republika, 10. 10. 2009.

[26] *Prednáška* – G. Jirásková: *P=NP? Alebo - ako sa stať milionárom,*, Programátorská súťaž PALMA, Danišovce, 25. 4. 2009.

[27] Prednáška – G. Jirásková: *Prvočísla, Riemann a Riemannova hypotéza*, Popoludnie s informatikou, PF UPJŠ, Košice, 5. 11. 2009.

[28] Prednáška v rámci Európskeho týždňa vedy a Dňa otvorených dverí MÚ SAV – K. Nemoga: *Utajený svet šifrovania,* MÚ SAV, 3. 11. 2009.

[29] Prednáška v rámci Európskeho týždňa vedy a Dňa otvorených dverí MÚ SAV – G. Okša–L. Halada: *Ako matematika hasí požiare*, MÚ SAV, 3. 11. 2009.

[30] Prednáška v rámci Európskeho týždňa vedy a Dňa otvorených dverí MÚ SAV – I. Vrťo: *Teória grafov – od hlavolamov po integrované obvody*, 3. 11. 2009.

[31] Prednáška v rámci Európskeho týždňa vedy a Dňa otvorených dverí MÚ SAV – T. Žáčik: *Aplikácie matematiky v plynárstve*, 3. 11. 2009.

2010:

[32] Prednáška v rámci Noci výskumníka – A. Dvurečenskij: *Čaro matematiky,* SNM, 22. 9. 2010.

[33] Prednáška v rámci Európskeho týždňa vedy a techniky a Dňa otvorených dverí MÚ SAV – A. Dvurečenskij: *Čaro matematiky*, 9. 11. 2010.

[34] Prednáška pre doktorandov v rámci projektu QUTE – A. Dvurečenskij: *Gleasonova veta a jej aplikácie*, 7. 12. 2010.

[35] Pozvaná popularizačná prednáška pre študentov ZŠ a Gymnázia v Tornali – A. Dvurečenskij: *Čo dokáže matematika, http://dadka.sk/ZS_slov/beseda_o_matematike.html*, 22. 4. 2010.

[36] Prednáška v rámci Európskeho týždňa vedy – R. Frič: *Od ostrej matematiky ku neostrej matematike*, Katolícka univerzita v Ružomberku, 9. 11. 2010.

[37] Prednáška v rámci Európskeho týždňa vedy – R. Frič: *Reč matematiky: presne, intuitívne, nepresne,* Gymnázium sv. Tomáša Akvinského, Košice. 8. 11. 2010.

[38] Prednáška v rámci Európskeho týždňa vedy – E. Halušková: *Abecedy matematiky*, ZŠ Kvačany, 18. 11. 2010.

[39] Prednáška v rámci Európskeho týždňa vedy – E. Halušková: *Abecedy matematiky*, Evanjelická ZŠ Lipt. Mikuláš, 16. 11. 2010.

[40] Prednáška v rámci Európskeho týždňa vedy – E. Halušková: *Abecedy matematiky*, Evanjelické gymnázium Lipt. Mikuláš, 12. 11. 2010.

[41] Prednáška v rámci Európskeho týždňa vedy a Dňa otvorených dverí MÚ SAV – K. Nemoga: *Utajený svet šifrovania*, MÚ SAV, 9. 11. 2010.

[42] Prednáška v rámci Európskeho týždňa vedy a Dňa otvorených dverí MÚ SAV – G. Okša: *Ako matematika hasí požiare,* MÚ SAV, 9. 11. 2010.

[43] Prednáška v rámci Európskeho týždňa vedy a Dňa otvorených dverí MÚ SAV – T. Žáčik: *Ako matematika pomáha prepravovať plyn*, MÚ SAV, 9. 11. 2010.

2011:

[44] Prednáška – A. Dvurečenskij: *Načo sú nám kvantové štruktúry*, Prir. fak. Univer. Olomouc, ČR, 20. 11. 2011.

[45] Prednáška v rámci Európskeho týždňa vedy a Dňa otvorených dverí MÚ SAV – R. Frič: *Bernoulliho Ars Conjectandi a smery rozvoja pravdepodobnosti,* Katolícka univerzita v Ružomberku, 9. 11. 2011.

[46] Prednáška v rámci Európskeho týždňa vedy a Dňa otvorených dverí MÚ SAV – R. Frič: *Bernoulliho Ars Conjectandi a smery rozvoja pravdepodobnosti,* MÚ SAV – Detašované pracovisko Košice, 7. 11. 2011.

[47] Prednáška v rámci Európskeho týždňa vedy a Dňa otvorených dverí MÚ SAV – E. Halušková: *Chemické grafy*, Evanjelické gymnázium, Liptovský Mikuláš, 11. 11. 2011.

[48] Prednáška v rámci Európskeho týždňa vedy a Dňa otvorených dverí MÚ SAV – E. Halušková: *Chemické grafy*, EZŠ Liptovský Mikuláš, 10. 11. 2011.

