

SAS ANNUAL REPORT

2015



Slovak Academy of Sciences
Štefánikova 49
814 38 Bratislava



IMPRINT

The Annual Report has been compiled pursuant to the Act on the Slovak Academy of Sciences No. 133/2002 Coll. In compliance with Article 8 paragraph 7 c) thereof, the Assembly of the Slovak Academy of Sciences endorsed the Annual Report on 18th april 2016.

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Published by: Presidium of the Slovak Academy of Sciences,

Štefánikova 49, 814 38 Bratislava

Available in electronic form at www.sav.sk

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*Photos and images of the best scientific results by various SAS scientific institutes.
Other photos: Vladimír Šimíček, Gabriel Kuchta, Ľubica Suballyová.*



The Scientist of the Year awards ceremony was held on May 12th, 2015 at the Concert Hall of the Slovak Radio building in Bratislava. Among the celebrated guests and awards presenters were Slovak President Andrej Kiska, State Secretary of the Ministry of Education, Science, Research and Sport Romana Kanovská, Director General of the Centre of Scientific and Technical Information prof. Mgr. Jan Turna, PhD., President of the Academy of Sciences prof. Mgr. Pavol Šajgalík, PhD., President of ZSVTS (the Association of Slovak Scientific and Technological Societies) prof. Ing. Dusan Petras, PhD., Eur Ing., rectors of Slovak universities. The Evaluation Commission this year was led by SAS Vice President Mgr. Eva Majková, PhD.

The photos above show the arrival of Slovak President Andrej Kiska alongside Pavol Šajgalík and Dušan Petráš. Below: 2014 Scientist of the year Fedor Gömöry of the SAS Electrotechnical Institute.



UN General Secretary Mr. Ban Ki-moon 18. October 2015 on an official visit to Slovakia accompanied by the Slovak minister for Foreign and European Affairs, Miroslav Lajčák and his spouse at the Lomnický štít observatory. Research in the field of cosmic rays and the solar corona as well as unique instrumentation were presented by the head of the SAS Astronomical Institute, Aleš Kučera.

TABLE OF CONTENTS

I. Foreward

I.1 Scientific Policy

II. Science and Research

II.1. Most significant results of scientific work:

II.1.1 Section 1

II.1.1.1 Significant results in basic scientific knowledge

II.1.1.2. Resolution of problems for social practice

II.1.1.3. Significant results of international scientific projects

II.1.2 Section 2

II.1.2.1 Significant results in basic scientific knowledge

II.1.2.2. Resolution of problems for social practice

II.1.2.3. Significant results of international scientific projects

II.1.3 Section 3

II.1.3.1 Significant results in basic scientific knowledge

II.1.3.2. Resolution of problems for social practice

II.1.3.3. Significant results of international scientific projects

III. Educational Activities

Doctoral studies and educational activities

IV. SAS in the international context

SAS in European research

Cooperation with economic/research developed countries

SAS activities in the development of international cooperation

V. SAS in relation to Slovakia

V.1. SAS research output for application in the field

V.1.1. The contribution of the activities of SAS to Slovakia's economic development

V.1.2 Cooperation with applied and economic spheres

V.2. Research cooperation with Universities

V.3 Cooperative workplaces

VI. SAS and the public

VII. SAS in internal processes

VII.1. The transformation of SAS

Annexes:

International cooperation projects

Statistics publication and editorial activity

SAS Organisations

SAS Presidium

For the period 2013 – 2017 operated in 2015 as follows:

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MOROVICS, CSc.

Ing. MÁRIA OMASTOVÁ, DrSc.

PhDr. DAGMAR PODMAKOVÁ, CSc.

RNDr. PAVOL SIMAN, PhD.



European Commissioner for Regional Policy Corina Cretu on a working visit to Slovakia March 26th, 2015 visited the new science park on Patrónka, Bratislava. Ms. Cretu was accompanied by the delegation of the Slovak Minister for Education, Science, Research and Sport Juraj Draxler, SAS President Pavol Šajgalik and Head of Representation of the European Commission in the Slovak Republic, Dušan Chrenek.

CHAPTER I

FOREWARD

2015 was a significant year for the Slovak Academy of Sciences in many aspects. The beginning of the year saw the SAS Assembly elect new members to the SAS Presidium, which culminated in its reconstruction from the end of the previous year. The first important document of 2015 was the development and adoption of the Long-Term Plan for the Development of the Slovak Academy of Sciences (SAS 2020). In line with this objective the SAS Presidium along with scientific organizations proposed new research programmes for the Academy. In the SAV 2020 document we define the strategic and operational objectives of SAS. The most important and representative strategic objective is to form a modern, dynamic and successful SAS with an improved position in the European Research Area, building on the strategy of the government of Slovakia "knowledge RIS3 to prosperity (Poznatkami k prosperite RIS3)." Our medium-term objectives are outlined in 2020. We are formulating research programmes and building quantitative indicators which we want to meet in the set timeframe. Part of operational objectives have already been fulfilled, some are in progress. For economic operational objectives I consider stability and predictable institutional funding for SAS in the short term to be most important. This objective was fulfilled on 14 July 2015 with the signing of the stabilisation contract between the Ministry of Finance, Ministry of Education, Science, Research and Sport and the Slovak Academy of Sciences. For organizational calls the objective of providing a means of accreditation of SAS scientific institutes was important. In October the SAS Assembly approved a draft for SAS performance evaluation to be carried out by a panel of international experts. Evaluation will be carried out throughout 2016. A concept of creating shared SAS offices and universities is also being prepared.

The Slovak Academy of Sciences saw a decrease in its number of scientific workplaces when in Scientific Section 1 the Geological and Geophysical Institutes merged and established a joint workplace called the SAS Institute of Earth Sciences. Section 2 has completed the process of merging the Institute of Experimental Endocrinology, Cancer Research Institute, Institute of Virology and Institute of Clinical and Translational Research and of the Institute of Molecular Physiology and Genetics, producing the biggest department of biomedical research in Slovakia called the SAS Biomedical Research Center. Section 3 established the SAS Centre for social and psychological sciences connecting the Forecasting Institute, Institute of Experimental Psychology and the Institute of Social Sciences. This trend will continue at SAS and will link the institutions so as to reap the benefits from the diversity and complementary work and scientific directions. We expect the strong synergic potential will be reflected in higher quality research and a better position for these scientific disciplines and their place in the European Research Area. This should ultimately result in their increased participation in attracting competitive research funding sources.

The most serious challenge in meeting the operational objectives of SAS has surprisingly proven to be that of the organizational and legislative changes concerning the transformation of SAS to a public research institution. The surprising element is the fact that the new legislation by the Slovak Ministry for Education, Science, Research and Sport has undergone the process of review and ultimately to the Government Legislative Council and to the Government, and did not make it to the agenda of the National Council in 2015. We expect this to be approved in 2016. The adoption of this law is the key to set the knowledge policy followed by SAS to achieve our main strategic goal - to form a modern and dynamic SAS. In the area of European projects, SAS was successful overall in the TEAMING Building-up Centre Excellence for Advanced Materials Application project where it earned the second highest score of more than 130 projects.

The construction of new research centers and university parks was completed in 2015: - Applied Materials Research Center in Bratislava, University science park for biomedicine in Bratislava, Research Center of advanced materials and technologies for current and future applications at PROMATECH in Kosice, SAS biotechnology laboratory in Šarišské Michaľany and the AGROBIOTECH Science center in Nitra. Scientists have obtained the suitable space for broad co-operation and cutting-edge research infrastructure.

The SAS Annual Report documents the results of SAS Organisations achieved in all areas of research. Some of these are published in leading journals, others in valuable monographs and others are applicable in economic practice. All of them are important to society.

Pavol Šajgalík
SAS President



Signing of the Stabilisation Agreement on 14 July 2015 SAS: Deputy Prime Minister and Finance Minister Peter Kazimir, President of SAS Pavol Šajgalík and Minister of Education, Science, Research and Sport Juraj Draxler

I. 1. Scientific Policy

In 2015 the Presidium of SAS and the SAS Assembly approved the SAV2020 document (<http://www.sav.sk/?lang=sk&doc=docs-main>), updating the basic mission of SAS as a non-university research institution. It analysed various social factors, international and national frameworks and reflected key strategic EU and SR documents (2020, Horizon 2020, RIS3, the National Reform Programme 2015) which currently determine the development of science. The basic mission of SAS is redefined in the SAV 2020 document. We have established strategic, operational and short-term targets and a timetable for these.

SAS is currently working toward the following:

- Research in natural and technical sciences, medical sciences and social sciences and humanities in areas that are innovative, intensive for researchers or research infrastructure and which develop innovative technologies and diagnostics;
- Research focused on current topical global and societal challenges;
- National, regional and culturally oriented research and protection of cultural heritage.

The main objective of SAS is to increase the quality of its output to become one of the successful research institutions of the European Union. The focus is to increase the number of publications in high impact journals, publish quality monographs or chapters in monographs published in world languages and in prestigious publishing houses. The problem of the small number of patents received with European or world effect still persists. This is confounded with the need for high quality knowledge transfer for which quality basic research is an imperative prerequisite.

Slovakia, including SAS, has a very low success rate in obtaining grants from the European Research Council (ERC) which is among the most prestigious. Another problem is the small number of projects submitted. Analyses show that according to the number of the ERC grants received, some new EU member states (Hungary and Czech Republic) are gradually approaching the level of the "European Twelve" while others, including Slovakia, are still lagging behind more and more. This also applies to SAS, despite the fact that the only ERC grant awarded so far was to SAS staff. SAS has an important task in the coming period to create a stimulating environment for the submission of ERC projects.

In 2015, the 2007-2015 program period for use of EU Structural Funds ended. The Structural Funds have helped significantly to reduce the stagnation of Slovakia in research infrastructure and has boosted the potential to increase the efficiency and success of research of Slovakia within V4 and the EU. To make full use of this potential requires the enhancement of competitive research funding through a variety of APVV (SRDA – Slovak Research and Development Agency) programs. SAS is proposing, among others, open sustainability programs which would enable the support of laboratories built from state funding in a competitive format. Without programs such as these, there is a risk that a large part of investment in research infrastructure will not bring the expected benefits for Slovakia.

An important part of the scientific policy of SAS is the acquisition of talented researchers from abroad. SAS won the 2014 SASPRO project (<http://www.saspro.sav.sk/>) under the 7th EU Framework Programme FP7 Marie Curie-COFUND. This project aims to acquire talented researchers from abroad, not only Slovak citizens who have completed a long-term research stay in foreign countries but also foreign researchers. These are posts for doctoral students and researchers who completed PhDs within less than 14 years prior to application. The project is a competition selecting the best candidates (by international experts) for positions at SAS workplaces.

We expect that the adoption of researchers will enrich the scientific teams at SAS and will contribute to obtaining excellent results as well as increasing SAS participation in international projects, mainly in Horizon 2020. The SASPRO project will also enable at least partial reversal of the brain drain "phenomenon" from Slovakia in that it will motivate researchers to return to Slovakia and offers Slovak scientists operating abroad adequate conditions to carry out their work in their home country. It is the first project in the history of Slovakia which seeks to address the reintegration of research talent from abroad.

Eva Majková
SAS Vice President for Research

CHAPTER II Science and Research

SAS Section I

The most important scientific results achieved by the institutes of scientific Section 1. of SAS (Physical, Space, Earth and Engineering Sciences) cover a wide range of research in physics, materials research, geology, geotechnics, informatics and

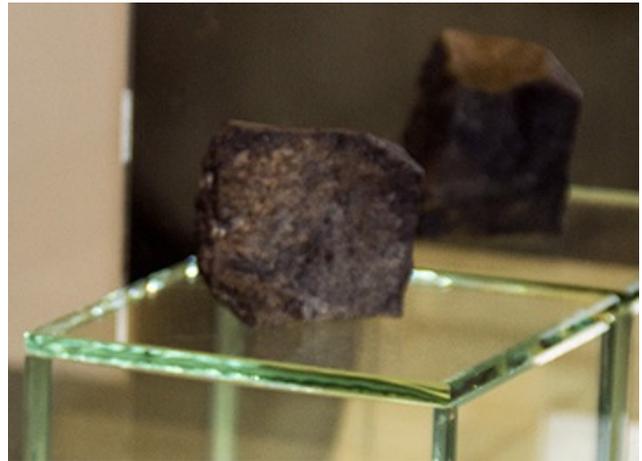
hydrology. The results are divided into the areas of basic scientific knowledge, problem solving for social practice and research in international scientific projects.

In the area of basic scientific knowledge, the magnetic states in ferromagnetic objects were experimentally examined on a nanometre scale and by computer simulations. Magnetic properties were explained by the one spin model. In the experimental part of the work it developed a novel scanning method based on dual tips. The findings of this work have paved the way to controlling the magnetic states of nano particles and their practical use.

In further work in the area of basic research, the unique catalytic properties of the surfaces of intermetallic zinc and nickel alloys, palladium and platinum were analysed in relation to the production of hydrogen for fuel cells. A key problem in addition to the thermal stability of the catalyst, apart from the occurrence of hydrogen and carbon dioxide is the formation of unwanted carbon monoxide. We established that the surface of the zinc-palladium has a desired property when hydrogen and carbon dioxide occur at the surface reaction. Geological research in the Eastern Alps yielded the discovery of diamond and silicon carbide in reshaped deposits. These minerals crystallized during the subsidence of continental crust into the mantle. The carbon source for the formation of diamond and silicon carbide could be derived from organic carbon deposits. This is the first discovery of diamond in the Eastern Alps.

The results of basic scientific research at Section 1 SAS scientific departments expand our knowledge of the world around us, from nano measurement of objects across the surface properties of metals to activity in the earth's crust.

In the field of applied research we looked at the structure of electrotechnical steel with composite structures. We found specifically configured microstructures and substructures for sheet thickness, while the subsurface area primarily exhibits high strength properties and the microstructure in the central area ensures good electromagnetic properties. This type of combination of steel properties enables its application for the construction of rotor cores for electric and hybrid gears and electric motors operating at high speed. In the field of information technology, an automatic voice dictation and voice input has been developed for the information system of the General Prosecutors Office of the Slovak Republic. We have created specialized language models and adapted special system features for several parts of the graphic user interface. The program was in cooperation with Datalan and submitted to the General Prosecutor's Office. In the area of gold acquisition, we developed a hydrometallurgical method for obtaining gold based on thiourea



leaching and electrolysis. This process is considered environmentally acceptable as opposed to previously used cyanide leaching.

Significant scientific results were also achieved in international scientific cooperation. Together with the University of Zagreb, we developed original dental implants, the structure of which comprises a matrix based on titanium, containing magnesium elongated fibres. The developed implants have excellent mechanical properties, and their binding to bone tissue is significantly better than with standard implants used in dental medicine. In the field of geology we found that the causes of the increase in biological diversity - in the Earth's geologic past as well as today - from the polar icecaps to the equator are associated with greater geographical and ecological specialization of organisms in the tropics. As part of the 7th Framework Programme "Watercourse Detection of Contamination in Developing Countries using Sensor Networks" project, we proposed an algorithm to locate the source of pollution based on the distribution of pollutant concentration in the watercourse.

The results of international scientific cooperation prove the importance of cooperation in various areas of our life and knowledge, from the use of new materials in the health sector to the knowledge of the geological past, to locating pollution in watercourses.

Karol Fröhlich

II.1.1.1. Most significant results of scientific work

Magnetic states in nanomagnets with broken symmetry

SAS INSTITUTE OF ELECTRICAL ENGINEERING

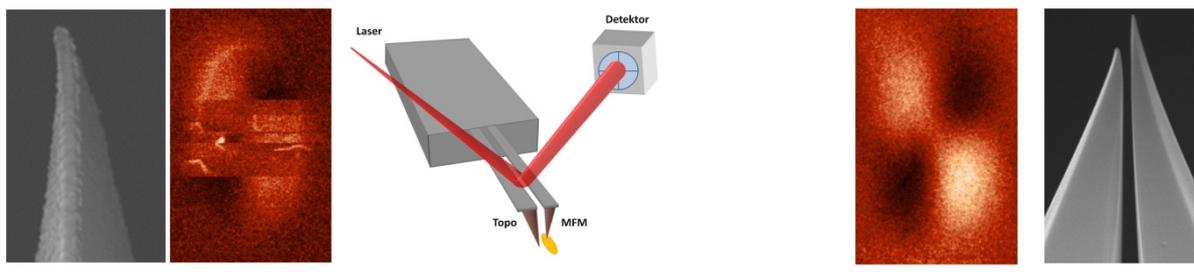
RESEARCHERS: J. Tóbiš, T. Ščepka, M. Precner, J. Šoltýs, J. Fedor, T. Polakovič, R. Kúdela, J. Dérer, M. Kulich, V. Cambel (EIÚ SAV) and G. Karapetrov (Drexel Univ., USA)

PROJECT: APVV-0088-12 NANOMAG

In this work we investigate magnetic states in ferromagnetic objects through simulation and experiment. In the theoretical section the origin of the magnetic state of nano-objects is examined ^[1]. The dynamics of the magnetic state for objects with reduced symmetry exhibit asymmetric temporal evolution. We explained this using the one spin model, thus paving the way to the control of the magnetic state of future nanoparticles and their practical application.

In the experimental section we: a) developed a new scanning method based on the scanning of dual tip ^[2] (DT-MFM); b) we examined the state of nanomagnets using micro Hall magnetometry ^[3].

DT-MFM imaging uses dual tips <1 μm apart, one (non-magnetic) measures topography nanomagnets and the other displays its magnetic field. The magnetic tip never touches the magnetic samples and therefore does not violate its magnetic state. The Hall sensor magnetometer showed the dynamics of the magnetic state of nanomagnets changed at an angle of the external magnetic field and with the temperature.



PUBLICATIONS:

[1] TÓBIK, Jaroslav – CAMBEL, Vladimír – KARAPETROV, Goran. Asymmetry in time evolution of magnetization in magnetic nanostructures. In *Scientific Reports*, 2015, vol. 5, 012301. (5.578 - IF2014). (2015 – Current Contents, Scopus, WOS). ISSN 2045-2322.

[2] PRECNER, Marian – FEDOR, Ján – ŠOLTÝS, Ján – CAMBEL, Vladimír. Dual-tip magnetic force microscopy with suppressed influence on magnetically soft samples.

In *Nanotechnology*, 2015, vol. 26, 55304. (3.821 - IF2014). (2015 - Current Contents). ISSN 0957-4484.