[49] Prednáška v rámci Európskeho týždňa vedy a Dňa otvorených dverí MÚ SAV – E. Halušková: *Chemické grafy*, ZŠ Kvačany, 7. 11. 2011.

[50] Prednáška – G. Jirásková: *P=NP? Alebo: Ako sa stať milionárom*, Letná škola Pytagoras, Hronec, 14. 7. 2011.

[51] Prednáška – G. Jirásková: *Prvočíselná veta a Riemannova hypotéza,* Matematický piatok, Slezská univerzita, Opava, Česká Republika, 11. 2. 2011.

[52] Prednáška v rámci Európskeho týždňa vedy a Dňa otvorených dverí MÚ SAV – K. Nemoga: *Matematika a svet šifrovania*, MÚ SAV, 8. 11. 2011.

[53] Prednáška v rámci Európskeho týždňa vedy a Dňa otvorených dverí MÚ SAV – K. Nemoga–T. Žáčik: *Ako matematika pomáha prepravovať plyn*, MÚ SAV, 8. 11. 2011.

[54] Prednáška v rámci Európskeho týždňa vedy a Dňa otvorených dverí MÚ SAV – G. Okša: *Ako matematika hasí požiare*, MÚ SAV, 8. 11. 2011.

[55] Matematický krúžok – E. Halušková: *Zábavná matematika*, EZŠ Liptovský Mikuláš.

Interviews in Radio/Discussions in Radio/Radio:

2007:

[56] A. Dvurečenskij, Rozhovor v Slovenskom rozhlase, 8. 2. 2007 o 12.30.

[57] R. Frič: Rozhovor na tému *Matematika okolo nás*, Rádio Lumen, relácia Emauzy, 2. 9. 2007.

[58] J. Haluška: Interview o knihe - Ján Haluška: *Hľadanie harmónie – vyznanie matematika o hudbe a trocha aj o filozofii*, Veda, Bratislava 2006, pp. 295, ISBN 80-224-0918-9, Rádio Lumen.

[59] A. Dvurečenskij: *O matematike*, Rádio Devín, relácia Solárium, beseda, 10. 6. 2008, 13.00– 13.30.

[60] *Slovenská akadémia vied udeľovala ceny najvýznamnejším slovenským bádateľom a propagátorom našej vedy.* (19.06.2008; Rozhlasová stanica Slovensko; Popoludnie s rozhlasom; 14.30; 3,5 min.; HARAJ Igor) Rozhovor A. Dvurečenského s redaktorkou K. Kacerovou.

[61] *Ako naši matematici prepravujú plyn (1. časť)*, beseda na stanici Rádio Slovensko, 20. 6. 2008, 17.10–17.30, A. Dvurečeskij.

[62] Rozhovor s A. Dvurečenským. Rádio Regina, relácia Stretnutia, 23. 6. 2008, 20.00– 20.30.

[63] A. Dvurečenskij-K. Nemoga: *Aplikácia matematiky pri preprave plynu,* Rádio Devín, relácia Solárium, beseda, 11. 9. 2008, 13.00–13.30.

[64] K. Nemoga: *Aplikácie matematiky v kryptológii* I, Rádio Devín, relácia Solárium 25. 9. 2008, 13:00.

[65] K. Nemoga: *Aplikácie matematiky v kryptológii* II, Rádio Devín, relácia Solárium 2. 10. 2008, 13:00.

2009:

[66] Rozhovor I. Haraja s A. Dvurečenským: *Deň akademika Jura Hronca*, Slovenský rozhlas, 29. 11. 2009.

[67] *Ovplyvňuje matematika náš svet?* Rádio Slovensko, relácia Nočná pyramída (mod. Igor Haraj, hostia prof. M. Marcelli, a prof. A. Dvurečenskij, 22:30-24:00), 26. 9. 2009.

[68] Rozhovor p. M. Hanáčka s A. Dvurečenským, Rádio Slovensko, 23. 8. 2009, 17:10-17:55.

[69] A. Dvurečenskij: *Aplikácia matematiky pri preprave plynu,* Rádio Devín, relácia Solárium, 9. 1. 2009, 13:00-13:30, beseda.

[70] /A. Dvurečenskij/ *Talent je súbor schopností na originálne výkony*, Rádio Regina (14:00; 7 min.; red. Tatiana Šušková) , 23. 3. 2009.

[71] *Začal sa dvojdňový seminár k 50. výročiu vzniku Matematického ústavu SAV*, Rádio Slovensko, Správy o 15:00, 18. 6. 2009.

[72] /účinkujú P. Vadovič – A. Zemánková/ Reportáž k Týždňu vedy – I. Haraj: *Čo robia celý deň matematici? O úspechoch slovenskej matematiky a o tom, ako k nim naši matematici prichádzajú,* Rádio Slovensko, vysielané 2. 11. 2009, o 11:12.

2010:

[73] Beseda /účinkujú N. Diľna – V. Solovyov/ Rádio Regina, relácia Stretnutia, rozhovor.

[74] Beseda – /účinkuje A. Dvurečenskij/: Rádio Slovensko, relácia Nočná pyramída, 29. 5. 2010.

[75] Beseda /účinkujú A. Dvurečenskij a K. Nemoga/K. Kacerová, Rádio Devín, relácia Solárium, 14. 6. 2010.

[76] Rozhovor na tému *Matematika a hudba* - A. Dvurečenskij, rádiu Viva , 17. 5. 2010

2011:

[77] Rozhovor s A. Dvurečenským, Rádio Regina, Rádiobudík, 5. 5. 2011.

Interviews in Television/Television/Internet Video

2007:

[78] A. Dvurečenskij: *Na školách bude možno menej matematiky*, vyjadrenie pre TV TA3, dňa 18.12.2007 o 16.35 hod.

[79] M. Hyčko: Účasť v súťažno-zábavnej relácii Inkognito, TV JOJ, 15. 2. 2007.

[80] M. Hyčko: Vyjadrenie sa k pravdepodobnosti výhry jackpotu v lotérii Športka, TV Markíza, správy, august 2007.

2008:

[81] /účinkuje B. Riečan/ Televízna relácia *Prof. Beloslav Riečan*, Gen.sk, STV2, vysielané 28. 11. 2008.

2009:

[82] /účinkuje M. Hyčko/ Vyjadrenie sa k pravdepodobnosti, že v Bulharskej štátnej lotérii padli dvakrát po sebe rovnaké čísla, TV JOJ, relácia TV Noviny, 17. 9. 2009.

2010:

[83] Ivo Brachtl: *prof. RNDr. A. Dvurečenskij, DrSc.* - filmový medailón, CVTI SR národné centrum pre popularizáciu vedy a techniky.

[84] /Účinkuje A. Dvurečenskij/ Quark VIDEO 01/2010, http://www.equark.sk/index.php?cl=article&iid=1364&action=itemclick&tname=torss&pr=click%2Cdefault.

[85] A. Dvurečenskij, K. Nemoga, G. Wimmer: *Spektrum vedy, Je možný život bez matematiky?* STV2, 10. 11. 2010.

2011:

[86] T. Prokopčák: Rozhovor s matematikom A. Dvurečenským v SME a video, Na ulici nenájdete ležať prvočíslo, 19.9.2011 SME, http://veda.sme.sk/c/6057806/matematik-anatolij-dvurecenskij-na-ulici-nenajdete-lezat-prvocislo.html. 19. 9. 2011.

[87] /A. Dvurečenskij/ Krištáľové krídlo za rok 2010 - nominácia za medicínu a vedu., STV1, 16. 1. 2011, 20.15-22.00.

[88] /A. Dvurečenskij/ Slovenskí supervedci, TV Markíza 4. 11. 2011, večerné správy.

[89] Vyjadrenie sa k 111 (*Magické jednotky*) – M. Hyčko, TV JOJ, správy.

Publications/Popularizing articles/Interviews in press:

2007:

[90] M. Babic: *Radšej plné hlavy než bruchá*, Quark, č. 4. (2007), p. 19–19.

[91] *Plné brucha či aj hlavy?* Spotrebiteľ 1, marec 2007.
      http://www.consuminstit.sk/file_download/5

[92] D. Čaplovič: Na ceste k poznatkovej spoločnosti. 8. 2. 2007.
      http://www.caplovic.vlada.gov.sk/index.php?ID=3230

[93] Rozhovor s A. Dvurečenským - P. Marianyi: *Magická moc čísie*l, Revue priemyslu, č. 5 (2007),
      70– 71.

[94] A. Štrpková, Základný kameň SAV položili pred 65 rokmi, SME, 28. 6. 2007.

[95] Grodovská, Ľ.: *Nová šanca pre talenty*, Slovenka; č. 35/2007, s. 22. 3. 9. 2007.

[96]   Rozhovor s A. Dvurečenským - L. Černická: *Krajina talentov*, Slovenka, č. 46, 2007, s. 51.

[97] Greš, J.: *Dary viac ako vianočné*, Slovenka; 49/2007, s. 79, 10. 12. 2007.

2008:

[98] A. Dvurečenskij: *Nestor matematikov 85 ročný*, Aktuality SAV, 16. 10. 2008. (článok)

[99] Greš, J.: *Malí géniovia sa pobili o milióny,* Slovenka; č. 9, 2008, s. 81.

[100] /A. Dvurečenskij/ mq: *Plynovody sú bezpečnejšie vďaka matematikom zo Slovenska*, Pravda, s.
      8, 25. 4. 2008.

[101] Haló haló haló. E. Ťapajová: *rozhovor s A. Dvurečenským*, Tele plus, 17 č. 11, 2008, str. 2.