[3] ŠČEPKA, Tomáš – POLAKOVIČ, T. – ŠOLTÝS, Ján – TÓBIK, Jaroslav – KULICH, Miloslav – KÚDELA, Róbert – DÉRER, Ján – CAMBEL, Vladimír. Individual vortex nucleation/annihilation in ferromagnetic nanodots with broken symmetry observed by micro-Hall magnetometry. In *AIP Advances*, 2015, vol. 5, 117205. (1.524 - IF2014). (2015 - Current Contents). ISSN 2158-3226.

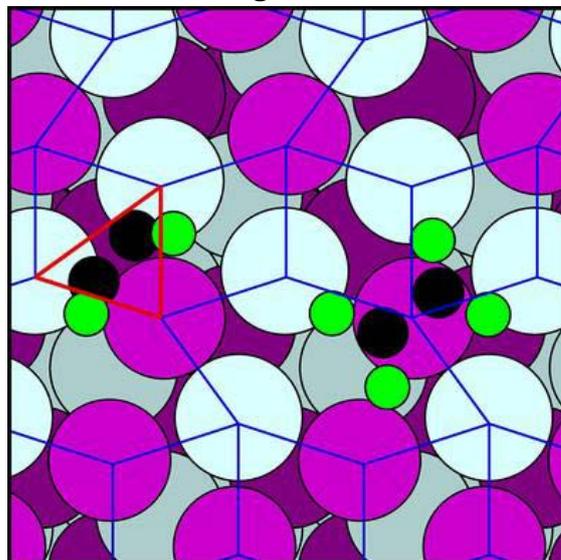
Unique catalytic properties of the surface of intermetallic alloys

SAS INSTITUTE OF PHYSICS

RESEARCHERS: M. Krajčí and associates.

PROJECTS: VEGA 2/0189/14, APVV 0495-11, CEX FUN-MAT

We studied the atomic structure and unusual catalytic surface properties of intermetallic alloys. We clarified the reactive mechanism of catalytic selectivity in the reaction of methanol with water on the surfaces of three isostructured alloys, NiZn, PdZn and PtZn ^[1]. This methanol reaction is used to produce hydrogen for fuel cells. The reaction of methanol with water or methanol steam reforming reaction (MSR) enables six hydrogen atoms to be obtained per molecule of CO₂. As a possible catalyst for the MSR reaction, dozens of varying metal alloys were tested. The key issue in addition to the thermal stability of the catalyst was apparent in its selectivity. In addition to MSR the vast majority of alloys produced inadmissible CO as well as CO₂. Pd surface (111) is an excellent dehydrogenation catalyst and in addition to H₂ it produces CO almost exclusively instead of CO₂. However PdZn alloy surface for example has the desired CO₂ selectivity. In addition to clarifying the mechanism of MSR selectivity we proposed methods for its optimization. There are also further works devoted to the atomic



structure of the surface of intermetallic alloys [2, 3], their chemical reactivity [2] and catalytic properties [2, 4, 5].

Diagram of catalysed hydrogenation of acetylene on the surface intermetallic alloys GaPd [2].

PUBLICATIONS:

[1] KRAJČÍ, Marián – TSAI, A.-P. – HAFNER, J. Understanding the selectivity of methanol steam reforming on the (111) surfaces of NiZn, PdZn and PtZn: Insights from DFT. In *Journal of Catalysis*, 2015, vol. 330, p. 6 – 18. (6.921 - IF2014). (2015 - Current Contents). ISSN 0021-9517.

[2] KRAJČÍ, Marián – HAFNER, J. Intermetallic Compounds as Selective Heterogeneous Catalysts: Insights from DFT, *ChemCatChem* (2015), DOI: 10.1002/cctc.201500733, in print, IF = 4.556 (2014).

[3] HAFNER, J. – KRAJČÍ, Marián. Surfaces of complex intermetallic compounds: Insights from density functional calculations. In *Accounts of Chemical Research*, 2014, vol. 47, no. 11, p. 3378 – 3384. (24.348 - IF2014). (2014 - Current Contents). ISSN 1554-8929.

[4] KRAJČÍ, Marián – HAFNER, J. Semihydrogenation of acetylene on the (010) surface of GaPd₂: Ga enrichment improves selectivity. In *Journal of Physical Chemistry C*, 2014, vol. 118, no. 23, p. 12285 – 12301. (4.772 - IF2014). (2014 - Current Contents, WOS, SCOPUS). ISSN 1932-7447.

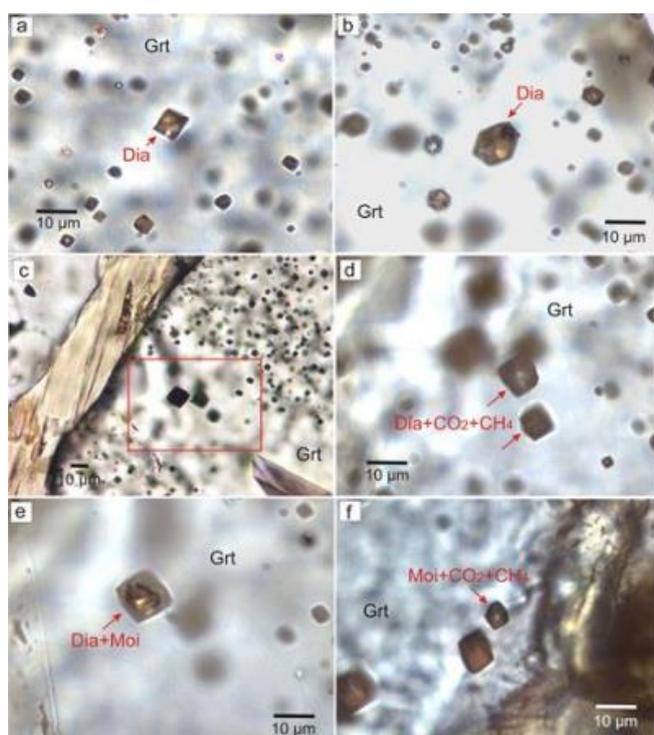
[5] KRAJČÍ, Marián – HAFNER, J. Selective semi-hydrogenation of acetylene: Atomistic scenario for reactions on the polar threefold surfaces of GaPd. In *Journal of Catalysis*, 2014, vol. 312, p. 232-248. (6.921 - IF2014). (2014 - Current Contents). ISSN 0021-951.

A Window to deep continental subduction – diamond and natural carbide SiC

SAS INSTITUTE OF HYDROLOGY

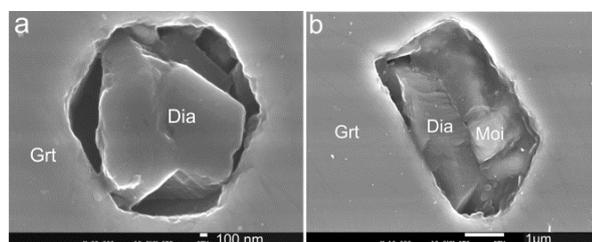
Diamond and moissanite (SiC) were identified in metamorphosed sediments (paragneisses) as inclusions in garnet. Our results show that diamond and moissanite precipitated from a supercritical fluid in the C-O-H-S system under highly reductive and UHP conditions (≥ 3.5 GPa; 800-850°C) during subduction of continental crust into the Earth's mantle. The source of carbon for diamond and SiC could be biogenic

C from sediments. This is the first discovery of diamond in the Eastern Alps.



Diamond (Dia) and moissanite (Moi) with CO₂ and CH₄ as inclusions in garnet (Grt). Janák et al. 2015, *Journal of Metamorphic Geology*.

Photos in Optical polarization microscopy (Fig. 1) and scanning electron microscope (F-SEM) JEOL JSM 7600F in HD– secondary electrons (Fig. 2).



PUBLICATIONS:

JANÁK, Marián – FROITZHEIM, Nikolaus – YOSHIDA, Kenta – SASINKOVÁ, Vlasta – NOSKO, Martin – KOBAYASHI, T. – HIRAJIMA, Takao – VRABEC, Mirijam. Diamond in metasedimentary crustal rocks from Pohorje, Eastern Alps: a window to deep continental subduction. In *Journal of Metamorphic Geology*, 2015, vol. 33, p. 495 – 512. (4.147 - IF2014). (2015 - Current Contents). ISSN 0263-4929.

II.1.1.2. Resolution of problems for social practice

High strength isotropic electrical steel with composite microstructure

SAS INSTITUTE OF MATERIALS AND MACHINE MECHANICS

RESEARCHER: I. Petryshynets

PROJECT: APVV -0147-011 High strength electrical composite steel, Head researcher RNDr. František Kováč, CSc.

Findings on this project are related to a new microstructural concept of the grain of non-oriented high strength electrical steel. Based on this concept, composite microstructure and substructure arrangement for the sheet thickness and subsurface region primarily exhibits high strength properties and microstructure in the central area ensures good electromagnetic properties. The composite morphology of the microstructure of sheet thickness from the surface layer consists of two surfaces which range from 0.02 to 0.2 times the sheet thickness, wherein the layer is comprised of fine ferritic grain with a mean size ranging from 5 to 25 μm , with reinforced fine precipitates VC carbides and other elements 100nm in size. This layer is characterized by a tensile strength of 600 to 1000 MPa. The central layer of thickness of the sheet is made up of coarse ferritic grain with an average size of 30 to 200 μm , reinforced solid solution elements in the matrix, the overall percentage of the secondary particles in the layer is 0.005 percent in volume. The composite microstructure provides a combination of high strength and excellent electromagnetic properties, with good resistance to dynamic material fatigue. This combination of steel properties enables its application in the construction of the rotor cores for electric and hybrid gears and electric motors operating at high speeds and with rapid changes resulting from high speed centrifugal force.

PATENT SUBMITTED: PP 00090-2015. Banská Bystrica: ÚPV SR 2015

Automatic transcription of dictation and voice input for the information system of the General Prosecutor's Office, PATRICIA

SAS INSTITUTE OF INFORMATICS

RESEARCHERS: M. Rusko, M. Trnka, S. Darjaa, R. Sabo, M. Ritomský, J.Pálffy

PROJECT: Elektronické služby Generálnej prokuratúry, OPIS-2011/1.1/32-NP

PROJECT COORDINATOR: DATALAN

INSTITUTE COORDINATOR: M. Rusko ÚI SAV

COOPERATING INSTITUTIONS: TU Košice

Client: General Prosecutors Office of the Slovak Republic

This project aims at increasing the efficiency of the work of the General Prosecutors Office of the Slovak Republic. The functionality is based on voice input data into text documents or directly into the office's PATRICIA information system. Specialized

language models were created for the work of prosecutors. The APD system has been adapted according to the requirements of the work of prosecutors as well as several parts of the graphical interface of the program. Profiles of users and an update management program were designed and created. Architecture was designed and implemented with voice recognition and the information systems of the PATRICIA system, communication format, voice navigation and other components necessary for the use of voice recognition for direct dictation to the information system forms.

We submitted 900 APD and HVP licenses. No scientific publications have been published on this project as of yet. Lectures at professional DATALAN Digital City 2015 conferences have taken place as part of popularisation activity. We presented the results of the project to local representatives from all over Slovakia. On December 11, 2015 it was accepted for print in a popularisation article in the form of an interview for Modern magazine issue 4/2015, in which the results of the project are featured.

Hydrometallurgical gold extraction from the Biely Vrch (Detva-Slovakia) deposit through the application of electrolysis and mechanical activation

SAS INSTITUTE OF ELECTRICAL ENGINEERING

Mechanical activation of the ore deposit at Biely Vrch (Detva) has led to the growth of the specific surface material and also caused its structural change which has had a positive impact on thioarea leaching and subsequent electrolysis. This type of leaching with the application of electrolysis is highly suitable for the extraction of gold from ore and has achieved a 99 percent yield. Thioarea leaching is acceptable in environmental terms with highly favourable kinetics (leaching time was 1-2 hr.) as opposed to conventional cyanidation (24-48 hrs) which is prohibited in Slovakia.

PUBLICATIONS:

FICERIOVÁ, Jana – DUTKOVÁ, Erika. Non-cyanide leaching and electrolysis of gold. In XVI Balkan Mineral Processing Congress: proceedings of Congress Belgrade, Serbia, June 17–19, 2015. II. Belgrade, Serbia: Colorgrafix, 2015, p. 757 – 759. ISBN 978-86-82673-11-8.

II.1.1.3. Significant results in International Scientific Projects

Use of titanium magnesium composites for dental implants

SAS INSTITUTE OF MATERIALS AND MACHINE MECHANICS

RESEARCHERS: M. Balog, P. Krížik (ÚMMS SAV), Z. Schauerl, M. Snajdar, Z. Stanec, A. Catic, J. Viskic (Univerzita Záhreb, CR)

Bilateral cooperation: IMMM SAS and the University of Zagreb – Faculty of Dental Medicine and the Faculty of Mechanical Engineering and Naval Architecture.

Original dental implants have been prepared by pressing a mixture of Ti and Mg. The structure of the implants consists of a Ti-containing matrix with extended Mg phase fibres. This matrix provides the desired biocompatibility and mechanical and fatigue properties for the implant. The Mg is gradually eliminated from the implant throughout the healing process, thereby reducing its rigidity, and improving mechanical compatibility with the bone. Porosity created at the same time improves

tissue implant osseointegration, and quickly produces the desired bond with bone. Compared with standard used, Ti provides implants that can be developed at a lower cost with comparable mechanical properties and significantly improved binding to bone tissue than ceramic (porcelain) coatings used in dental medicine.

PATENT APPLICATION: BIOAKTIVNI KOMPOZITNI METAL (BiaCoM); submitted in Croatia 15. 7. 2015; class 381-03/15-010/0781; identification number 559-03/2-15-001

In Slovakia the trademark awarded to the material for active Ti+Mg bio-composite is "BiaCoM".

PUBLICATIONS:

VISKIC, J. – CATIC, A. – SCHAUPERL, Z. – BALOG, Martin – KRÍŽIK, Peter – MEHULIC, K. Effects of surface treatment of powder metallurgy manufactured titanium on bond strength to veneering ceramics. In CED-IADR 2015: 47th Meeting of the Continental European Division of the International Association for Dental Research (CED-IADR) co-hosted by the Scandinavian Division (NOF). Belek-Antalya, October 15-17, 2015 [abstracts], s. 15. Available on the internet: <http://www.ced-iadr2015.com/meeting_abstracts.pdf>.

VISKIC, Josko – CATIC, Amir – SCHAUPERL, Zdravko – BALOG, Martin – KRÍŽIK, Peter – MEHULIC, Ketij. Fracture surface analysis of PM CP titanium after ceramic debonding. Ed. H. Hubálková, M. Bartoňová. In 39th Annual Conference of the European Prosthodontic Association: 39th Annual conference. Prague, Czech Republic, September 3-5, 2015. Prague: Czech Society of Prosthetic Dentistry and Czech Dental Chamber, 2015, s. 36. ISBN 978-80-260-8581-2. Available on the internet: <<http://www.epa2015.cz/abstracts.php>>.

M. Balog – J. Viskic – P. Krizik – Z. Schauerl – M. Snajdar – Z. Stanec – A. Catic. CP Ti fabricated by low temperature extrusion of HDH powder: application in dentistry, in PM Titanium 2015 Leuphana University Lüneburg, 31. 8. – 3. 9. 2015 (lecture; “full length” received at Key Eng.)

The effect of temperature and climate on the extension of benthic marine organisms from the tropical to arctic zones

SAS EARTH SCIENCE INSTITUTE

It is frequently assumed that the causes of the increasing biological diversity from high to low latitudes both throughout geological history and today are driven by the higher holding capacity of tropical environments, with ecologically and geographically more specialized species in the tropics. In a paper published in *Global Ecology and Macroecology* in collaboration with researchers from the University of Chicago, we have found that the geographic size range increases towards the tropics in benthic organisms (on the basis of global distribution of Mollusca). Tropical species attain 5,000-6,000 km (black circles in the top row) even when their thermal tolerances are quite narrow (black circles in the bottom row). This trend is in contrast to the so-called Rapoport's pattern observed in terrestrial organisms (species at temperate latitudes attain the broadest geographic ranges). This finding implies that geographic gradients in range size do not explain latitudinal diversity gradients, which are rather underlain by tropical peaks in diversification rates.

PUBLICATIONS:

TOMAŠOVÝCH, Adam – JABLONSKI, David – BERKE, S. K. – KRUG, Andrew Z. – VALENTINE, J. W. Nonlinear thermal gradients shape broad- scale patterns in geographic range size and can reverse Rapoport's rule. In *Global Ecology and Biogeography*, 2015, vol. 24, no. 2, p. 157-167. (6.531 - IF2014). (2015 - Current Contents). ISSN 1466-822X.

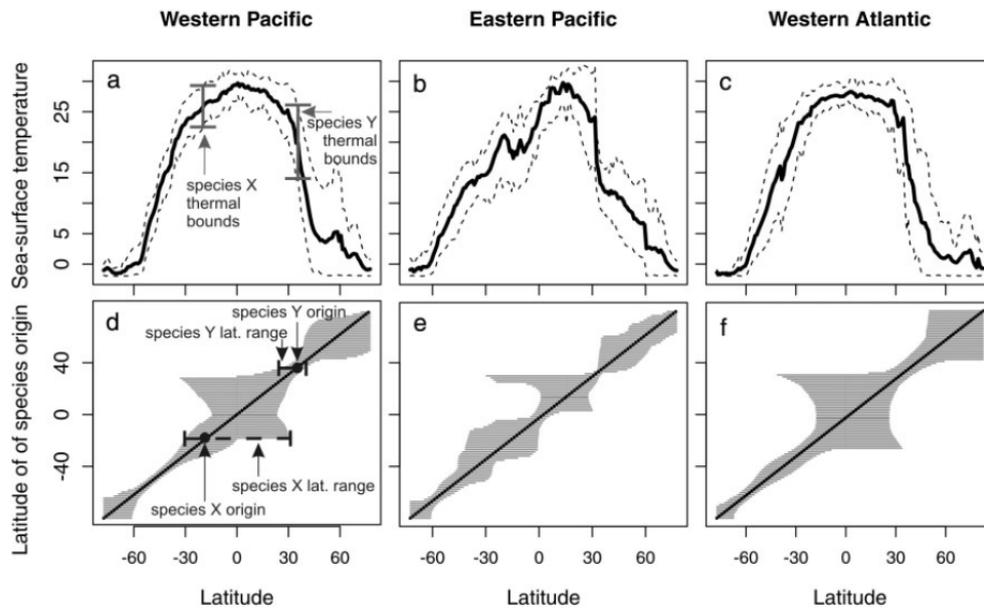


Figure 1

Top row: The minimum, average and maximum annual temperature ("sea surface temperature") from the polar icecaps to the equator in the western Pacific Ocean and the western Atlantic remained relatively constant in the tropics (in contrast to the eastern Pacific ocean), thus enabling extensive expansion of tropical organisms. Bottom Line: The geographical distribution of temperature is the basis for modelling the distribution of species of marine organisms in our study, according to where a species originated ("Latitude Origin of Species"). The geographic distribution of marine organisms on the bottom line shows the southern and northern boundary predicted by this model (each horizontal line is a biological species).