[102] A. Štrpková: *Kráľovná vied v službách plynárov*, Revue priemyslu, č. 6, 2008, 70–71.

[103] /A. Dvurečenskij/ *Možno hľadajú práve teba*, Slovenka; č. 37, 2008, s. 80.

[104] /A. Dvurečenskij/ *Matematické rovnice v rúrach,* Siemens Visions 2/2008.

[105] A. Dvurečenskij: *Cena ministra v správnych rukách*, Správy SAV 43, č. 12, 2008, p. 2.

[106] /S. Pulmannová/ 4tk: *Vedecké ceny získali od Mikolaja najmä technici a prírodovedci*, SME,
      www.sme.sk; Slovensko, S ;4tk, 27. 11. 2008 - Zmienka o ocenení Osobnosť vedy a techniky
      2008.

2009:

[107] A. Dvurečenskij: *Akademik Jur Hronec a jeho odkaz,* Quark č. 12 (2009), s. 19.

[108] A. Dvurečenskij: *Cena podpredsedu vlády a ministra školstva SR*, Quark č. 12, príloha (2009),
      s. 4.

[109] Rozhovor s A. Dvurečenským: *Kto je dobrý v matematike, je vynikajúci vo všetkom*, Pravda,
      red. Vladimír Jancura, 11. 6. 2009.

[110] /A. Dvurečenskij/ S. Klamová: *Matematika je stará dáma, ale veľmi aktívna!* Správy SAV, 5.
      11. 2009.

[111] *Náš hosť*, Rozhovor J. Vitkovskej s A. Dvurečenským, Akademik, máj 2009 , 12-13.

[112] /A. Dvurečenskij/ Pavel Novotný: *Slovák, ktorý pátra po superpočítači*, Hospodárske noviny; s.
      8; , 17. 2. 2009.

[113] /A. Dvurečenskij/ *Talenty novej Európy*, Woman, č. 3 (2009), s. 97.

[114] V. Kellö-J. Pišút-M. Považan: *Špičkoví vedci a ich pracoviská na Slovensku z pohľadu H-
      indexu*, ARRA Newsletter, vol. 3, č. 2 (2009), 1-5.

[115] R. Hajossy: *Najúčinnejšie homeopatikum je 50 kvapiek z horského potoka?* Quark č. 9 (2009), s.
      45.

[116] K. Nemoga: *Kryptológia je umením utajenia informácie,* Quark, 1, p. 8-9.

[117] B. Riečan: *Bieda vysokých škôl leží v profesorskom zbore*, Pravda, 5. 12. 2009.

[118] B. Riečan: *Čo s Riemannovým integrálom?* Obzory matematiky, fyziky a informatiky, vol. 38, no. 3 (2009), 1-16.

[119] B. Riečan: *Komunisti bez viny*, časopis Týždeň, reakcia na článok.

[120] B. Riečan: *Od pravdepodobnosti ku kombinatorike a nie naopak,* Obzory matematiky, fyziky a informatiky, vol. 38, no. 1 (2009), 1-20.

2010:

[121] Recenzia knihy - M. Duchoň: *Evolution Algebras and their Applications, by Tian, Jianjun Paul (Springer-Verlag Berlin 2008, Lecture Notes in Mathematics 1921, ISBN 978-3-540-74283-8/PBK 0),* Obzory Matematiky, Fyziky a Informatiky vol. 39, no. 2 (2010), 69—71.

[122] /citovanie výrokov A. Dvurečenského/ A. Antonyová: *Ekonometria a matematické modelovanie,* Datapress, Prešov 2010.

[123] A. Dvurečenskij: *Kto získal tohtoročné Fieldsove medaily za matematiku?* Quark, č. 11 (2010), 22—22.

[124] A. Dvurečenskij: *Deň akademika Jura Hronca*, Správy SAV 46, č. 1 (2010), str. 5—6.

[125] A. Dvurečenskij: *Ďalšia šanca pre talenty*, Slovenka; č. 9, s. 39.

[126] A. Dvurečenskij: *Doc. RNDr. František Kôpka, CSc. 22.2.1953--28.4.2008*, Inter. J. Theor. Phys. 49 (2010), 2947—2949.

[127] /A. Dvurečenskij/ Z. Handzová: *Talent ničia rodičia, ktorí chcú priveľa*, Pravda; príloha. Magazín Pravdy, č. 11, s. 6—9. 18. 3. 2010.

[128] K. Potoková, *Na pamiatku akademika Jura Hronca*, Poľnohospodár, roč. 54, č. 8-9. 2010, str. 5. 22. 1. 2010.

[129] M. Babic: *Užitočná matematika. Rozhovor s RNDr. prof. A. Dvurečenským, DrSc.*, Quark č. 1 (2010), 8—9.

[130] /O. Strauch/ *S Otom Strauchom o jednej domnienke*, Týždeň, číslo 33/2010, 15. 8. 2010.

2011:

[131] *Matematik Anatolij Dvurečenskij: Na ulici nenájdete ležať prvočíslo*, SME, 18. 9. 2011.

[132] /A. Dvurečenskij/ *Nobelova cena. Čo by sa muselo stať, aby najlepší slovenskí vedci dostali Nobelovu cenu. Slovenské hlavičky.* Život, č. 50, 2011, 12-15.

[133] /A. Dvurečenskij/ *Slovensko má vedcov zo svetovej špičky*, SME 2. 11. 2011.

[134] Anatolij Dvurečenskij: *Večery neďaleko dedinky Stará Lesná. In:* Š. Luby, Legendy a inšpirácie, Veda SAV, 2011, str. 73-78.

[135] A. Dvurečenskij: *Prof. RNDr. Beloslav Riečan, DrSc. -- One of the last Spriritus Mathematicus Slovakiensis*, Acta Univ. Math. Belii, 19 (2011), 5- 10.

[136] A. Dvurečenskij: *Prof. Gennadij Alekseevich Ososkov, DrSc. -Octogenerian?* In: Birthday Recognition Book, PROBASTAT 2011, Smolenice, Slovakia, July 4—8, 2011. pp. 9—12.

[137] A. Dvurečenskij, Pozlátený sviatok matematiky. Najvyššie ocenenie SAV pre prof. L. Kubáčka, prof. G. A. Ososkova, Správy SAV 47, č. 7—8 (2011), str. 7—8.

[138] A. Dvurečenskij: *Prof. RNDr. BELOSLAV RIEČAN, DrSc. Dr.h.c. 75-ročný?* Tvorba 21 (2011), 21—23.

[139] A. Dvurečenskij: *Prof. RNDr. Ing. Luboš Kubáček, DrSc., Dr.h.c.--Spiritus mathematicus et statisticus*, ODAM 2011, Book of abstracts, Olomouc, 26-28, 2011, eds. E. Fišerová, J.

Talašová, ISBN 978-80-244-2684-0, pp. 78—80.

[140] A. Dvurečenskij: *Štefan Luby a matematika*. In: $\int_0^{70} Luby.dt$, J. Slezák, I. Túnyi, eds., ISBN 978-80-224-1180-6, Veda, Bratislava, 2011, pp. 24—25.

[141] /A. Dvurečenskij/ Mária Vaškovičová o Krištáľovom krídle: Ženy nominujú prevažne mužov, Plus JEDEN DEŇ: Marika Studeničová, 10. 1. 2011.

[142] /A. Dvurečenskij/ T. Prokopčák: Čo je pre vás udalosť roka, SME, 31. 12. 2011.

[143] B. Riečan: *Príbehy o integráloch*. Bratislava, vydavateľstvo Young Scientist, 2011.

Internet:

2007:

[144] Tipovacia horúčka Slovákov pokračuje, 03.08.2007; www.webnoviny.sk.

[145] http://www.kysuce.sk/clanky/tipovacia-horucka-slovakov-pokracuje- 11106.html

[146] http://www.24hod.sk/clanok-36376-Tipovacia-horucka-Slovakov- pokracuje.html

[147] http://www.bleskovky.sk/cl/10/167064/Tipovacia-horucka-Slovakov-pokracuje

[148] http://kosice.mconet.biz/index.php?action=fullnews&id=338544&category=505&category_name=Ľudia_a_život

[149] *Aká je šanca vyhrať v jackpote?*
http://www.tnky.sk/index.php?option=com_content&task=view&id=2267&Itemid=65

[150] *CEF a Slovnaft podporujú nadané deti*, 22. 8. 2007; http://www.strategie.sk.

[151] Nadaná mládež dostane možnosť rozvíjať sa aj vďaka projektu Talenty Novej Európy, 21. 8. 2007; http://kino.server.sk; s. ; tasr

[152] http://www.slovnaft.sk/sk/o_nas/spolocenska_zodpovednost/talenty

[153] http://www.mediadoor.sk/?reklama=6&PR-servis=mediadoor-reklamna_agentura-servis&servis=9

[154] http://kino.server.sk/diskusia---aktuality-z-domova-nadana-mladez-dostane-   moznost-rozvijat-sa-aj-vdaka-projektu-talenty-novej-europy--category-je-1-x- id-je-22047

[155] http://www.cef.sk/index.php?page=news&itemid=27

[156] http://kino.server.sk/diskusia---aktuality-z-domova-nadana-mladez-dostane-   moznost-rozvijat-sa-aj-vdaka-projektu-talenty-novej-europy--category-je-1-x- id-je-22047

2008:

[157] http://www.sme.sk/c/3844725/Matematici SAV pomahaju prepravovat plyn.html

[158] http://www.inews.sk/291012/matematici sav pomahaju prepravovat plyn

[159] http://www.ta3.com/sk/reportaze/aktualne?sekcia=3

[160] http://www.financnik.sk/index.phpid=54&messagefr=SK&messageid=614567&messagetitle=Tab%3A+Preh%BEead

[161] http://teraz.sme.sk/

2009:

[162] Cena podpredsedu vlády a ministra školstva SR za vedu a techniku za rok 2009 http://www1.minedu.sk/TyzdenVedy/Stranka.aspx?StrID=15.