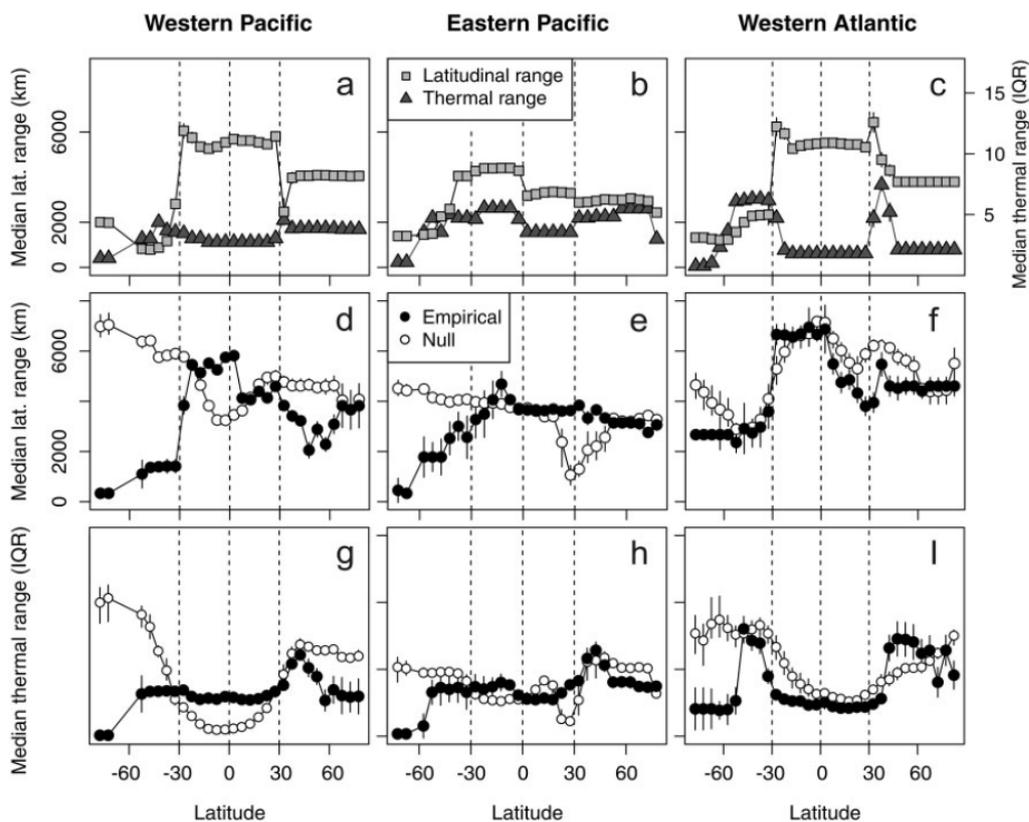


Figure 2

Top row: Prediction model for the geographic ranges for the three ocean regions. Middle row: The average size of the geographic scope (black spots) observed in bivalve molluscs rises towards the tropical zone in the Western Pacific Ocean (left column), in the Eastern Pacific Ocean (middle column) and Western Atlantic (right column). Bottom row: average size temperature ranges observed in bivalve molluscs, the maximum in the temperate zone. The white dots represent the results of the model with the extension of the shellfish is not limited by temperature. Modelled and empirically observed geographic and temperature ranges coincide quite well.

Localisation of the source of pollution in rivers - a pilot algorithm

SAS INSTITUTE OF HYDROLOGY

RESEARCHERS: Y. Velísková, M. Sokáč.

PROJECT: 7 RP EÚ – 269985 (Detection of Watercourse Contamination in Developing Countries using Sensor Networks)

Water is an essential component of the human environment, as well as all plant and animal ecosystems. Pollutants as a result of human activities impair the quality of water as well as soil and air. As part of this project a study was performed in which we analysed the possible ways to address this problem. At the same time potential risks of their application were also evaluated as were inaccuracies in outcomes when applied to the natural flow at various stages of schematisation inputs. Based on this analysis an algorithm was designed to approximate the location of the source of pollution concentration and the distribution of pollution in the stream. This algorithm was a basis for the pilot version of a software tool that has been successfully tested. In testing we used available data from real measurements or modelled values from numerical models able to simulate pollution dispersion in surface streams. In the final stage of the project the software was successfully tested in real conditions on the Liwiec (Poland) and the Coello (Colombia) rivers.

PUBLICATIONS:

VELÍSKOVÁ, Y. – SOKÁČ, M. Longitudinal dispersion coefficient as sensitivity parameter in water quality simulation model. In Proceedings of the International Conference on Mathematical Methods, Mathematical Models and Simulation in Science and Engineering (MMSSE 2015), Proceedings of the International Conference on Pure Mathematics - Applied Mathematics (PM-AM 2015): NEW DEVELOPMENTS in PURE and APPLIED MATHEMATICS. Series: Mathematics and Computers in Science and Engineering Series | 42 - 2015, s. 191 – 195. ISBN 978-1-61804-287-3. ISSN 2227-4588.

SOKÁČ, M. – VELÍSKOVÁ, Y. Dispersion coefficient sensitivity analysis on simulation results: a case study Grote Laak River. In International Multidisciplinary Scientific GeoConference SGEM 2015: Conference Proceedings. vol. 1. Hydrology and Water Resources. Sofia: STEF92 Technology Ltd., 2015, p. 213 – 220. ISBN 978-619-7105-36-0. ISSN 1314-2704.

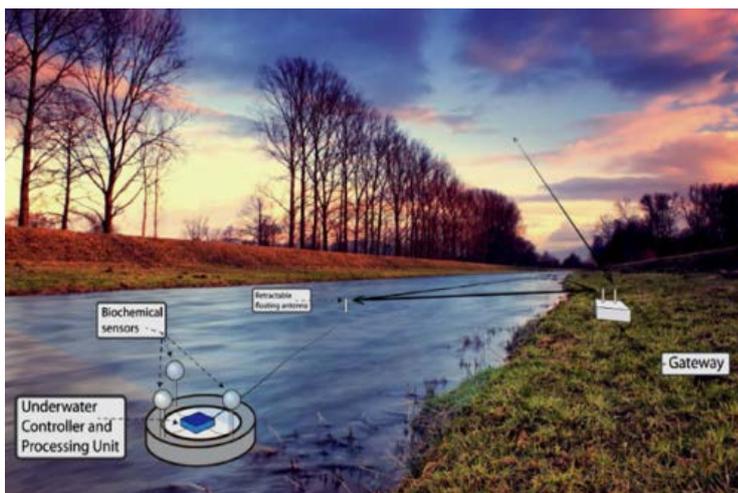


Diagram of the monitoring system and a demonstration of the environment of the software tool.

River section : Experiment Valley Kr

Pollution data

BEST FIT

Length = 1200 m

File: Krj 785.pol

$\Delta T = 1$ min

$n = 1200$

River area = 1.483 m²

Pollution sum 43899.73

$X0 = 530$ m

$n = 800$

sumq1 = 163325.5

Dispersion coefficient = 0.16 m²s⁻¹

Max concentration

$d = 130$ m

100000000

sumq2 = 515259.9

Velocity = 0.142 m.s⁻¹

Max time 1.0 min

$dP = 3$

190325.5

0.00000000

3 - 0%

Open file

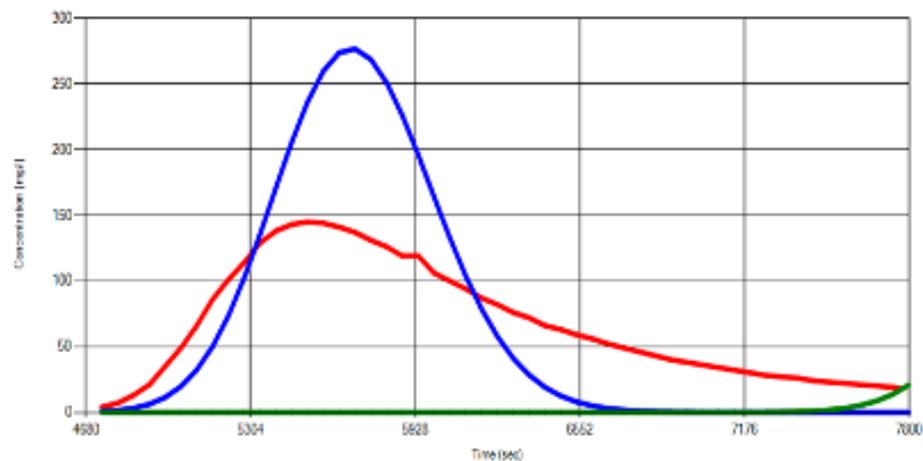
Load data

Computation

STOP calc

END

V:\krj 785 m\krj785 A1.44 v8.14



SAS Scientific Section II

The results of the projects addressed in scientific section 2 of SAS which are featured as the most important results of basic scientific knowledge, problem solving for social practice and international scientific projects, represent a broad spectrum of disciplines and methodological approaches.



Several interesting findings were made in the field of biomedical science in 2015. For the treatment of depression, animal models of pharmacologically resistant depression are important in helping to solve the issue of the inefficacy of conventional antidepressants. Thanks to the newly developed model of depression, various mechanisms related to resistance have been discovered and the role of the aldosterone hormone in the early stages of the development of depressive behaviour have been ascertained.

Further results have been obtained using new advanced techniques in the development of analytical devices that have the potential to be applied in the analysis of very low amounts of biomarkers in the serum / blood of patients which is important for the diagnosis of the early stages of various illnesses. These devices have been used for the analysis of real samples in particular for the analysis of sera of patients with rheumatoid arthritis, systemic sclerosis, and in the analysis of a biomarker for prostate cancer.

In a study of rats with spinal cord injury, alginate biomaterial was used to bridge the area of injury. The alginate bioactive molecules significantly protected the damaged spinal tissue, resulting in a higher rate of survival of neurons above and below the area of injury. Improved motor function was also confirmed in rat groups with spinal cord injury treated with alginate with a bioactive species compared to rats that were not treated this way.

*Probiotic substances containing lactic acid bacteria are given to strengthen the immune system as well as for other purposes. This may lead to disruption of the acid-base balance due to increased production of organic acids in the digestive tract. In one of the projects, the results of which are presented in this report, in dogs application of chlorophyll together with probiotic bacteria *Lactobacillus fermentum* reduced acidification of digestive tract content observed after application of probiotic alone.*

In chronically inflamed tissue, alongside necrotic cells, other cells can be found which, due to damage of the extracellular glycocalyx, are insufficiently supplied with oxygen. In these cells an increasingly reactive oxygen species such as $O_2^{\cdot-}$, H_2O_2 can occur in the hypoxic state. OH arising from them can destroy the tissue. In order to effectively reduce unwanted flow of these forms of oxygen from mitochondria so called "Mitochondrially-targeted" antioxidants (MTA) were applied. These have been incorporated into membranes composed of high-molar-mass hyaluronan (HA) and chitosan biopolymers. The combination of a suitable

content of HA and chitosan can be achieved by the formation of solid bio-films, and inclusion of MTA in such a bio-film results in the formation of biomembranes from which the MTA is in a sustained mode.

*Ticks and horseflies secrete saliva into the blood stream which contains a mixture of pharmacologically active compounds. These substances prevent blood coagulation and suppress the immune response as well as aiding the transfer of viruses, bacteria and other microorganisms. DNA sequencing has yielded the identification of a substance produced in the salivary glands of the *Tabanus bromius* horsefly and the *Rhipicephalus pulchellus* tick. This has provided an overview of proteins including new bioactive substances which can serve for the development of new medicine and vaccines to protect humans and animals against arthropod parasites and the transfer of pathogens.*

In the study of biodiversity and ecosystem services some particularly interesting results have been achieved in the development of methodology for assessing the diversity of the country and its contribution to the provision of ecosystem services. Attention was focused on extensively cultivated agricultural land in model areas with orchards and vineyards. This type of landscape is characterized by a greater diversity of landscape features and the presence of nature near habitats that provide more benefits (ecosystem services) for society and also have high cultural and historical value.

*Study of mushrooms of the *Russula* genus yielded a tested and generally accepted view that the same species can grow throughout the territory of North and South America and even in Europe while others only in a smaller area. However phylogenetic analysis of the DNA of the anatomical characteristics established that *Russula* mushrooms from the east and west coasts of North America vary and no European species grow in the subtropical zone of the subcontinent. Two species have also been deemed new to science.*

*Karol Marhold
Vice President of SAS Section II*

II.1.2.1. Significant results in scientific knowledge

Discovery of animal models of depression resistant to treatment and uncovering the mechanisms involved

SAS INSTITUTE OF EXPERIMENTAL ENDOCRINOLOGY



Validation model



Evidence of resistance to treatment

RESEARCHERS: D. Ježová, N. Hlaváčová, S. Babic, M. Pokusa.

A serious clinical problem in the treatment of depression is the resistance to classic antidepressants, i.e. pharmacoresistant depression. To develop new drugs with novel modes of action, research in animal models is required. The development of treatment resistant models is in itself problematic because the effectiveness of antidepressants constitutes an important component of the model validation process. We have solved this problem in an original way. We validated a model of depression based on diet-induced tryptophan depletion in male rats and we developed a pharmacoresistant depression-like state using the same model in females. With this new model we discovered several mechanisms related to pharmacoresistance and we have revealed an important role of hormone aldosterone in the development of depression-like state. The importance of findings obtained in experimental studies was also confirmed under clinical conditions. We brought evidence that the amount of aldosterone in the saliva of patients with major depression negatively correlates with the outcome of their treatment with antidepressants.

PROJECTS: Oxford Brookes HEIF 4 a HEIF 5 funding; VEGA 2/0128/14, 2/0057/15; APVV-0028-10.

PUBLICATIONS:

FRANKLIN, M. – HLAVACOVA, N. – BABIC, S. – POKUSA, M. – BERMUDEZ, I. – JEZOVA, D. Aldosterone Signals the Onset of Depressive Behaviour in a Female Rat Model of Depression along with SSRI Treatment Resistance. *Neuroendocrinology*. 2015, 102: 274-287. (4.373 – IF2014) (2014 - Current Contents), ISSN: 0028-3835.

FRANKLIN, M. – HLAVACOVA, N. – BABIC, S. – BERMUDEZ, I. – JEZOVA, D. Pineal Melatonin in a Sub-chronic Tryptophan Depletion Female Rat Model of Treatment-resistant Depression. *Pharmacopsychiatry*. 2015, 48: 181-183 (1.851 – IF2014) (2014 - Current Contents), ISSN: 0176-3679.

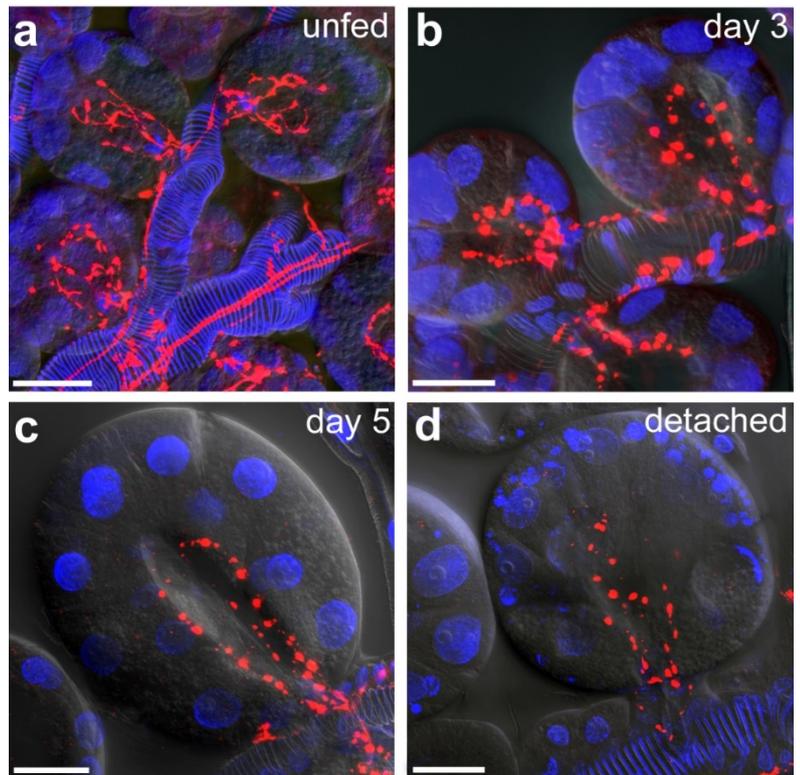
BÜTTNER, M. – JEZOVA, D. – GREENE, B. – KONRAD, C. – KIRCHER, T. – MURCK, H. Target-based biomarker selection - Mineralocorticoid receptor-related biomarkers and treatment outcome in major depression. *J Psychiatr Res*. 2015, 66-67: 24-37. (3.957 – IF2014) (2014 - Current Contents), ISSN: 0022-3956.

The role of bioactive substances in the intestinal and salivary glands of ticks and *Ovadia*

SAS INSTITUTE OF ZOOLOGY

RESEARCHERS: M. Kazimírová, L. Roller, M. Slovák, P. Takáč, D. Žitňan.

Ticks and horse flies are blood feeding parasitic arthropods that bite various animals and humans. During feeding these parasites secrete saliva into the host bloodstream which contains a mixture of pharmacologically active compounds. These compounds act as anticoagulants and immunosuppressants that aid transmission of viruses, bacteria and other microorganisms causing serious health problems in humans and animals. We used DNA sequencing to identify compounds produced by the salivary glands of the *Tabanus bromius* (1) horse fly and the *Rhipicephalus pulchellus* (2) tick. Using this approach, we obtained the entire array of proteins, including novel bioactive compounds that could be used for development of new drugs and vaccines protecting humans and animals against parasitic arthropods and transmission of pathogens. Tick saliva also contains molecules that elicit relaxation of host arteries for long-term blood feeding. However, we found that saliva of several tick species also causes constriction of arteries depending on the duration of feeding to control blood intake from the host (3). Intake and digestion of blood by the tick is regulated by specific brain neurons producing peptide hormones. We identified neurons controlling function of the gut and secretory cells of the salivary glands of ticks. These large neurons release neuropeptide orcoxin to control secretion of the saliva, blood intake and gut contractions of feeding ticks (4).