[163] Ceny ministra školstva SR udelené, Aktuality SAV, V. Šmihula , 5.11.2009.

[164] CHRONOLÓGIA: Udalosti v SR v období október december 2009, www.tasr.sk.

[165] *Minister Mikolaj ocenil vedecké osobnosti roka*, www.tasr.sk; Slovensko, s. ; TASR, 4. 11. 2009.

[166] Predsedom Učenej spoločnosti akadémie sa stal profesor Vladimír Bužek www.piestanskydennik.sk; 12:19, s. tasr, ala, ed , 25. 11. 2009.

[167] SAV: Predsedom Učenej spoločnosti akadémie sa stal profesor Vladimír Bužek, www.tasr.sk.

[168] Začal sa dvojdňový seminár k 50. výročiu vzniku Matematického ústavu SAV , www.orangeportal. sk; Dnes, , s. ; TASR , 18. 6. 2009.

2010:

[169] Kto získa KRIŠTÁĽOVÉ KRÍDLO 2010? http://www.pluska.sk/slovensko/spolocnost/kto-ziska-kristalove-kridlo-2010.html, 20. 12. 2010.

[170] Noc výskumníka v Slovenskom národnom múzeu, F. Tisovič, Aktuality SAV, http://www.sav.sk/?lang=sk&charset=&doc=services-news&news_no=3476, 22. 9. 2010.

[171] Nominácie na cenu Krištáľové krídlo sú už známe, http://klebety.fashionshow.sk/medialne/clanok/141433/nominacie-na-cenu-kristalove-kridlo-su-uz-zname.html, 21.12.2010.

[172] Nominácie na cenu Krištáľové krídlo sú už známe, http://readora.com/article/show/article/1409/, 21. 12. 2010.

[173] Nominácie na cenu Krištáľové krídlo sú už známe, http://spravy.czin.sk/nominacie-na-cenu-kristalove-kridlo-su-uz-zname, 21.12.2010.

[174] Nominácie na cenu Krištáľové krídlo sú už známe, http://spravy.pozri.sk/clanok/Nominacie-na-cenu-Krista%C4%BEove-kridlo-su-uz-zname/127004, 21.12.2010.

[175] Nominácie na cenu Krištáľové krídlo sú už známe, http://www.aktuality.sk/tlacit/178794/nominacie-na-cenu-kristalove-kridlo-su-uz-zname/?cache=false/?cache=false/, 21.12.2010.

[176] Nominácie na cenu Krištáľové krídlo sú už známe, http://www.comein.sk/aktuality/57618/Nominacie-na-cenu-Kristalove-kridlo-su-uz-zname/, 21.12.2010.

[177] Nominácie na cenu Krištáľové krídlo sú už známe, http://www.fmg.sk/spravy/clanky/nominacie-na-cenu-kristalove-kridlo-su-uz-zname-129467.html, 21.12.2010.

[178] Nominácie na cenu Krištáľové krídlo sú už známe, http://www.ruzombercan.sk/clanky/nominacie-na-cenu-kristalove-kridlo-su-uz-zname-154762.html, 21.12.2010.

[179] http://www.titulka.com/2010/12/21/nominacie-na-cenu-kristalove-kridlo-su-uz-zname/, Nominácie na cenu Krištáľové krídlo sú už známe, 21.12.2010.

[180] Nominácie na cenu Krištáľové krídlo sú už známe,
http://www.videomartin.sk/component/content/article/50/642-nominacie-na-cenu-kristalove-kridlo-su-uz-zname.html, 21.12.2010.

[181] Nominácie na cenu Krištáľové krídlo sú už známe, www.webnoviny.sk, 21.12.2010.

[182] Nominované osobnosti na Krištáľové krídlo za rok 2010,
http://www.kristalovekridlo.sk/novinky/nominovane-osobnosti-na-kristalove-kridlo-za-rok-2010, 17.12.2010.

[183] Minister školstva odovzdal ceny vedcom a technikom,
http://www.sav.sk/index.php?lang=sk&charset=&doc=services-news&news_no=3636, 3. 12. 2010.

[184] VEDA: Minister Jurzyca ocenil najlepších slovenských vedcov a tímy (02.12.2010; www.tasr.sk; s. ?; TASR) www.tasr.sk, 2. 12. 2010.

2011:

[185] Krištáľové krídlo 2010: O Krištáľové krídlo za rok 2010 sa uchádza 23 nominovaných osobností! http://www.europrofit.sk/kultura/kulturne-podujatia/25149-o-kristalove-kridlo-za-rok-2010-sa-uchadza-23-nominovanych-osobnosti, 11. 1. 2011.