The release of neuropeptide orcoxin (red) in the salivary glands during blood feeding of the tick. Nuclei of the salivary glands are labelled blue.

PUBLICATIONS:

Ribeiro, J. M. C. – Kazimírová, M. – Takáč, P. – Andersen, J. F. – Francischetti, I. M.B. 2015. An insight into the sialome of the horse fly, *Tabanus bromius*. *Insect Biochemistry and Molecular Biology* 65: 83 – 90.

Tan, A.V. L. – Francischetti, I. M. B. – Slovak, M. – Kini, R. M. – Ribeiro, J. M. C. 2015. Sexual differences in the sialomes of the zebra tick, *Rhipicephalus pulchellus*. *Journal of Proteomics* 117: 120–144.

Pekáriková, D. – Rajska, P. – Kazimírová, M. – Pecháňová, O. – Takáč, P. – Nuttall, P. A. 2015. Vasoconstriction induced by salivary gland extracts from ixodid ticks. *International Journal for Parasitology* 45: 879 – 883.

Roller, L. – Šimo, L. – Mizoguchi, A. – Slovák, M. – Park, Y. – Žitňan, D. 2015. Orcokinin-like immunoreactivity in central neurons innervating the salivary glands and hindgut of ixodid ticks. *Cell & Tissue Research* 360(2): 209 – 222.

Diversity of agricultural landscape and its ecosystem services

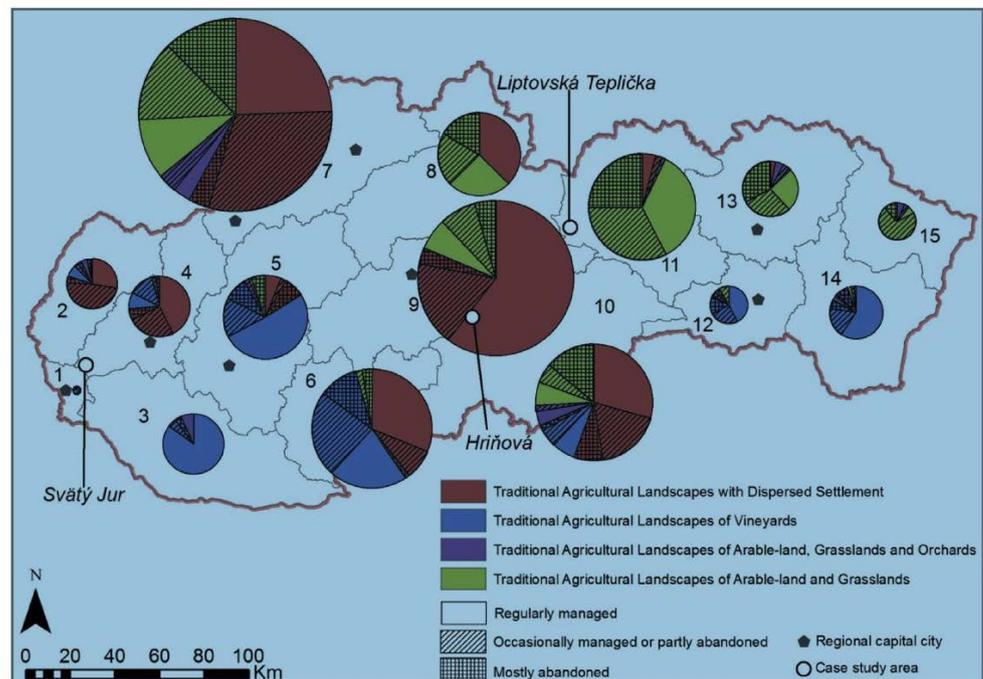
SAS INSTITUTE OF LANDSCAPE ECOLOGY

RESEARCHERS: Špulerová Jana, Lieskovský Juraj, Bezák Peter, Dobrovodská Marta, Piscová Veronika, Kanka Róbert, Štefunková Dagmar

The most significant contribution of the basic research is methodological approach for landscape diversity assessment and its contribution to the provision of ecosystem services (ecosystem benefits). The research was focused on extensively cultivated farmland and case study areas of traditional agricultural landscapes with the presence of orchards or vineyards were selected. These are characterized by higher diversity of landscape pattern and by the presence semi natural habitats that significantly contribute to the provision of ecosystem services including increasing cultural historical value.

The most significant research outputs were published in CC and SCOPUS journals (Lieskovský et al., 2015, Špulerová et al., 2015, Hanušin & Štefunková, 2015). The results of country-wide mapping and study of land use changes showed that 50% of the traditional agricultural landscapes are threatened by abandonment that occurs most intensively on steep slopes and on less fertile soils.

The intensity of land use in historical structures agricultural landscape (HSPK) in residential natural catchment regions of Slovakia and localization model areas (1 Bratislava-metropolitan, 2 Záhorský, 3rd Podunajský, 4. Trnava, Ponitrian, 5th, 6th Dolnohronský-dolnoipeľský (Hontský), 7 Povazský (reality-Žilinský), 8 turcianske-Liptov-Orava, 9 Pohronský, Novohradský 10th, 11th Spiš, 12. England, 13. Saris, 14 Dolnozemplínsky, 15 Hornozemplínsky). The size of the circle represents HSPK presence in the region.



PUBLICATIONS:

LIESKOVSKÝ, Juraj – BEZÁK, Peter – ŠPULEROVÁ, Jana – LIESKOVSKÝ, Tibor – KOLEDA, Peter – DOBROVODSKÁ, Marta – BÜRGI, Matthias – GIMMI, Urs. The abandonment of traditional agricultural landscape in Slovakia - analysis of extent and driving forces. In *Journal of Rural Studies*, 2015, vol. 37, p. 75– 84. (2.444 - IF2014). (2015 - Current Contents). ISSN 0743-0167.

ŠPULEROVÁ, Jana – PISCOVÁ, Veronika – GERHÁTOVÁ, Katarína – BAČA, Andrej – KALIVODA, Henrik – KANKA, Róbert. Orchards as traces of traditional agricultural landscape in Slovakia. In *Agriculture, Ecosystems and Environment*, 2015, vol. 199, p. 67 –76. (3.402 - IF2014). (2015 - Current Contents). ISSN 0167-8809.

HANUŠIN, Ján – ŠTEFUNKOVÁ, Dagmar. Zmeny diverzity vinohradníckej krajiny v zázemí Svätého Jura v období 1896-2011. In *Geografický časopis*, 2015, roč. 67, č. 3, s. 243 – 259. (2015 - SCOPUS). ISSN 0016-7193. Available on the internet: <<http://www.sav.sk/journals/uploads/11191013Hanusin,%20Stefunkova.pub.pdf>>.

II.1.2.2. Resolution of problems for social practice

Self-associating biopolymer membranes as carriers of remedies with antioxidative properties

SAS INSTITUTE OF EXPERIMENTAL PHARMACOLOGY AND TOXICOLOGY

RESEARCHERS: L. Šoltés, Tamer Mahmoud Tamer Abd-el-Razik, M. Veverka, K. Valachová, Mohamed Samir Mohy Eldin.

Apart from necrotic cells, chronically inflamed tissue also contains cells with insufficient oxygen uptake due to damage of extracellular glycocalyx (state of hypoxia). It is known that mitochondria in cells during hypoxia overproduce reactive oxygen forms (ROS). ROS, such as $O_2^{\bullet-}$, H_2O_2 , of which $\bullet OH$ are produced, are the reactants destroying the tissue. One way to effectively reduce an adverse flow of ROS from mitochondria is the application of mitochondrially-targeted antioxidants (MTA). To solve this task, researchers (PP 5032-2015) incorporated the MTA into a membrane formed by a couple of biopolymers, namely high-molar-mass hyaluronan (HA) and chitosan. HA molecules (negatively charged) are a skin component, chitosan is positively charged. To combine a proper content of HA and chitosan it is possible to form very firm bio-films with a certain surplus of the negative charge. Incorporation of the MTA into the biofilms results in a formation of biomembranes, from which MTA can be released by sustained mode.

PROJECT: VEGA 2/0065/15

CONTRIBUTORS:

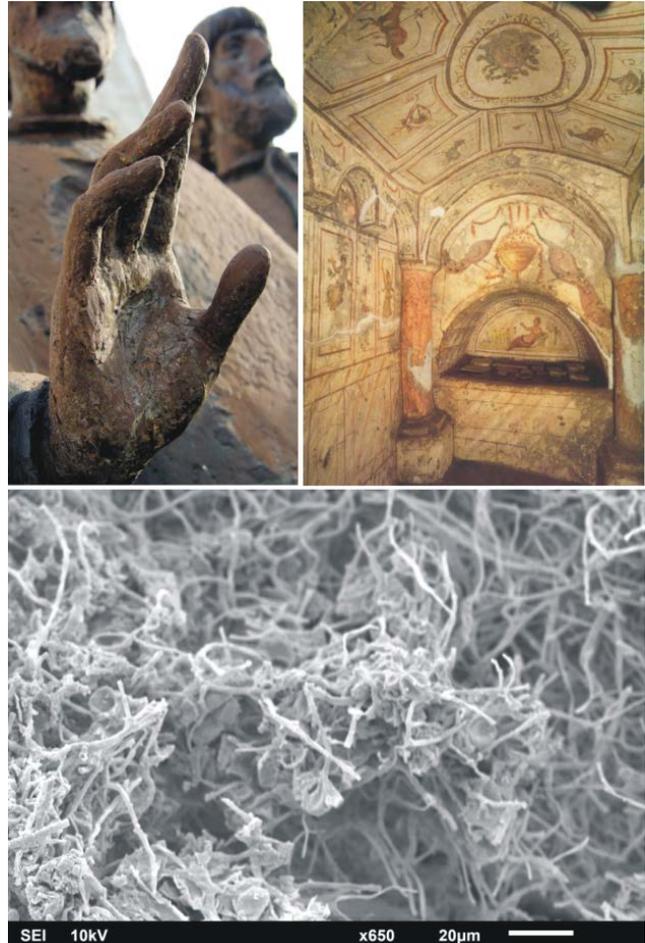
ŠOLTÉS, Ladislav - TAMER ABD-EL RAZIK, Tamer Mahmoud - VEVERKA, Miroslav - VALACHOVÁ, Katarína - MOHY ELDIN, Mohamed Samir. Samoasociujúce biopolymérne membrány ako nosiče liečivých prípravkov s antioxidačnými vlastnosťami a ich použitie: patentová prihláška č. PP 5032-2015, medzinárodné patentové triedenie: A61L15/00, verzia MPT: 16, dátum podania prihlášky: 10. 7. 2015, prihlasovateľ: Ústav experimentálnej farmakológie a toxikológie SAV, Dúbravská cesta 9, 841 04 Bratislava, SK. Banská Bystrica: Úrad priemyselného vlastníctva Slovenskej republiky, 2015.

Various investigation strategies to assess the microbial community degrading fresco surface and epoxy resin statue

SAS INSTITUTE OF MOLECULAR BIOLOGY

RESEARCHERS: D. Pangallo, L. Kraková, M. Bučková, A. Puškárová, T. Grivalský.

In order to improve the safeguard of our cultural heritage, the microbial communities colonizing a fresco in Rome catacombs and an epoxy statue of Saints Cyril and Methodius (Devin) were investigated using different molecular biological approaches. DNA and RNA were extracted from several places of contaminated fresco and epoxy statue. Nucleic acids were analysed in detail and results obtained evidenced the presence of various microbial communities which were composed by degrading bacteria, cyanobacteria, algae, and extremophilic fungi. Bacteria and fungi were also isolated from both environments and subsequently identified using molecular methods. Microorganisms recovered from the epoxy statue were assayed for the production of lipases by different agar tests; the lipases are considered to be responsible for the degradation of synthetic polymers. Such complex investigations have yielded valuable knowledge about the microflora living and degrading these two items and important strategies have been developed for the protection of our cultural heritage.



PROJECTS: VEGA 2/0103/14; VEGA 2/0179

PUBLICATIONS:

Pangallo, D. – Bučková, M. – Kraková, L. – Puškárová, A. – Šaková, N. – Grivalský, T. – Chovanová, K. – Zemanková, M. Biodeterioration of epoxy resin: a microbial survey through culture-independent and culture-dependent approaches. (2015) *Environ. Microbiol* **17**: 462-479. [IF 6.201]

Kraková, L., De Leo, F., Bruno, L., Pangallo, D., Urzì, C. Complex bacterial diversity in the white biofilms of the Catacombs of St. Callixtus in Rome evidenced by different investigation strategies. (2015) *Environ. Microbiol* **17**: 1738-1752. [IF 6.201]

Chlorophyll as a modulator effect of probiotics

SAS INSTITUTE OF ANIMAL PHYSIOLOGY

RESEARCHERS: V. Stropfová, I. Kubašová, A. Lauková.

Long-term applications of probiotic preparations containing lactic acid bacteria (e.g. for stimulation of the immune system) can disturb the acid-base balance due to overproduction of organic acids in the digestive tract. For this reason we tested a

combination of our selected probiotic bacteria *Lactobacillus fermentum* CCM 7421 and chlorophyll as a substance with alkalizing properties. Since no negative impact of chlorophyll at tested concentrations (0.05 to 0.25 %) on the growth of probiotic bacteria under *in vitro* condition was detected, we tested the effect of 14-day application of this combination in healthy dogs (at a dose 60 mg of chlorophyll and 10⁸ cells/day/dog of probiotic). Results showed the ability of chlorophyll to reduce acidification of the digestive tract content after application of probiotic alone, as well as the possibility of positive modulation of intestinal microbiota composition or stimulation of cellular immunity following combined application with no negative impact on faecal consistency.

PUBLICATIONS:

STROMPFOVÁ, Viola – KUBAŠOVÁ, Ivana – FARBÁKOVÁ, J. – GANCARČÍKOVÁ, Soňa – MUDROŇOVÁ, Dagmar – MAĎARI, Aladár – LAUKOVÁ, Andrea. Experimental application of *Lactobacillus fermentum* CCM 7421 in combination with chlorophyllin in dogs. In *Applied Microbiology and Biotechnology*, 2015, vol. 99, p. 8681-8690. (3.337 - IF2014). (2015 - Current Contents). ISSN 0175-7598.

II.1.2.3. Significant results of international scientific projects

Active alginate-based implant contributes to the regeneration of the injured spinal cord in the rat

SAS INSTITUTE OF NEUROBIOLOGY

RESEARCHERS: I. Grulova¹, L. Slovinska¹, J. Blaško¹, S. Devaux^{1,2}, M. Wisztorski², M. Salzet², I. Fournier², O. Kryukov³, S. Cohen³ & D. Cizkova^{1,2}.

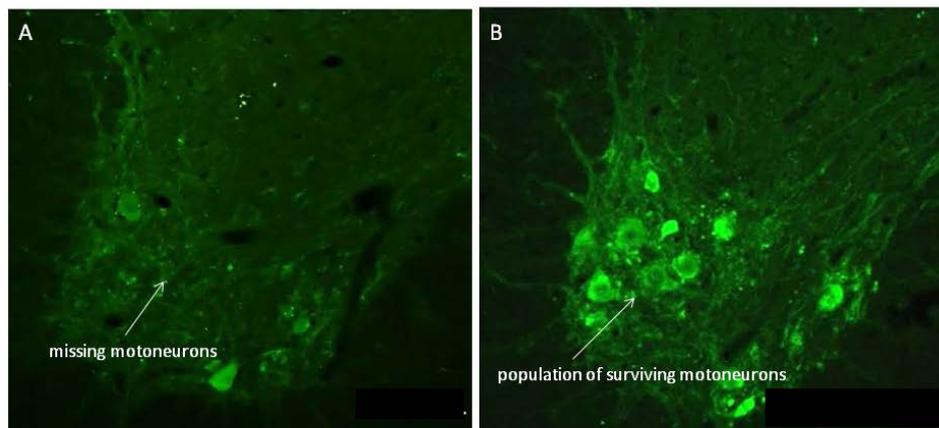
WORK SITES: 1 SAS Institute of Neurobiology Košice, Slovensko, 2 Laboratoire PRISM: Université de Lille 1, 3 Ben-Gurion University of the Negev, Beer Sheva, Israel.

In this study rats with spinal cord injury were injected with an active biomaterial that bridged the injury site. Alginate-based implant capable of binding and gradually releasing the bioactive molecules, epidermal growth factor (EGF) and basic fibroblast growth factor (bFGF) for 2-3 weeks was designed in co-operation with scientific colleagues from Israel. These bioactive molecules significantly protected the damaged spinal cord tissue that contained a greater number of surviving motor neurons (chat motoneurons). At the injury site we observed regenerating nerve fibres (corticospinal fibres), and blood vessels. We confirmed the improvement of motor function in the injured group of rats treated with alginate releasing bioactive molecules compared to untreated rats. These results suggest the possible therapeutic use of the active alginate implants releasing bioactive molecules for the treatment of spinal cord injury.

PROJECTS: APVV 0472-11 (DC), VEGA 2/0125/15, PRISM (INSERM U1192) (MS)

PUBLICATIONS:

GRULOVA, I. – SLOVINSKA, L. – BLAŠKO, J. – DEVAUX, S. – WISZTORSKI, M. – SALZET, M. – FOURNIER, I. – KRYUKOV, O. – COHEN, S. – CIZKOVA, D.
Delivery of Alginate Scaffold Releasing Two Trophic Factors for Spinal Cord Injury Repair. *SciRep*. 2015 Sep 8;5:13702. doi: 10.1038/srep13702. IF= 5,57



After spinal cord injury, neuronal cell death often occurs - in this case death of motoneurons (A). In the spinal cord of rats treated with growth factors and the alginate we were able to reverse this negative phenomenon and rescue cells (B).

Application of various bioanalytical approaches in glycomics and diagnostics

SAS INSTITUTE OF CHEMISTRY

RESEARCHERS: Bertók, Filip, Holazová née. Šedivá, Kluková, Hushegyi, Pihíková, Belický, Damborský, Katrlík, Tkáč.

In this study, novel and progressive methods including nanotechnology were applied for the construction of various devices which are amongst the most sensitive described so far in literature. Thus, such devices have the potential to be used in the analysis of a low level of biomarkers in blood/serum of patients which is important for early stage diagnosis of various diseases. Furthermore, such devices were modified by novo synthesised compounds, applied to secure high selectivity of analysis in blood/serum. The devices were subsequently employed in the analysis of real samples (serum samples from patients suffering from rheumatoid arthritis and systemic sclerosis) and for analysis of a biomarker of prostate cancer – PSA (a prostate specific antigen), with potential for future application for more reliable diagnosis of diseases. The devices developed in the study were also applied for better understanding of the function of complex sugars (glycans) in living organisms including humans.

PUBLICATIONS:

PALEČEK, Emil – TKÁČ, Ján – BARTOŠÍK, Martin – BERTÓK, Tomáš – OSTATNÁ, Veronika – PALEČEK, Jan. Electrochemistry of non-conjugated proteins and glycoproteins. Towards sensors for biomedicine and glycomics. *Chemical Reviews*, 2015, vol. 115, p. 2045 – 2108. (46.568 - IF2014). (2015 - Current Contents). ISSN 0009-2665.

HUSHEGYI, András – BERTÓK, Tomáš – DAMBORSKÝ, Pavel – KATRLÍK, Jaroslav – TKÁČ, Ján. Ultrasensitive impedimetric glycan biosensor with controlled glycan density for detection of lectins

and influenza hemagglutinins. In *Chemical Communications*, 2015, vol. 51, p. 7474 – 477. (6.834 - IF2014). (2015 - Current Contents). ISSN 1359-7345.

KLUKOVÁ, Ludmila – BERTÓK, Tomáš – PETRÍKOVÁ, Miroslava – ŠEDIVÁ, Alena – MISLOVIČOVÁ, Danica – KATRLÍK, Jaroslav – VIKARTOVSKÁ, Alica – KASÁK, Peter – ANDICSOVÁ-ECKSTEIN, Anita – MOSNÁČEK, Jaroslav – LUKÁČ, Jozef – ROVENSKÝ, Jozef – IMRICH, Richard – TKÁČ, Ján. Glycoprofiling as a novel tool in serological assays of systemic sclerosis: A comparative study with three bioanalytical methods. In *Analytica Chimica Acta*, 2015, vol. 853, p. 555-562. (4.513 - IF2014). (2015 - Current Contents). ISSN 0003-2670.

BERTÓK, Tomáš – ŠEDIVÁ, Alena – FILIP, Jaroslav – ILČÍKOVÁ, Markéta – KASÁK, Peter – VELIČ, Dušan – JÁNE, Eduard – MRAVCOVÁ, Martina – ROVENSKÝ, Jozef – KUNZO, Pavol – LOBOTKA, Peter – ŠMATKO, Vasilij – VIKARTOVSKÁ, Alica – TKÁČ, Ján. Carboxybetaine modified interface for electrochemical glycoprofiling of antibodies isolated from human serum. In *Langmuir*, 2015, vol. 31, p. 7148 – 7157. (4.457 - IF2014). (2015 - Current Contents). ISSN 0743- 7463.

JOLLY, Pawan – FORMISANO, Nello – TKÁČ, Ján – KASÁK, Peter – FROST, Christopher G. – ESTRELA, Pedro. Label-free impedimetric aptasensor with antifouling surface chemistry: A prostate specific antigen case study. In *Sensors and Actuators B: Chemical*, 2015, vol. 209, p. 306 – 312. (4.097 - IF2014). (2015 - Current Contents). ISSN 0925-4005.

ILČÍKOVÁ, Markéta – TKÁČ, Ján – KASÁK, Peter. Switchable materials containing polyzwitterion moieties. In *Polymers*, 2015, vol. 7, p. 2344 – 2370. (3.681 - IF2014). (2015 - Current Contents). ISSN 2073-4360.

ILČÍKOVÁ, Markéta – FILIP, Jaroslav – MRLÍK, Miroslav – PLACHÝ, Tomáš – TKÁČ, Ján – KASÁK, Peter. Polypyrrole nanotubes decorated with gold particles applied for construction of enzymatic bioanodes and biocathodes. In *International Journal of Electrochemical Science*, 2015, vol. 10, p. 6558 – 6571. (1.500 - IF2014). (2015 - Current Contents). ISSN 1452-3981.

BELICKÝ, Štefan – TKÁČ, Ján. Can glycoprofiling be helpful in detecting prostate cancer? In *Chemical Papers*, 2015, vol. 69, p. 90 – 111. (1.468 - IF2014). (2015 - Current Contents). ISSN 0366-6352.

DAMBORSKÝ, Pavel – MADABOOSI, Narayanan – CHU, Virginia – CONDE, João P. – KATRLÍK, Jaroslav. Surface plasmon resonance application in prostate cancer biomarker research. In *Chemical Papers*, 2015, vol. 69, p. 143 – 149. (1.468 - IF2014). (2015 - Current Contents). ISSN 0366-6352.

FILIP, Jaroslav – KASÁK, Peter – TKAC, Jan. Graphene as a signal amplifier for preparation of ultrasensitive electrochemical biosensors. In *Chemical Papers*, 2015, vol. 69, p. 112 – 133. (1.468 - IF2014). (2015 - Current Contents). ISSN 0366-6352.

PIHÍKOVÁ, Dominika – KASÁK, Peter – TKÁČ, Ján. Glycoprofiling of cancer biomarkers: Labelfree electrochemical lectin-based biosensors. In *Open Chemistry*, 2015, vol. 13, p. 636 – 655. (2015 - Current Contents). ISSN 2391-5420.

Evolution and spatial diversity of geographically disjunct taxa of *Russula* subject

Decolorantinae in Latin and North America based on material held in the herbarium of Museum Histoire Naturelle Paris and type studies

SAS INSTITUTE OF BOTANY

RESEARCHER: S. Adamčík.

Fungi of the genus *Russula* produce strikingly colourful fruiting bodies. Hundreds of species are known from Northern Hemisphere, among them some edible ones. Less known is their important role in forests, where they colonize root tips of woody species and form symbiosis to support the exchange of nutrients and water. In order to understand how these ecosystems function, in addition to species diversity we also need to know their ecological preferences and distribution ranges. We focused delimitation and relationships of russulas with blackening flesh (section *Decolorantinae*). Our challenge was generally accepted opinion that the same species can occur in entire area of North and Latin America, even in Europe, while others are

limited to smaller areas. Based on morphological as well as phylogenetic analyses, we concluded that species from East and West coast of North America all vary and there are no European species that occur in the temperate and subtropical belt of this subcontinent. The morphological, genetic and evolutionary characteristics of ten species were presented of which two were introduced as new to science.

PROJECTS: The Synthesis FR-TAF-5016 mobility project is part of long term cooperation between the SAS Institute of Botany and (S. Adamčík) and the Museum of Natural History in Paris, France (B. Buyck) since 2008.

PUBLICATIONS:

Buyck, B. – Jančovičová, S. – Adamčík, S. 2015: The Study of *Russula* in the Western United States. In *Cryptogamie, Mycologie*, 2015, vol. 36, no. 2, s. 193 – 211.

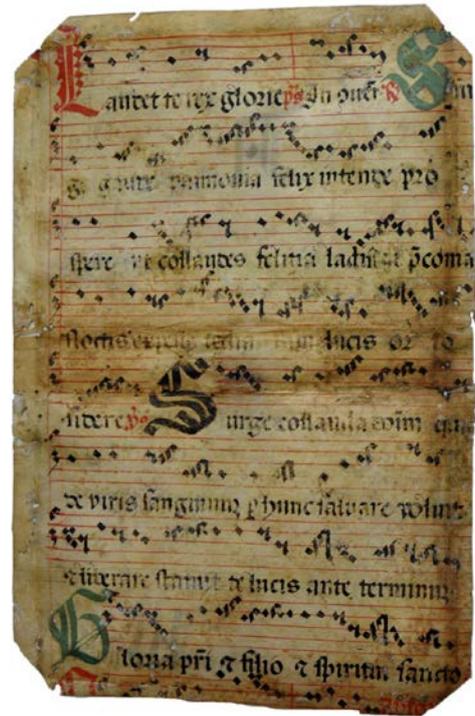
Adamčík, S. – Cai, L. – Chakraborty, D. – Chen, X. H. – Cotter, H. – van T. Dai, D. Q. – Dai, Y-Ch. – Das, K. – Deng, Ch. – Ghobad-Nejhad, M. – Hyde, K. D. – Langer, E. – Latha, K. P. D. – Liu, F. – Liu, S-L. – Liu, T. – LV, W. – LV, S-X. – Machado, A.R. – Pinho, D. B. – Pereira, O. L. – Prasher, I. B. – Rosado, A. W. C. – Qin, J. – Qin, W. M. – Verma, R. K. – Wang, Q. – Yang, Z-L. – Yu, X.-D. – Zhou, L.-W. – Buyck, B. 2015: Fungal Biodiversity Profiles 1-10. In *Cryptogamie, Mycologie*, 2015, vol. 36, no. 2, s. 121 – 196.

Liu, J. K. – Hyde, K. – Jones, E. B. G. – Ariyawansa, H. A. – Bhat, D. J. – Boonmee, S. – Maharchchikumbura, S. S. N. – McKenzie, E. H.C. – Phookamsak, R. – Phukhamsakda, Ch. – Shenoy, B. D. – Abdel-Wahab, M. A. – Buyck, B. – Chen, J. – Chethana, K. W. T. – Singtripop, Ch. – Dai, D. Q. – Dai, Y. Ch. – Daranagama, D. A. – Dissanayake, A. J. – Diolom, M. – D´Souza, M. J. – Fan, X. L. – Goonasekara, I. D. – Hirayama, K. – Hongsanan, S. – Jayasiri, S. – Jayawardena, R. S. – Karunarathna, S. C. – Li, W. J. – Mapook, A. – Norphanphoun, Ch. – Pang, K. L. – Perera, R.H. – Persoh, D. – Pinruan, U. – Senanayake, I. C. – Somrithipol, S. – Suetrong, S. – Tanaka, K. – Thambugala, K. M. – Tian, Q. – Tibpromma, S. – Udayanga, D. – Wijayawardene, N. N. – Wanasinghe, D. – Wisitrassameewong, K. – Zeng, X. Y. – Abdel-Aziz, F. A. – Adamčík, S. – Bahkali, A. H. – Boonyuen, N. – Bulgakov, T. – Callac, P. – Chomnunti, P. – Greiner, K. – Hashimoto, A. – Hofstetter, V. – Kang, J. Ch. – Lewis, D. – Li, X. H. – Liu, X. Z. – Liu, Z. Y. – Matsumura, M. – Mortiner, P. E. – Rambold, G. – Randrianjohany, E. – Sato, G. – Sri-Indrasuttdhi, V. – Tian, Ch.-M. – Verbeken, A. – Von Brackel, W. – Wang, Y. – Wen, T. Ch. – Xu, J. Ch. – Yan, J. Y. – Zhao, R. L. – Camporesi, E. 2015: Fungal diversity notes 1-110: taxonomic and phylogenetic contributions to fungal species. In *Fungal Diversity*, 2015, vol. 72, no. 1, s. 1 – 197.

Adamčík, S. – Jančovičová, S. – Buyck, B. 2015: Type-studies in American *Russula* subsection *Decolorantes* (Russulales, Basidiomycota), part II. In *Phytotaxa*, 2015, vol. 231, no. 3, s. 245 – 259.

SAS SCIENTIFIC SECTION III

Scientific organizations in Section 3 of SAS are developing their research in several areas, namely the social science, humanities, the science of history, culture and art. These fields deal with artefacts and social facts, social and human relationships, cultural values and institutions, linguistic meaning and interpretation, philosophical concepts and ideas, social communication and human behaviour, emotion and consciousness, and the search for meaning of human history and civilization. The results of their research therefore cannot simply be measured by quantitative indicators, numbers and statistics or even through the short-term financial effect and economic returns. These results are reflected in particular in long-term social effects in the form of a contribution to solving societal problems as well as the cultural development of society.



However, social, public or state investment in social sciences and humanities-scientific research "pays off" when this research also achieves results comparable to the level of research in other countries, when it contributes to the social sciences and humanities-scientific knowledge on an international scale. The results of research by the institutes of SAS Section 3 are therefore significant in the long term, albeit on a differentiated scale.

This was also the case in 2015. The scientific output of institutions last year brought contributions to the development of social sciences and humanities in the international and domestic context, especially with monographs in the field of history, ethnology, philosophy, economics, legal and political sciences, arts and literature. Scientific monographs published in foreign (13 in total) and domestic publishing houses (104 altogether) confirm that the focus of publications has been in books (with 28 specialised monographs brings the overall total of books to 145). A considerable part of the output consists of chapters in monographs (248 in total), of which 68 were published abroad. An upward trend was seen in journals (692 in total, of which 107 were featured in the leading CC database). Work in scientific collections (531 altogether) remains the standard publication medium, of which the vast majority were peer-reviewed (414).

In addition, researchers of the institutes of social sciences and humanities presented 1038 lectures and represented their institutes at various scientific meetings, of which one third were held abroad (397). The overall response to their scientific work represents a total of more than 9,000 citations, of which 967 were featured in the WoS and Scopus databases.

The quality and thematic results of the institutes of SAS Section 3 in 2015 mean a contribution to the knowledge of the migration process and ENP countries of Central Europe, the "grey economy" and the debt crisis, history of politics in the Middle East and ancient Egypt in the Nile delta, the atlas of Slovak folk culture, theory of theatre dramaturgy and the literary process as well as to interpret the

works of Kant and D. Tatarka, all presented in monographs published by foreign publishers, including houses as renowned as Routledge (USA) and P. Lang (Switzerland). Dozens of monographs published in domestic publishing houses including houses as renowned as Veda, Kalligram et al., which show a contribution to the knowledge of national history and culture, archaeological research at selected areas of Slovakia (Zemplín, Požitavie), the history of artistic translation, the nature of political discourse and ethnological research of Roma and other minorities (Ukrainians), the development of confessional, musical, literary, theatrical and film culture in Slovakia, the development and problems of the current Slovak economy, but also the problems of the world economy, the history of ideology in the European context and history of the UN, the history of transport, the Holocaust, corruption, the 2nd world war and the development since then. Theoretical contributions include the interpretation of the works of world philosophical personalities (E. Husserl, R. Rorty), domestic political personalities (L. Štúr, M. Hodža, Lettrich J. Slávik), scientific personalities (A. Kmet'), literary figures (B. Tablic, J. Kollar, G. Vámoš). A separate chapter forms a further edition of the Dictionary of Contemporary Slovak Language (M-N) and a brief etymological Slovak dictionary.

*Emil Višňovský
Vice President of SAS Section III*

II.1.3.1. Significant results in basic scientific knowledge

Roma in mainstream Slovak society

SAS INSTITUTE OF ETHNOLOGY

This collective scientific monograph is a synthesized work that originated at the SAS Institute of Ethnology over several years as part of the VEGA 2/0014/11 Roma in mainstream society project: research on models of coexistence (Rómovia v majoritnej spoločnosti: výskum modelov vzájomného spolužitia). 22 experts from various disciplines and countries who are dedicated to the research of Roma in Slovakia contributed to the project. Five of those authors are from the SAS Institute of Ethnology. Three authors (T. Podolinská, T. Hrustič, A. Mann) contributed thematic chapters to the publication; four writers and authors (T. Podolinská, T. Hrustič E. Krekovičová, Z. Panczová) also contributed thematic chapters. Individual chapters are based on long-term ethnographic research, current quality and original quantitative research across the social and humanities disciplines. Some studies focus on discourse analysis (public, political and media). The publication shows through many examples how to construct the image of ethnic groups associated with the attribution of certain ethnic and cultural stereotypes. The aim of the publication is to convey a better understanding of how the Roma and mainstream society interact. The publication opens up new themes and provides insight from within the Roma community. It also provides direct application in practice for better adjustment of public policy.

PUBLICATIONS:

Editors: Tatiana Podolinská, Tomáš Hrustič. Čierno-biele svety : Rómovia v majoritnej spoločnosti na Slovensku. Bratislava : Ústav etnológie SAV : VEDA, vydavateľstvo SAV, 2015. 600 s. Etnologické štúdie, 23. ISBN 978-80-224-1413-5.

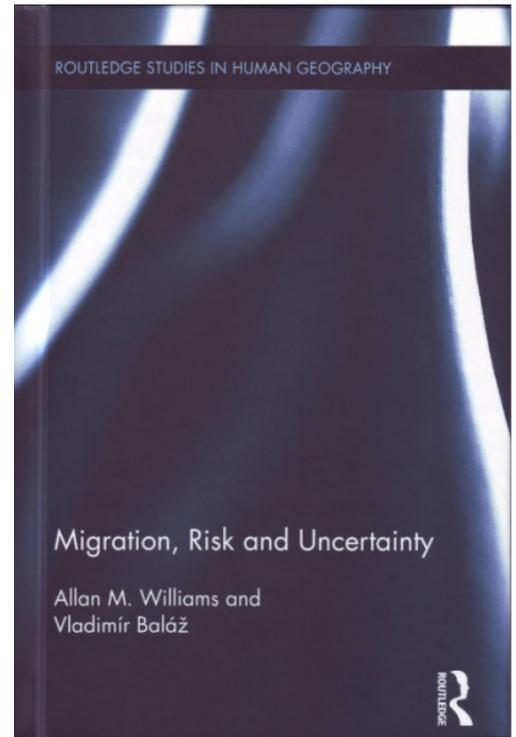
Analysis of the relationship of risk and migration

SAS INSTITUTE OF SOCIAL AND PSYCHOLOGICAL SCIENCES

In a globalized world, migration is one of the driving forces of social and economic change. This publication, "Migration, Risk and Uncertainty is the first scientific work of its kind to provide a systematic analysis of the relationship of risk and migration. The book integrates research in economics, psychology, sociology, and geography and examines the role of risk tolerance in shaping decisions on migration. Based on its research, the authors demonstrate that risk tolerance is an important predictor of the willingness of individuals to migrate. At the same time, migration also brings many potential risks for the migrants themselves and their host society.

PUBLICATIONS:

WILLIAMS A., BALAZ V.: Migration, Risk and Uncertainty. Routledge 2015. 238p.



Micro aesthetic analysis of literature

SAS INSTITUTE OF SLOVAK LITERATURE



This monographic collection of studies focuses on the author's thematic and methodological journey from aesthetic creativity to aesthetic pulsing to interference aesthetic silence while the semiotics based on mutually exclusive binary opposition to the interference aesthetics of modal intervals. Scientific literary reflection receiving aesthetic moment scaling aesthetic processes is embedded in the philosophical and aesthetic framework in the issues of perception and being. The author applies older methodological instrumentarium, when viewing processes of silence in literary texts and poetics of silence enriched by new concepts such as interference or latency.