[186] Krištáľové krídlo 2010: O Krištáľové krídlo za rok 2010 sa uchádza 23 nominovaných osobností!
http://www.gregi.net/vl/article/Kristalove_kridlo_2010_O_Kristalove_kridlo_za_rok_2010_sa_uchadza_23_nominovanych_osobnosti_38170/, 11. 1. 2011.

[187] Krištáľové krídlo pozná nominantov,
http://www.osobnosti.sk/index.php?os=clanok&ided=11805&view=x, 12. 1. 2011.

[188] T. Prokopčák: Rozhovor s matematikom A. Dvurečenským v SME a video, Na ulici nenájdete ležať prvočíslo, 19.9.2011 SME, http://veda.sme.sk/c/6057806/matematik-anatolij-dvurecenskij-na-ulici-nenajdete-lezat-prvocislo.html. 19.9.2011.

[189] Monitoring elektronických médií, tlače a internet, Matematik Anatolij Dvurečenskij: Na ulici nenájdete ležať prvočíslo, Monitoring elektronických médií, tlače a internet, 20. 9. 2011.

[190] Krištáľové krídlo 2010,
https://www.vedatechnika.sk/SK/enoviny/DianieNaSlovensku/Stranky/Kristalove-kridlo-2010.aspx, 5. 1. 2011.

[191] Krištáľové krídlo pozná nominantov, ttp://www.aktuality.sk/clanok/180162/kristalove-kridlo-pozna-nominantov/, 12. 1. 2010.

[192] Nová kniha fyzika Štefana Lubyho zo SAV vyšla vo vydavateľstve akadémie – VEDA, www.prestavka.sk, 15. 12. 2011. (internet)

[193] O Krištáľové krídlo za rok 2010 sa uchádza 23 nominovaných osobností,
http://promi.noviny.sk/celebrity/11-01-2011/o-kristalove-kridlo-za-rok-2010-sa-uchadza-23-nominovanych-osobnosti.html, 11. 1. 2011.

[194] O Krištáľové krídlo za rok 2010 sa uchádza 23 nominovaných osobností. http://www.netky.sk/z-domova/kultura?start=6, 14. 1. 2011.

[195] OCENENIE: Krištáľové krídla sa rozletia k osobnostiam po 14. krát,
http://www.piestanskydennik.sk/sita-detail/?tx_kiossita_pi1[detail]=9800, 11. 1. 2011.

[196] Prof. Lubomír Kubáček s najvyšším ocenením, V. Šmihula, Aktuality SAV,
http://www.sav.sk/index.php?lang=sk&charset=&doc=services-news&source_no=20&news_no=3981, 11. 7. 2011.

[197] Špičkové vedecké tímy na SAV. www.arra.sk/spickove-vedecke-timy, 27. 10. 2011.

[198] Vymenovanie riaditeľov ústavov a zariadení SAV, F. Tisovič, Aktuality SAV, http://www.sav.sk/?lang=sk&charset=&doc=services-news&news_no=3669, 3. 1. 2011.

[199] Významný matematik z Ruska prevzal v Bratislave Zlatú medailu SAV, www.orangeportal.sk, 9. 7. 2011.

[200] Zlatá medaila pre prof. G. A. Ososkova, V. Šmihula, Aktuality SAV, http://www.sav.sk/index.php?lang=sk&charset=&doc=services-news&source_no=20&news_no=3975, 4. 7. 2011.

[201] Zverejnili nominácie na Krištáľové krídlo za rok 2010, http://kultura.sme.sk/c/5716066/zverejnili-nominacie-na-kristalove-kridlo-za-rok-2010.html, 11. 1. 2011.

ii. Summary of outreach activities

Popularisation of science	2007	2008	2009	2010	2011	total
articles in press media/internet popularising results of science, in particular those achieved by the Organization	21	13	23	27	27	111
appearances in telecommunication media popularising results of science, in particular those achieved by the Organization	6	9	6	7	7	35
public popularisation lectures	9	12	11	11	11	54

iii. Supplementary information and/or comments on popularisation activities

Within frames of the Week of Science, we are organizing the Day of Open Door in our Institute which is visited by students of Bratislava's high schools. Also our branch in Košice is organizing lectures for students. In besides also in schools in Ružomberok and Tornaľa. We are popularizing mathematics and our research and personalities of mathematics in journals like Quark, Spravy SAV, web, radio, TV, etc.

Our mathematics showed that is not any jackstraw but an important part of our science. We hope to be active in popularization of Math also in future because this is a unique way how to show for our politicians, government and people the importance of the basic research, in particular of mathematics, for Slovakia.

8. Background and management. Staffing policy and implementation of findings from previous assessments

i. Summary table of personnel

Personnel	2007	2008	2009	2010	2011
all personnel	84	83	86	89	89
research employees from Tab. Research staff	51	52	52	53	52
FTE from Tab. Research staff	29,23	30,94	32,36	31,03	31,02
average age of research employees with university degree	47,91	49,49	50,3	50,6	51,6

ii. Professional qualification structure

Number of	2007	2008	2009	2010	2011
vedúci vedecký pracovník DrSc./ research professor DrSc.	17	16	16	15	15
Vedúci vedecký pracovník CSc., PhD/research professor CSc., PhD	0	0	0	1	1
samostatný vedecký pracovník/ senior scientist	11	13	15	16	16
vedecký pracovník/research scientist	21	23	21	21	20
profesor/professor	8	9	10	10	10
docent/assoc. prof.	21	19	18	17	19

Vyplňte podľa prílohy A, správy o činnosti organizácie.

iii. Status and development of research infrastructure incl. experimental, computing and technical base (description of the present infrastructure, premises, and material and technical resources. Infrastructure, instrumentation and major technical equipment necessary for the achievement of the objectives specified in the research Concept)

A particularity of our Institute is a high qualified structures of our colleagues. In the evaluated period, one university professorship, one associated professorship, RNDr., and many PhD's were gained. We plan to continue in this important activity in human sources also for the next period.

The research activity of the Mathematical Institute of SAS needs fortunately only a few material and technological equipments. Due to grants and application activities, our computer pool is equipped with sufficiently many PCs with the latest PC versions and programs. Of course, during the time it will be necessary to update them with new and modern computer tools.

iv. Status and development of bibliographic resources, activities of the Organisation's library and/or information centre

The library of the Mathematical Institute is one of the best mathematical libraries in Slovakia. Each our branch has also own small library in Košice, Department of Computer Sciences, as well as in B. Bystrica. The library contains over 25947 items of books and journals. In view of economical problems, the growth of library is not so intensive as in the past. However, thanks to grants, we can every year buy new books, we have electronic access to many important mathematical journals. We are unique in Slovakia who has printed versions of Mathematical Reviews, and thanks to collaboration as Slovak unit of Zentralblatt MATH, we are also unique who has printed versions of Zentralbatt MATH and electronic access e.g. to MATHSCI and to journals edited by greatest publishing houses like Springer-Verlag, Birkhauser, partially to Elsevier.

v. Describe how the results and suggestions of the previous assessment were taken into account

Our Institute was accredited in 2007 according to its activity in the period 2003-2006 with the highest grade A*. The Accreditation very high estimated the level of the mathematical research at our Institute comparable with world trends, with a very active collaboration with domestic and foreign important mathematical centers, with grant and economical activities, with outstanding Phd studies.

According to evaluation report, it was recommended to participate in multidisciplinary projects where is a bigger chance to be successful than in pure mathematics. We had obtained two grants within frames of Structural Funds EU together with Institute of Physics SAS (Prof. Bužek PI), QUTE and meta QUTE, as well as we have a two joint projects with Institute of Physics: Center of Excellence of the Slovak Academy of Sciences : Physics of Information and Center Excellence of the Slovak Academy of Sciences: Quantum technologies.

Concerning the web pages of the Institute and its collaborators, it was improved.

The age structure of the Institutes improved a little bit, mainly in the category of researchers in the category under 40 which is now more uniform. We have accepted young colleagues from our former PhD students and others, also this year we will accept a very perspective our young PhD student who will finish his study this year. The strong middle generation in the previous assessment period moved to a higher age. Very old colleagues have now only a partial time job in the Institute, but in the calculation of average age they are counted as a full time. Some project leaders of VEGA grants moved to younger colleagues. Also a very young colleague is a member of the Institute Research Council.

The publication activity is a main criterion at annual financial rewards.

vi. Supplementary information and/or comments on management, research infrastructure, and trends in personnel development

Mathematical Institute SAS pays great attention in improvments of personnel developments. In the assessed period 2007-2011, the following colleagues has gained the following qualifications:

RNDr.: M. Pospíšil;

qualification IIa (independent researcher) M. Bečka, S.Dobrev, G. Jirásková, M. Grendár, G. Okša, A. Zemánková;

Associate professor (docent) M. Gredár, G.Okša;

University professor: R. Nedela.

9. Supplementary information and/or comments important for the assessment of organisation which are not explicitly mentioned in the questionnaire (concerning each previously mentioned evaluation criteria, facts not included, evaluation of research teams by ARRA, etc.)

According to ARRA evaluation 2011 *Identification of top scientific teams and their members in the Slovak Academy of Sciences*, as a **top team** from 22 teams (and of 17 above-average teams) of SAS who achieve the world parameters, Dvurečenskij and Pulmannová form such a top team. Due to evaluation ARRA (2008/08), Dvurečenskij, Jakubík, Pulmannová, Nedela belong to **Slovak mathematical tops** (vedecká špička v matematike)

Other information relevant to the assessment