PUBLICATIONS:

ZAJAC, Peter: Ästhetik des Schwingens. Gutachter: Adam Bžoch, František Koli. Deutsche Redaktion: Ute Raßloff. Translation: Rainette Lange, Ute Raßloff, Renata SakoHoess, Nora Schmidt, Linda Weiß. Frankfurt am Main : Peter Lang, 2015. Slovak Academy of Sciences: Series of the Slovak Academy of Sciences. Band/Volume 7. 318 s. ISBN 978-3-631-66307-3.

II.1.3.2. Resolution of problems for social practice

The year of Ľudovít Štúr

SAS INSTITUTE OF HISTORY

The SAS Institute of History made significant contributions to the scientific and popularization activities dedicated to the *Year of Štúr* which was declared by the Slovak Government on the occasion of the 200th anniversary of his birth.

On 12th and 13th May 2015 the SAS Institute of History organized an international conference “*Ľudovít Štúr v premenách času. Život, dielo a doba verzus historická*



pamäť. (Štúr in changing times. Life, work and time versus historical memory)”. A collective monograph, *Ľudovít Štúr na hranici dvoch vekov : život, dielo, doba verzus historická pamäť (Štúr on the border of two ages: life, work, time versus historical memory)* was created based on the conference papers. The preparation for the conference as well as the concept of further activities for the anniversary of Štúr were handled by Peter Macho and Daniela Kodajová. 0905147880

The staff of the SAS Institute of History (D. Kodajová, P. Šoltés, P. Macho M. Bednárová E. Kowalská, D. Kováč) were heavily involved in popularisation activities dedicated to Ľ. Štúr organized by museums, universities and educational institutions. The most public response was met at their media appearances (Rádio Slovensko, Rádio Devín, Rádio Regina, STV 1, STV 2, TA 3), as well as in newspapers. For example a documentary, *True Štúr* (STV2, 24. 10. 2015 / image above) was aired, and numerous hourly performances on dejiny.sk, Rádio Regina, the *Štúr z mäsa a kostí (The flesh and blood Štúr)* on the Devín radio station, as well as a conference with a discussion as part of the IH SAS program and the *Historia magistra* University library... on the topic of *Ľudovít Štúr a fenomény doby (Štúr and phenomena of the times)*, which was aimed at the general public.

PUBLICATIONS:

Peter Macho, Daniela Kodajová eds.: *Ľudovít Štúr na hranici dvoch vekov : život, dielo, doba verzus historická pamäť.* Bratislava: SAS Institute of History: Veda, 2015. 398 s.

Practice arbitration in the field of freedom of expression

SAS INSTITUTE OF STATE AND LAW

This collective monograph is the work of leading experts from home and abroad, including judges of constitutional courts, former Advocate General of the ECJ whether and a judge from the European Court of Human Rights. Through analysis of the most relevant arbitration the authors show the development of practice courts in the field of freedom of expression not only in the post-socialist countries such as Hungary, Slovakia and Czech Republic, but especially in the more established democracies such as the US, Germany and France. Particular attention is paid to the case law of the European Court of Human Rights in the online environment, as well as freedom of expression in the context of the Charter of Fundamental Rights of the European Union. At the end of the monograph one of its authors describes a personal experience with restrictions on freedom of expression in China.

PUBLICATIONS:

VOZÁR, J. a kolektív: Sloboda prejavu v rozhodnutiach súdov. Bratislava: Ústav štátu a práva SAV, 2015, 212 s. ISBN: 978-80-224-1470-8.

From reconstruction of theatre productions to cultural history

SAS INSTITUTE OF THEATRE AND FILM RESEARCH

This publication is the result of the first phase of the 100 years of the Slovak National Theatre project – from the phase of acquiring the new knowledge necessary to basic research in perspective for applied research. Knowledge that brings out the "work in progress" will be completed in the coming years and made available for wider use in the educational process as study material for teaching at universities (all levels) in the fields of performing arts and history and theory of performing arts, and they will also be made available to a wide range of readers through historical productions - the reconstruction of key dramatic and operatic productions, other parameters of development of SND (The Slovak National Theatre), of the aesthetic and poetic quest for people of the stage (directors, actors, dramaturges, stage designers). The struggle for the professionalization of the first theatre scene puts into perspective its qualitative ripening, as well as contacts with non-national cultures, etc. This collective monograph provides, inter alia, major outputs as more comprehensive chapters by PhDr. Dagmar Podmaková, , CSc. and Mgr. Michaela Mojžišova, PhD. It is a collaborative electronic publication ÚDFV SAS and DF VŠMU and will be made available online at <http://www.udfv.sav.sk>.

PUBLICATIONS:

LINDOVSKÁ, Nadežda a kol. Od rekonštrukcie divadelnej inscenácie ku kultúrnym dejinám? 1. etapa Slovenského národného divadla. Divadelné inscenácie 1920 – 1938 (činohra, opera). [DVD]. Bratislava : VEDA, vydavateľstvo SAV, ÚDFV SAV, DF VŠMU, 2015. 337 s. ISBN 978-80-224-1488-3.

II.1.3.3. Significant results of international scientific projects

Slovak research on Ancient Egyptian Civilization

SAS INSTITUTE OF ORIENTAL STUDIES

PROJECT LEADER: D. Magdolen.

RESEARCH REPRESENTATIVE: Jozef Hudec (Head of Slovak research at Tell er-Retábe).

Project identification code: APVV-0579-12



Photo: J. Hudec; Findings from research at Tell el-retaba 2015 season.

Archaeological research was carried out as part of this project in the area of Tell el-Retaba in the months of August-September 2015. Alongside the Slovak research participants of the expedition were experts from Poland, the Czech Republic, Great Britain and Egypt. The work continued on research on archaeological objects in areas 4, 7 and 9. The objects and findings discovered come from around the 17th to 4th centuries BC (the second transitional period to the later period). A new part of the cemetery was unearthed, as were the remains of the tomb architecture of buried individuals from the Hyksos period, covered with layers of settlement platform walls from the era of Pharaoh Ramses III. The findings from the previous period were processed. Manuscript studies were submitted for print and further studies are currently in a state of development. A Preliminary Research Report was submitted at the Supreme Council of Antiquities in Cairo which was received from research sites at Tell er-retab during the 2015 season. A study was also published in the “Ägypten und Levante” periodical published by the Austrian Academy of Sciences:

RZEPKA S., HUDEC J., WODZIŃSKA A., JARMUZEK Ł., HULKOVÁ L., DUBCOVÁ V., PIORUN M., ŠEFČÁKOVÁ A.: Tell el-Retaba from the Second Intermediate Period till the Late Period. Results of the Polish-Slovak Archaeological Mission, Seasons 2011 – 2012. In: Aegyptenund-Levante, Band XXIV, 2015, pp. 39 – 120. Ďalšia štúdia bola uverejnená v časopise Asian and African Studies: HUDEC J. – FULAJTÁR E. – STOPKOVÁ E.: Historical and Environmental Determinations of the Ancient Egyptian Fortresses in Tell el-Retaba. In: Asian and African Studies, Volume 24, Number 2, 2015, pp. 247 – 283, 303 – 318.

Visegrad cooperation prospects in light of changing economic, political and social conditions. Visegrad 2022

SAS INSTITUTE OF ECONOMIC RESEARCH

International Visegrad Fund's Strategic grant project, No. 31210045.

The V4 countries have to face new challenges both within the EU area and especially in the individual V4 countries. This should enable closer cooperation between these countries and sharing their own experience in addressing pressing economic and social problems. The aim of the project was based on analysis of developments in internal and external environments and to propose possible areas of cooperation of V4 countries, with regard to the course of the financial and debt crisis, as well as social development and long-term trends

COOPERATING RESEARCHERS FROM ABROAD: Institute of World Economics – Centre for Economic and Regional Studies (Hungary), Warsaw School of Economics (Poland), Europeum (Czech Republic).

PUBLICATIONS:

HOŠOFF, Boris. Demographic processes of the Slovak Republic – current developments future trends. In Prospects of the Visegrad cooperation: identifying converging and diverging factors. Budapest: Institute of world economics, 2015, s. 273-302. ISBN 978-963-301-622-0.

HOŠOFF, Boris. EU governance and economic challenges – perspectives from the Slovak Republic. In Prospects of the Visegrad cooperation: identifying converging and diverging factors. Budapest: Institute of world economics, 2015, s. 85 – 116. ISBN 978-963-301-622-0.

Artistic innovations and cultural zones

SAS INSTITUTE OF ART HISTORY

Edited collective monograph published in English in cooperation with a foreign publisher:

CIULISOVÁ Ingrid: Artistic Innovations and Cultural Zones. Edited by Ingrid Ciulisová. Frankfurt am Main: Peter Lang Publishing Group, Bratislava: Veda, 2014. 296 s. (Spectrum Slovakia), Vol. 7. ISBN 978-3-631-66122-2.

(The publication was funded by the Lila Acheson Wallace-Reader's Digest Publications grant, awarded to the editor of the Villa I Tatti, the Harvard University Center for Italian Renaissance Studies, with a contribution from the VEGA agency (Gotické tabuľové maliarstvo (Gothic panel painting) v Spišskej Kapitule a 'Flámski primitívi', grant no. 2/0053/13)); study in the following monograph:



CIULISOVÁ Ingrid: Rogier van der Weyden and Veit Stoss and Their Two Followers. In: CIULISOVÁ, I. (ed). *Artistic Innovations and Cultural Zones*. - Frankfurt am Main; Bratislava: Peter Lang Publishing Group: Veda, 2014, s. 182-213. ISBN 978-3-631-66122-2.

CHAPTER III

Educational Activities

Doctoral studies and educational activities

Young adepts of science are continuously being educated at SAS organizations in doctoral studies. SAS is participating in doctoral study programs at 11 universities as an external educational institution.

Under the Act No.131 / 2002 Coll. on universities, as amended, MŠVVaŠ SR granted SAS the right to train doctoral programs to 53 organizations in 66 disciplines of study. 111 doctoral students were newly admitted to study at SAS. The number of doctoral students compared with last year fell slightly. SAS institutes had 547 doctoral students altogether, including 470 PhD fulltime doctoral students and 77 part-time. Doctoral studies were completed per 104 doctoral theses. In addition to this, SAS staff acted as the main tutors for 105 doctoral students at universities, displaying further SAS capacity for scientific-pedagogical workplaces.

The education and scientific work of PhD students and post-doctoral students at the Academy is at a high standard of quality. SAS also supports young scientists through the Stefan Schwarz Support Fund. In 2015, 16 institutes received a contribution to their wage funds for 21 Post Doc candidates.

In cooperation with universities and higher education institutions, SAS employees were mostly involved in lecturing activities at universities - 326 employees gave 13,510 hours of lectures at home and 38 gave 891 hours of lectures abroad, workshops and seminars were led in Slovakia by 251 employees (13,364 hours) and abroad by 11 employees (396 hours). An important part of the educational activity was overseeing theses (436 members of staff oversaw 1,094 theses and dissertations), 219 employees officiated over 387 dissertations and habilitation works. The role of main tutor was undertaken by 380 advisers who also trained at other institutions and supervised 653 doctoral students in total. SAS staff worked as members of commissions for PhD defence (290), the Commission for the defence of doctoral dissertations (46), and as members of committees and officiating at the inaugural or habilitation procedures at universities (72), as members of scientific boards of universities and of the boards of universities and faculties (277). In 2015, 10 SAS employees received the DrSc and 13 received the scientific pedagogical titles. SAS departments have 24 shared workplaces with higher education institutions and universities and associations aimed at making use of equipment and facilities for teaching and the joint resolution of projects.

Up to 31.12.2015 there were 1 908 scientists at SAS workplaces, 258 of which were doctors of science and 1,650 were PhD (full status) candidates. Compared to the previous year, the number of researchers with scientific and academic titles has decreased meaning 139 professors and 148 associate professors currently operate at SAS. According to the qualification structure of SAS, 315 leading scientists and 852 independent scientists worked at SAS.

The SAS Scientific Council awarded 10 Doctor of science scientific degrees and two honorary doctorate degrees in 2015.

The SAS commission for assessing the scientific qualifications of employees received 108 proposals for recognition of scientific levels of qualification, 82 of which were proposals from the Slovak Academy of Sciences and 26 from the Ministry of Education (MŠ SR) and other organs of the Slovak Republic. The commission discussed seven proposals for recognition of level I scientific qualifications and 101 proposals for level IIa scientific qualifications, 103 of which were approved, four of which were rejected and one of which was postponed to the next sitting. 77 SAS members of staff achieved a higher level of scientific qualification in 2015.



TOP student 2013/2014 as well as the holder of the President of Slovakia, Ing. Thomas Bertók, PhD. from the Institute of Chemistry. He was awarded for his doctoral thesis in the field of biotechnology, which was given to one of the most sensitive methods for the detection of glycoprotein (complex sugars).

II.3

SAS Projects

SAS research teams can apply for projects within the following national grant schemes:

a) VEGA –Scientific Grant Agency of the Ministry of Education, Science, Research and Sport SR (MŠVVaŠ SR), which provides a common, coordinated approach when selecting and assessing projects for basic research at institutes, universities and scientific institutions of SAS. Currently VEGA is a stable system which has been operating without interruption since 1995. The budget for VEGA research teams from SAS was € 4 516 769 for the year 2015.

b) APVV –Agency for promotion of research and development is a national grant agency that supports projects in the framework of general calls and specific APVV programs; research teams from SAS acquire projects under the general APVV call on average of EUR 7.800m per call.

c) VA –Research agency is focused on the implementation of the Operational Research and Development Programme

d) SAS – within its own budget, SAS supports the participation of research collectives in selected ERA-net schemes and in particular in international cooperation schemes such as MOS Taiwan, V4 cooperation, JST etc.

e) SAS projects supporting cutting edge research:

SAS Scholarship

As part of the objective of promoting excellent science and cutting-edge research at SAS, we implemented the first call for the SAS Scholarship in 2013. The SAS scholarship program, approved in 2012 by the SAS Presidium, aims to bring excellent foreign researchers up to the age of 40 years who are currently working abroad in the field of science and research to SAS workplaces. The goal is to reinforce SAS workplaces with people with experience at leading foreign research institutions which will contribute to the development of Slovak science in the national and international context. In the first call in the program 11 applicants were enrolled, of which three were recommended for funding based on the opinions and discussions of assessment committees. The SAS Presidium approved funding for 4-year placements for incoming researchers. The project is currently on hold due to the fact that SAS won the 2013 Marie Curie project COFUND which has a similar focus.

SASPRO

The Slovak Academy of Sciences received the SASPRO program in 2013 as part of the 7th EU Framework Programme - Marie Curie Actions - People scheme.

This project aims to attract researchers from abroad and motivate them to create conditions for work at SAS organizations. Equally important is the effort to enable Slovak scientists to return from abroad. SASPRO focuses on the mobility of scientists responding to the problem of brain drain while trying to attract top scientists from prestigious world workplaces. The COFUND scheme has the financial means to create

and implement projects jointly paid by means of SAS and the European Commission at a ratio of 60: 40. The budget for the operation of the five-year program is a maximum of EUR 7.8 million.

After the first call which was completed in December 2014, the Presidium of SAS accepted 19 grantees. In the second call which concluded in July 2015, we accepted 8 candidates and in the third and final call we approved 13 candidates. For all three calls 40 scientists (from 138 submitted projects) were accepted altogether, 16 of whom were scientists from the Slovak Republic, 24 originating from other countries (Hungary, Poland, Austria, Germany, Romania, Serbia, Norway, Finland, India, Ukraine, Croatia, Spain, Greece, the Netherlands and Brazil). The average duration of a project is 34 months. All projects must be completed by 31.12.2018.

On the occasion of the end of the first reporting period of the SASPRO program (24 months) a meeting of representatives of the Executive Research Agency, the implementation team for the SASPRO programme and project grantees took place in November 2015.

SAS Centres of Excellence

To support quality research, SAS has an SAS Centres of Excellence program. The program which is more than 10 years old is now attenuating in particular on the SAS scholarship program and the aforementioned SASPRO programme.

f) SAS HORIZON2020 projects

In the field of science with society and science for society, SAS acquired a project called Horizon 2020 CIMULACT (Citizen and Multi-Actor Consultation on Horizon 2020) in 2015. The main objective of the project is to contribute to increasing the significance and scope of scientific policy at both the European and national level. The CIMULACT project involves key stakeholders and members of the public in the creation of a joint research program based on real and legitimate social visions, needs and requirements. The project is to expand awareness and debate on matters of science and technology, increase scientific literacy which includes the understanding of the role of science and technology in society and to create a common understanding among key actors in science, policies and citizens. Establishing a functioning dialogue will lead to debate and create visions and desired future scenarios, and these are used to inform recommendations and proposals in the field of scientific policy. CIMULACT includes actors in 28 EU countries, Norway and Switzerland.

The Slovak Academy of Sciences organized a National Seminar for citizens in science (Národný seminár občanov vo vede), held on 28 November 2015 at the Centre of Scientific and Technical Information in Bratislava. The seminar was attended by 35 members of the public (21 women and 14 men), to enable the utmost diversity of participants who met the criteria (per registration forms). All age groups were represented as well as all Slovak self-governing regions and various professions: students, employees of the public and private sector, entrepreneurs, unemployed people, pensioners and people on parental leave or at home.

The most interesting aspects of the areas discussed were:

- Popularization of science and technology for the lay public;
- Technology for better health;
 - Unlimited possibilities for the future: transport, health and dissemination of ideas;
- futurofarma and space tourism;
- Technology – will it replace humanity?

VEGA

In 2015, the SAS Presidium approved the funding of 610 projects by SAS Institutes and 54 joint projects with universities on solutions involving investigators from SAS

CHAPTER IV

SAS in the international context

International cooperation is one of the main pillars underpinning the operation of SAS. Adequate participation in various forms of international cooperation is an essential prerequisite for improving the quality of research and the improvement of infrastructure. The development of international collaboration also presents possibilities for SAS organizations and their research teams for applying for additional funding to support research through international and domestic resources.

IV. 1.

SAS in European research

In 2015, SAS also actively participated in the establishment of a common European Research Area. The focus is the participation of researchers and research teams from SAS organizations in multilateral cooperation projects with partner organizations from the EU Member States, the development of bilateral relations on the basis of joint projects and exchanges. A prerequisite for development of cooperation is SAS representation in international scientific organizations and associations.

Activity in international scientific organisations

SAS purposefully builds relationships with international scientific institutions and associations at government level, the most important of which are the EU, UNESCO, CERN, ESA; as well as on the non-governmental level such as ICSU, SE, ALLEA, EASAC and others. In several of these organizations SAS also represents other scientific institutions in Slovakia.

The **ICSU** (International Council for Science) brings together international scientific societies, however members are also states represented by scientific organisations. Slovakia is represented by SAS. The ICSU is concerned with issues of scientific research and mainly supports the handling of serious problems in the protection of the environment and the development of human society. To this end it formulates interdisciplinary research programs providing administrative support and promoting its findings in international forums such as UNESCO and the UN.

ALLEA (All European Academies) is a federation of all European Academies of Sciences. There are currently 56 member academies from 41 countries. Its aims and objectives include drawing up "policy for science" in order to improve the conditions for scientific work as well as enhancing excellence and high ethical standards of science in Europe.

SAS is represented in ALLEA by Prof. Ježová, PhD., who is currently Vice President of ALLEA. In addition to the regular meetings of the ALLEA Council and the General Assembly, Dr. Ježová also participated in the joint ALLEA and JRC (Joint Research Center) "Science Meets Parliaments" event (15. 9. 2015 in Brussels), the aim of which was to present the importance of science to MEPs and to support scientific research for the economic, social and cultural development of the European Union. Another significant event was the ALLEA conference "Lund Revisited: Tackling Societal Challenges" (3rd-4th Dec 2015 in Lund, Sweden), which dealt with the role of science and in particular with cutting-edge research for solving pressing social problems.

EASAC (European Academies Science Advisory Council) is made up of national academies of EU Member States. It enables cooperation between academies, brings together statements of national academies and provides consultancy for policy-laws within the EU. EASAC creates a relevant analysis of the scientific aspects of current issues, assesses and advises on setting European official regulations, organizes seminars focused on identifying scientific views on the main issues currently being addressed by the European Commission, organizes seminars aimed at briefing for policy on European official regulations within the EU, issues statements on topics debated at the European Commission and presents brief overviews on these topics.

In 2015, SAS organized in cooperation with EASAC and the Joint Research Center (JRC) a seminar on "Management of spent nuclear fuel and its waste" (Bratislava, 9. 6. 2015). Keynote lectures on the issue of waste treatment and disposal of nuclear fuel were delivered by JRC expert on the subject, Pierre Kockerols.

On 18th-20th Nov 2015 on the premises of the SAS Congress Centre in Smolenice an EASAC Council meeting was held which involved a joint meeting with representatives of SAS. Both sides agreed on the need for greater participation of SAS scientists in EASAC activities.

SE (Science Europe) is an association of organizations which finance European research and implementing research. The aim of SE is to promote common interests in research funding in Europe. SE supports its member organizations in their efforts to promote European research, strengthening the European Research Area through the direct involvement of key partners, collaborating with European universities, academies, scientific organizations and the European Commission. As part of its activities, it takes into account the interests and opinions of researchers from all European research systems. It provides a platform for dialogue at the European level and cooperates with non-European research organizations as well as contributing to the development of the economy in Europe. SAS has been a member since 2013 and Prof. Daniela Ježová is the SAS representative.

The **ESF** (European Science Foundation) was originally a 78 member organization which aimed to bring together scientists through scientific programs, networks, workshops, projects of mutual cooperation and conferences. Another aim of the ESF was to contribute to the development of strategic plans for research in Europe. In 2015 ESF did not manage to fulfil these goals which are overlapping with those of other international organizations and associations and therefore ceased its activity. Some of its leaders are currently developing efforts to transform the institution which should provide various services to scientific institutions. SAS which was one of two representatives of Slovakia to the organization (second representative was APVV) has not taken part in these activities which do not correspond with the original focus of ESF (and require inter alia a change of its name), and therefore terminated its membership of the organisation on 31. 12. 2015.

The **ESA** (European Space Agency) is an intergovernmental space research organization of 18 Member States, founded in 1974. The research focuses on monitoring the environment, meteorology, Aeronomy and Geoinformatics research on the Solar System as well as navigation and safety systems. In 2010 an agreement was signed between the Slovak Republic and ESA on Slovakia's entry to the first of three phases of research cooperation and the use of space for peaceful purposes.

SAS has actively participated in the activities of ESA primarily on cosmic science, microgravity research (cosmic biology and medicine) and materials processing, including the development of advanced alloys and material architectures suitable for use in outer space. In 2015 work on two projects with the participation of SAS continued (details on the projects are featured in Annex 5, Table IV-7).

Activities of national committees

SAS coordinates the activities of 21 national committees that ensure coordination of activities of Slovak scientists in international unions associating scientists by fields. Following reports on the activities of the individual committees, SAS paid membership fees and other costs associated with the activities of committees in the total amount of € 92,080 in 2015. The list of committees is featured in Annex 5, Table IV-1.

Bilateral scientific cooperation

SAS has concluded 44 bilateral agreements on scientific cooperation (MAD) with scientific institutions in 34 countries, which allows SAS to send and accept foreign workers in the total scope of 4,700 man-days per year. Based on this agreement bilateral projects were implemented as were short stays of SAS scientists at foreign institutions, stays of foreign workers at SAS workplaces and attendance at professional conferences and other events, as well as ways to acquire new contacts or prepare joint projects. Within the framework of bilateral scientific cooperation, SAS worked on a total of 83 projects (Argentina, Bulgaria, Czech Republic, Hungary, Germany, Poland, Italy), and 22 joint research topics (Ukraine).

In accordance with the concluded agreements, 191 SAS scientists travelled abroad in 2015 with 1 438 overnight stays and 173 foreign scientists arrived from abroad and spent a total of 1 131 days (this number includes the deployment and adoption in projects with the Czech Republic and Hungary). An overview of inbound and outbound travel on the basis of inter-academic agreements for the year 2015 is featured in Table IV-2 annex 5.

In countries where SAS has no MAD agreement, it makes use of contacts at governmental level – cultural agreements or agreements for scientific and technical cooperation.

Bilateral inter-academic agreements are continuously being updated. In 2015, a new implementation protocol was signed in addition to the agreement on scientific cooperation between SAS and the Bulgarian Academy of Sciences for the period 2015 to 2017, a new agreement on project cooperation between SAS and the German Academic Exchange Service (DAAD) for the period 2015-2016, a new implementation protocol in addition to the agreement on scientific cooperation between the Academy of Sciences and the Chinese Academy of Sciences and the Academy of Sciences and the Chinese Academy of social Sciences in the period 2015 – 2017. Preparation began on new implementation protocols for an additional cooperation period between SAS and the Hungarian Academy of Sciences, the Academy of Scientific Research and Technology (ASRT) Egypt and the Polish Academy of Sciences.

In 2015, calls were announced for joint mobility projects between SAS and the Academy of Sciences of the Czech Republic, CONICET (Argentina), the Hungarian Academy of Sciences, the National Research Council (Italy) and the Polish Academy of Sciences.

In addition to bilateral cooperation and exchange at the central level for the mutual exchange of scientists involved, SAS organizations are also involved in direct bilateral agreements between SAS organizations and foreign research institutions (interdepartmental agreements). Based on the interdepartmental agreements a researcher exchange took place with foreign institutions in approximately the same capacity as per the central agreement.

Multilateral scientific cooperation

Horizont 2020 and 7th Framework programme projects

Multilateral scientific cooperation formed the focus of international cooperation for SAS in 2015. Undoubtedly the most important part of multilateral cooperation is participation in handling projects within the European Union, particularly the 7th Framework Programme (FP7) and Horizon 2020 (H2020). 2015 was in this respect a transition year, whereby the remaining FP7 projects continued to be addressed while SAS organisations bid on further H2020 projects. SAS institutes took part in 38 FP7 projects and 18 H2020 projects. SAS teams participated in the preparation of 62 H2020 project proposals in 2015, 6 of which saw SAS take the role of proposal coordinator. Although the H2020 program is only beginning, the number of projects worked as well as the number of submitted proposals with SAS cannot be considered satisfactory. This situation is to some extent a consequence of a different structure of the H2020 program compared to that of FP7, its higher competitiveness and strong competition, but also the fact that projects supported by EU structural funds ended in 2015. However, if SAS does not want to lose step with European partners, it must increase its participation in H2020.

Cost projects

In other programs SAS recorded high participation particularly in COST projects (91, which is an increase of nearly 25 percent in comparison with 2014). COST (European Collaboration in Science and Technology) is the oldest European transversal program for scientific and technical cooperation amongst the EU Member States and EFTA countries. Cooperation takes place through the coordination of national research projects which are nationally funded. The essence of the COST program is networking around research projects in those areas that form the common interest of participants from at least five countries. Participation in the COST project is important from the point of view of building potential partnerships for applying for H2020 projects, as well as in terms of the involvement of young scientists. Increased participation in COST projects should therefore be reflected in the growth of participation in H2020 projects. Together with international partners, SAS workplaces were involved in COST projects in joint research mainly in the fields of medicine, chemical engineering, new materials and environmental protection. An overview of the projects is featured in Annex 5, Table IV.

ESF Projects

ESF completed two projects at SAS in 2015. As in other types of projects and their implementation, these projects were financed from the budgetary resources of SAS. An overview of these projects can be viewed in Table IV-6 Annex 5.

ERA-NET Projects

The ERA-NET programme is a specific EU instrument for the coordination of national research programs through national agencies (owning ministries and organizations) to support science and research. The program has two phases: the first is to create a consortium of agencies that support research that proposes coordinating projects. Once projects are approved by the European Commission the consortia can then launch a call for research projects (second phase). While the consortium activity is supported by EU funds, project research is covered by the agencies from their own resources. The ERA-NET program is set to continue under H2020. An important change compared with earlier periods is that the ERA-NET scheme will be carried out under the COFUND scheme which means that part of the funds contributing to a project's progression (up to 30percent, depending on the consortium contract) will be paid by the EU on completion of the project.

In 2015 SAS was a member of several consortia (listed in Table IV-8 in annex 5) and actively participated in the preparation of several coordination projects and their administration. SAS is involved in the activities of certain consortia as an associated member with the prospect of full membership after approval of the new coordination projects under H2020.

SAS participation in coordinating projects enables teams from SAS organizations to participate in the administration of these research projects. In 2015, SAS organizations were involved in the nine ERA-NET research projects with total support in the amount of € 203,291 (overview of projects featured in Table IV-9 in Annex 5).

SAS is gradually broadening its participation in ERA-NET consortia to enable the participation of teams from a wider range of disciplines from all scientific fields. As the cost of handling research projects is covered by SAS from its own budget, further increasing the participation of SAS in the ERA-NET will depend on obtaining additional resources.

Other projects

Other programs that SAS organizations are involved in include the International Visegrad Fund (IVF), in which SAS was involved in 13 projects and UNESCO (six projects). In cooperation with UNESCO, SAS participated in the International Hydrological Programme (IHP). SAS workplaces were represented in other major international programs such as IAEA, NATO, IEA, CERN and EMRP.

IV. 2. Cooperation with economically and research developed countries

Taiwan

The joint research project (Joint Research Project - JRP) programme is the result of a bilateral agreement on scientific cooperation between SAS and MOST (Ministry of Science and Technology, formerly the National Science Council) Taiwan. Cooperation is not thematically limited; calls phrased in general terms are open to all SAS organizations. In 2015, SAS organizations handled eight research projects (Table IV-10 Annex 5) together with their Taiwanese counterparts with total support in the amount of € 186,200.

In 2015 the MOST SAV-JRP programme announced the 7th call for research projects for the period 2016 - 2018. Seven applicants submitted proposals for the open call. Proposals were evaluated by selection committees specifically on the sides of Slovakia and Taiwan. Based on the results of the evaluation, three projects were approved for funding (Table IV-10b of Annex 5).

Turkey

SAS has a cooperation agreement with Turkey based on the agreement with TUBITAK (Turkish Council for Scientific and Technological Research). According to this agreement there are currently two types of projects:

- **Projects supporting mobility.** Projects are administered continuously throughout the year. Two projects are currently being addressed.
- **Joint research projects programme (JRP).** This program was launched in 2013. Throughout the year, usually in the first half, a call was opened for pre-approved topics to be announced on both sides. The four projects approved for funding in 2014 were continued in 2015. Funding for one project was approved following a call launched in 2015. The total amount of support amounted to € 152,766. An overview of projects is featured in Table IV-11 Annex 5.

Japan

In 2014 a Memorandum (MoU) was signed in Bratislava on scientific and technological cooperation between the countries of the Visegrad Group (International Visegrad Fund, Ministry of Education, Youth and Sports for the Czech Republic, the National Centre for Research and Development of Poland, the Slovak Academy of Sciences and Japan (Japan Science and Technology Agency). The aim of the MoU is to intensify the cooperation of scientists from V4 countries (Czech Republic, Hungary, Poland and Slovakia) and Japan. At the beginning of 2015 the first call for joint research projects was declared. The topics of the first call were materials for extreme environments, materials for electronics and light construction materials for energy production. 56 projects were submitted as part of the call, five of which were approved for funding including three with the participation of SAS (Table IV-12 Annex 5).

SAS also organized a meeting of the Scientific Committee in 2015 as well as a Funding Organizations Meeting.

The People's Republic of China

In 2015 there was a revival of contact with China. In April, Prof. J. Dusza visited the Chinese province of Henan and attended the 3rd World Emerging Industries Summit, an event focused on advanced materials, the Internet and new information technologies, new means of transport, biotechnology and nature preservation. Throughout the conference, SAS representatives gained a number of contacts with important Chinese experts. A further series of meetings with Chinese partners began with the visiting delegation of representatives of North-western Polytechnical University, Xi'an (NPU) to SAS in September 2015, which followed the visit of the President of the Academy of Sciences prof. Šajgalík to NPU. The outcome of negotiations with representatives of the universities was an agreement to organize a joint seminar in 2016 in Slovakia as well as the Memorandum of Understanding between SAS and NPU in which both sides declared their willingness to establish joint laboratories. At the end of 2015 Prof. Dusza visited NPU once again to discuss the specific format of projects with representatives of universities and laboratories involved of common laboratories of SAS - NPU in the field of advanced ceramic materials. The result is an Agreement on Establishing a Joint Laboratory of Advanced Ceramics which will be worked into its final form before next steps to implement the agreement in 2016 are taken.

On 16. 12. 2015 the 3rd High-Level Think Tanks Symposium of China and Central and East European Countries (CEE) took place in Beijing. The aim of the event was to create common platforms for mutual cooperation between China and Central and Eastern European countries in the area of science and research with an emphasis on solving current social issues. The new platform called the China-CEEC Think Tanks Network should boost the dynamics of cooperation between China and the countries of Central and Eastern Europe in the field of science.

Korea

V4 – Korea Joint Research program on Scientific and Technological Cooperation

On 2. 12. 2015 a Memorandum on scientific and technological cooperation between the V4 countries (International Visegrad Fund, Ministry of Education, Youth and Sports, the National Centre for Research and Development of Poland, the Slovak Academy of Sciences) and Korea (The Ministry of Science, ICT and Future Planning of the Republic of Korea) was signed in Prague. This memorandum paves the way for cooperation between partners through joint research projects. The first joint call will be launched in 2016.

Memorandum of Understanding between the Korea Institute of Materials Science (KIMS) and the Slovak Academy of Sciences

On 2. 12. 2015 President of SAS prof. Paul Šajgalík and President Dr. KIMS Hai-Doo Kim signed a memorandum of understanding that establishes cooperation between SAS and KIMS. This aims to strengthen the institutional exchange of scientists, promote the exchange of scientific and technical information and encourage joint research activities and other activities resulting in joint research projects.

IV. 3. SAS activities in the development of international cooperation

Cooperation between V4 country academies

On 12 to 13 October 2015 representatives of the V4 academies of science met at the SAS Congress Centre in Stara Lesna. The delegations discussed the experience of the process of transformation of the academies, and representatives of the Czech, Hungarian and Polish Academy of Sciences stressed the positive aspects of the transition to being public institutions. Another topic was public relations, in particular the presentation of academies in relation to the governments and parliaments of the V4 countries, as well as problems related to applied research and human resource development. Much attention and discussion resulted from a presentation by Hana Sychrová (ASCR) on the latest programs to support young scientists in the Academy of Sciences. Prof. Rivža of the Latvian Academy of Sciences, who presented the cooperation of Academy of Sciences of Latvia, Lithuania and Estonia also took part in the discussion. Part of the meeting was the presentation of young scientists, laureates of the young researcher award, this time on the topic of "Language and literature". SAS was represented by Lucia Satinská of the SAS Ludovit Stur Institute of Linguistics.



V4 Academy representatives (from the left): prof. Jiří Drahoš (President of the Academy of Sciences of the Czech Republic), prof. Jerzy Duszyński (President of the Polish Academy of Sciences), prof. Pavol Šajgalík (President of the Slovak Academy of Sciences) and prof. Domokos Szász (Vice President of the Hungarian Academy of Sciences).

Academy of Sciences of the Czech Republic

The development of relations with the Academy of Sciences of the Czech Republic (ASCR) holds a special place in international cooperation. As part of this cooperation, the second call for bilateral mobility projects between SAS and AS CR for the period 2016 – 2017 was announced in May. At the end of 2015, 23 project proposals were submitted and 16 were approved based on the results of the joint international tender.

The V4 Academies meeting in Stara Lesna was preceded on 12.10. 2015 by the session of representatives of the Presidium of the Slovak Academy of Sciences and the Academy of Sciences of the Czech Republic (ASCR delegation composed of Prof. Ing. Jiri Drahos, PhD. - President of the ASCR, Ing. Hana Sychrová. - member of the Academy Council of the Republic and President of the Foreign relations ASCR, and Mgr. Tařana Petrasová, PhD. - member of the Academic Council of the ASCR). Prof. Šajgalík informed our Czech colleagues on the progress and current state of

transformation of the Slovak Academy of Sciences in terms of the preparation of the act on public research institutions and highlighted some of the major problems associated with the legislative process, in particular the fact that the law had not yet been discussed by the Slovak government, despite the Legislative Council of the Slovak Government approving the bill in spring of that year.

Other key topics of the meeting were to evaluate the process of transition to a model of bilateral cooperation on bilateral mobility projects and exchange of experience with the accreditation of research centers in both academies.

Hungary

In May 2015 a call for bilateral mobility projects between SAS and the Hungarian Academy of Sciences (HAS) was announced for the period 2016 to 2018 and preparation for the new implementation protocol in addition to the agreement on scientific cooperation between SAS and HAS also began. The main emphasis has shifted to project collaboration. 11 project proposals were submitted for the call and the completion of the evaluation process and signing of the new implementation project in addition to the agreement on scientific cooperation between SAV and MAV is expected to follow in the first quarter of 2016. In the period 2013-2015 SAS addressed eight joint projects with HAS, while the framework annual exchange quota for projects was set at 200 days. The exchange quota outside of projects was set at 20 days.

Poland

SAS cooperation with Poland is based on agreements with the Polish Academy of Sciences (PAS) and the Polish Academy of Sciences and Arts (PAAS). According to the agreement with PAS, cooperation takes place in all fields of scientific collaboration through mobility projects and scientist exchanges (exchange quota is 40 weeks). In 2015, SAS organisations cooperated with Polish partners on 27 joint projects, including 13 projects addressed by Scientific Section 1 workplaces, 9 projects with Scientific Section 2 workplaces and 5 projects with Scientific Section 3 workplaces.

Laureates of the Young Researchers Award 2015: from the left: Zsolt Simon, Lucia Satinská and Pawel Mościcki.



Annexes:

International cooperation projects

**Table IV-1
National Committees**

	Abbreviation EN/FR/SK	National Committee Title English/French/ Slovak	SK Representative, function, workplace
1	CISH/ICHS (SNKH)	Comité Internationale des Sciences Historiques/Int.Committee of Hist.Sciences <i>Slovenský národný komitét historikov</i>	PhDr. B. Ferenčuhová President, SAS Institute of History
2	COSPAR	Committee on Space Research	prof. Ing. K. Kudela, DrSc. President, SAS Institute of Experimental Physics
3	IALE	International Association for Landscape Ecology <i>Slovenská asociácia pre krajinnú ekológiu</i>	doc. RNDr. E. Paudišová, PhD. Secretary in charge, Department of Human Geography and Demography
4	IAU	International Astronomical Union <i>Slovenský národný komitét pre Medzinárodnú astronómickú úniu</i>	RNDr. A. Kučera, CSc. President, SAS Astronomical Institute
5	IGU (SNGK)	International Geographical Union <i>Slovenský národný geografický komitét</i>	prof. RNDr. V. Ira, CSc. President, SAS Institute of Geography
6	IHP UNESCO	International Hydrological Programme UNESCO <i>NK pre Medzinárodný hydrologický program UNESCO</i>	RNDr. P. Miklánek, CSc. President, SAS Institute of Hydrology
7	INC (NNK)	International Numismatic Commission <i>Národný numizmatický komitét SR</i>	PhDr. J. Hunka, CSc. President, SAS Institute of Archaeology
8	IUCr (RKČSK)	International Union of Crystallography <i>Regionálny komitét českých a slovenských kryštaloografov</i>	prof. Ing. M.Koman, DrSc. Vice President, Slovak University of Technology in Bratislava, Faculty of Chemical and Food Technology
9	IUGG (SNKGG)	International Union of Geodesy and Geophysics <i>Slovenský národný komitét pre geodéziu a geofyziku</i>	prof. RNDr. M. Bielik, DrSc. President Department of Human Geography and Demography
10	IUGS (NGK)	International Union of Geological Sciences <i>Národný geologický komitét SR</i>	doc. RNDr. J. Michalík, DrSc. President, SAS Institute of Geology
11	IUPAC	International Union of Pure and Applied Chemistry <i>Slovenský národný komitét pre chémiu Medzinárodnej únie pre čistú a aplikovanú chémiu</i>	doc. RNDr.M.Drábik,PhD. President Faculty of Natural Sciences and the SAS Institute of Inorganic Chemistry
12	IUPAP	International Union of Pure and Applied Physics	prof. Ing. J. Cirák, CSc. President STU Faculty of Electrical Engineering and Information Technology
13	SCOPE	Scientific Committee on Problems of	prof. RNDr. P. Eliáš, CSc.

		Environment	Department of Ecology, Faculty of European Studies SPU Nitra
14	SCOSTEP	Scientific Committee on Solar – Terrestrial Physics	Mgr. M. Revallo, PhD. President SAS Institute of Geophysics
15	IFTtoMM	International Federation for the Promotion of Mechanism and Machine Science	doc. Ing. S. Žiaran, CSc. President Faculty of Mechanical Engineering, STU Bratislava
16	URSI	Union Radio Scientifique Internationale International Union of Radio Science	doc. Ing. V. Štofanič, PhD. President Faculty of Electrical Engineering and Information Technology in Bratislava
17	Future Earth (do r. 2015 DIVERSITAS)	International Programme on Biodiversity Science	Ing. J. Oszlányi, CSc. President SAS Institute of Landscape Ecology
18	IBRO	International Brain Research Organization	RNDr. N. Lukáčová, DrSc. President SAS Institute of Neurobiology
19	IMU	International Mathematical Union	prof. RNDr. A. Dvurečenskij, DrSc. President SAS Institute of Mathematics
20	IUFRO	International Union of Forest Research Organizations	Ing. J. Váľka, CSc. President SAS Institute of Forest Ecology
21	IUHPS	International Union of the History and Philosophy of Science	Doc. RNDr. J. Šebesta, PhD. President, Faculty of Mathematics, Physics and Informatics, UK

Table IV-2

Details on SAS staff mobility within the framework of international scientific cooperation within MAD

	No. Sent/received		Man days		Costs (€)	Projects
	Sent	Received	Sent	Received		
Argentina	3	3	41	15	673	2
Belgium	4	0	66	0	0	0
Bulgaria	23	26	185	181	8 935	18
Czech Republic	47	41	205	231	22 451	16
China	2	3	41	12	330	0
Egypt	0	3	0	54	2 591	0
Estonia	2	3	21	35	1 454	0
India	1	0	21	0	0	0

Israel	3	0	49	0	0	0
Canada	1	4	18	16	624	0
Latvia	0	1	0	4	108	0
Hungary	6	16	29	86	3 592	8
Germany	23	12	256	157	9 464	4
Poland	47	44	238	230	10 016	26
Romania	8	2	66	14	652	0
Slovenia	0	0	0	0	0	0
Serbia	0	1	0	5	147	0
Taiwan	0	3	0	27	1 564	1
Italy	12	6	101	32	1 328	6
Turkey	2	0	50	0	0	2
Ukraine	9	5	51	32	2 547	22
EÚ	172	151	1167	970	58 000	78
Others	21	22	271	161	8 477	27
Total	193	173	1438	1131	66 476	105

Table IV-3
Project overview 7. RP EÚ with SAS participation in 2015

SAS Organisation	Project title
SAS Scientific Section 1	
SAS Astronomical Institute	Topology and physical parameters of the magnetic fields of solar filaments
SAS Astronomical Institute	SOLARNET- High-Resolution Solar Physics Network
SAS Institute of Electrical Engineering	European development of superconducting tapes: Integrating novel materials and architectures into cost effective processes for high current applications and magnets
SAS Institute of Electrical Engineering	Superconducting, reliable, lightweight, and more powerful offshore wind turbine
SAS Institute of Physics	Simulators and Interfaces with Quantum Systems
SAS Institute of Physics	Quantum Technology for Europe
SAS Institute of Geotechnics	Water purification and soil from mixed contaminants
SAS Institute of Hydrology	Detection of Watercourse Contamination in Developing Countries Using Sensor Networks
SAS Institute of Informatics	Management of the Global Security of Air Traffic Services (Global ATM security management (GAMMA))
SAS Institute of Informatics	Systems for data interoperability rescue units (REDIRNET)
SAS Institute of Informatics	Virtual Enterprises Networked together by Interoperable Services
SAS Institute of Materials and Machine Mechanics	Innovative materials solutions for Transport, Energy and Biomedical sectors by strengthening integration and enhancing research dynamics of KMM-VIN

SAS Scientific Section 2	
SAS Institute of Botany	Building the European Biodiversity Observation Network
SAS Institute of Chemistry	Integrated Structural Biology Infrastructure
SAS Institute of Chemistry	Cancer diagnosis: Parallel sensing of prostate cancer biomarkers
SAS Institute of Chemistry	Electrochemical lectin and glycan biochips integrated with Nanostructures
SAS Institute of Chemistry	Microbial Resource Research Infrastructure
SAS Institute of Chemistry	Study of reaction mechanism of glycosyl transferases using ab initio molecular dynamics as a tool for design of inhibitors
SAS Institute of Parasitology	Assessment and Monitoring of the Impacts of Genetically Modified Plants on Agro-Ecosystems
SAS Institute of Inorganic Chemistry	Pushing the envelope of nuclear magnetic resonance spectroscopy for paramagnetic systems. A combined experimental and theoretical approach (pNMR)
SAS Institute of Inorganic Chemistry	Nitride Materials with Functional Properties for Energy Applications
SAS Institute of Experimental Endocrinology	Integrated Structural Biology Infrastructure
SAS Institute of Plant Genetics and Biotechnology	Plant adaptation to heavy metal and radioactive pollution
SAS Institute of Landscape Ecology	Operationalization of Natural Capital and EcoSystem Services: From Concepts to Real-world Applications – OpenNESS
SAS Institute of Molecular Biology	STREPSYNTH - Rewiring the Streptomyces cell factory for cost-effective production of biomolecules
SAS Institute of Molecular Physiology and Genetics	Clinical Development of Nitisinone for Alkaptonuria
SAS Institute of Molecular Physiology and Genetics	Mitochondria-endoplasmic reticulum functional interplay in Wolfram Syndrome: emerging role for heart and brain protection
SAS Polymer Institute	Molecular and atomic probed series elastomers in relation to the relaxation dynamics of broad-band dielectric spectroscopy
SAS Institute of Zoology	Biology and Control of Vector-Borne Infections in Europe
SAS Biomedical Research Center (Institute of Virology)	Anti-tick Vaccines to Prevent Tick-borne Diseases in Europe
SAS Biomedical Research Center (Institute of Virology)	Biomedical Engineering for Cancer and Brain Disease Diagnosis and Therapy Development
SAS Biomedical Research Center (Institute of Virology)	New Drugs Targeting Influenza Virus Polymerase
SAS Scientific Section 3	
SAS Institute of Economy	Employment 2025: How Multiple Transitions Will Affect the European Labour Market
SAS Institute of Economy	WWWforEurope - Welfare, Wealth and Work for Europe
SAS Institute for Research in Social Communication	Building a platform for enhanced societal research related to nuclear energy in Central and Eastern Europe

SAS Institute for Forecasting	Role of Science in Strategic Planning of Economic Growth and Sustainable Consumption: Linking Research and Public Policy-Making
SAS Institute for Forecasting	Youth Mobility: maximizing opportunities for individuals, labour markets and regions in Europe
SAS Institute for Forecasting	Lifelong Learning, Innovation, Growth and Human Capital Tracks in Europe
SAS Institute for Sociology	Media-hosted eParticipation in Slovakia

**Table IV-4
H2020 Project overview with SAS participation 2015**

SAS Organisation	Project title
SAS Scientific Section 1	
SAS Institute of Electrical Engineering	EUROfusion - Implementation of activities described in the Roadmap to Fusion during Horizon2020 through a Joint programme of the members of the EUROfusion consortium
SAS Institute of Physics	HELENIC-REF - Hybrid Electric Energy Integrated Cluster concerning Renewable Fuels
SAS Institute of Informatics	Engaging the EGI Community towards an Open Science Commons (EGI-Engage)
SAS Institute of Materials and Machine Mechanics	Creation of a center of excellence for the application of advanced materials
SAS Earth Sciences Institute	Brachiopods As Sensitive tracers of global marine Environment: Insights from alkaline, alkaline Earth metal, and metalloid trace element ratios and isotope systems
SAS Scientific Section 2	
SAS institute of Neuroimmunology	Coordination Action in support of the sustainability and globalisation of the Joint Programming Initiative on Neurodegenerative Diseases
SAS Institute Forest Ecology	European Long-Term Ecosystem and socio-ecological Research Infrastructure
SAS Institute Forest Ecology	Integrated Spatial Planning, land use and soil management Research Action
SAS Institute of Landscape Ecology	European Long-Term Ecosystem and Socio-Ecological Research Infrastructure – eLTER
SAS Institute of Landscape Ecology	Integrated Spatial Planning, land use and soil management Research ACTION - INSPIRATION
SAS Institute of Virology	European virus archive goes global
SAS Scientific Section 3	
SAS Center of Social and Psychological Sciences	YMOBILITY - Youth Mobility: maximizing opportunities for individuals, labour markets and regions in Europe

SAS Institute of Economic Research	FIRSTRUN - Fiscal Rules and Strategies under Externalities and Uncertainties
SAS Institute for Sociology	Strengthening and widening the European infrastructure for social science data archives
SAS Institute for Research in Social Communication	CIMULACT - Citizen and Multi-Actor Consultation on Horizon 2020

**TableIV-5
Overview of international COST projects with participation by SAS in 2015**

SAS Organisation	Project title
SAS Scientific Section 1	
SAS Astronomical Institute	The origin and evolution of life on Earth and in space
SAS Astronomical Institute	Polarization as a tool to study the Solar System and beyond
SAS Institute of Electrical Engineering	Hybrid energy storage devices and systems for mobile and stationary applications
SAS Institute of Electrical Engineering	Colloidal Aspects of Nanoscience for Innovative Processes and Materials
SAS Institute of Electrical Engineering	Advanced X-ray spatial and temporal metrology
SAS Institute of Electrical Engineering	Exchange of knowledge on ionic liquids
SAS Institute of Electrical Engineering	Modern X-ray and tomography imaging methods using phase contrast
SAS Institute of Electrical Engineering	Nanoscale Superconductivity: Novel Functionalities through Optimized Confinement of Condensate and Fields
SAS Institute of Electrical Engineering	HERALD - Hooking together European research in atomic layer deposition
SAS Institute of Physics	Thermodynamics in the quantum regime
SAS Institute of Physics	Advanced X-ray spatial and temporal metrology
SAS Institute of Physics	Stable Next-Generation Photovoltaics: Unravelling Degradation Mechanisms of Organic Solar Cells by Complementary Characterization Techniques
SAS Institute of Physics	Enhanced X-ray Tomographic Reconstruction: Experiment, Modelling, and Algorithms
SAS Institute of Physics	Nanoscale Quantum Optics
SAS Institute of Physics	Colloidal Aspects of Nanoscience for Innovative Processes and Materials
SAS Institute of Physics	Fundamental Problems in Quantum Physics
Institute of Geography SAS	Connecting European connectivity research
SAS Institute of Experimental Physics	Multifunctional Nanoparticles for Magnetic Hyperthermia and Indirect Radiation Therapy
SAS Institute of Experimental Physics	Nanoscale Superconductivity: Novel Functionalities through Optimized Confinement of Condensate and Fields
SAS Institute of	NGP-NET - Non-globular proteins - from sequence to structure,

Experimental Physics	function and application in molecular physiopathology
SAS Institute of Experimental Physics	Colloidal Aspects of Nanoscience for Innovative Processes and Materials
SAS Institute of Measurement Science	European network for innovative uses of EMFs in biomedical applications
SAS Institute of Measurement Science	European Network for Hyperpolarization Physics and Methodology in NMR and MRI
SAS Institute of Measurement Science	Colour and Space in Cultural Heritage
SAS Institute of Measurement Science	The origin and evolution of life on Earth and in space
SAS Institute of Materials Research	Electrospun Nano-fibres for bio inspired composite materials and innovative industrial applications
SAS Institute of Materials Research	Mechanical properties of materials for regenerative orthopaedic and dental medicine
SAS Institute of Materials Research	Advanced fibre laser and coherent source as tools for society manufacturing and life science
SAS Institute of Materials Research	Ferroelectric and Magnetoelectric Materials
SAS Institute of Materials Research	Porous composite biomaterial substrates of the biopolymer-calcium phosphate type for regenerative medicine
SAS Institute of Construction and Architecture	<i>Loss of the Night Network Initiative</i>
SAS Earth Science Institute	Time Dependent Seismology
SAS Earth Science Institute	A European network for a harmonized monitoring of snow for the benefit of climate change scenarios, hydrology and numerical weather prediction
SAS Earth Science Institute	Assessment of European Agriculture Water use and Trade under Climate Change
SAS Scientific Section 2	
SAS Institute of Botany	Building the European Biodiversity Observation Network
SAS Institute of Chemistry	Colloidal Aspects of Nanoscience for Innovative Processes and Materials
SAS Institute of Chemistry	Food waste valorisation for sustainable chemicals, materials & fuels (EUBis)
SAS Institute of Chemistry	Evaluation of waste lignocellulosic biomass for sustainable production of chemicals, materials and fuels using technologies with a low environmental use
SAS Institute of Chemistry	Mineral-improved crop production for healthy food and feed
SAS Institute of Chemistry	Systems biocatalysis
SAS Institute of Chemistry	Chemical approaches to targeting drug resistance in cancer stem cells
SAS Institute of Chemistry	Challenging organic syntheses inspired by nature – from natural products chemistry to drug discovery
SAS Institute of Chemistry	Multivalent glycosystems for nanoscience – MultiGlykoNano

SAS Institute of Neuroimmunology	Non-globular proteins - from sequence to structure, function and application in molecular physiopathology (NGP-NET)
SAS Institute of Parasitology	European Network for underestimated vectors and vector-borne infections
SAS Institute of Parasitology	European Network on Taeniosis/Cysticercosis
SAS Institute of Parasitology	European Network of Investigators Triggering Exploratory Research on Myeloid Regulatory Cells
SAS Institute of Inorganic Chemistry	Our Astro-Chemical History
SAS Institute of Inorganic Chemistry	New generation biomimetic and customized implants for bone engineering
SAS Institute of Experimental Pharmacology & Toxicology	Challenging organic synthesis inspired by nature - from natural products to drug discovery
SAS Institute of Experimental Pharmacology & Toxicology	An integrated European platform for pancreas cancer research: from basic science to clinical and public interventions for a rare disease
SAS Institute of Experimental Pharmacology & Toxicology	Multi-target paradigm for innovative ligand identification in the drug discovery process
SAS Institute of Experimental Pharmacology & Toxicology	Structure-based drug design for diagnosis and treatment of neurological diseases
Institute of Forest Ecology SAS	Pine pitch canker - strategies for management of <i>Gibberella circinata</i> in greenhouses and forests
Institute of Forest Ecology SAS	<i>Fraxinus dieback</i> in Europe: elaborating guidelines and strategies for sustainable management
Institute of Forest Ecology SAS	Determining invasiveness and risk of <i>Dothistroma</i>
Institute of Forest Ecology SAS	A global network of nurseries as early warning system against alien tree pests (Global Warning)
Institute of Forest Ecology SAS	Endophytes in Biotechnology and Agriculture
Institute of Forest Ecology SAS	Studying tree responses to extreme Events: a synthesis
Institute of Forest Ecology SAS	Innovations in Climate Governance: Sources, Patterns and Effects
Institute of Forest Ecology SAS	European Information System for Alien Species
Institute of Forest Ecology SAS	Tourism, welfare and ecosystem services
Institute of Forest Ecology SAS	Network for sustainable ultrascale computing
Institute of Forest Ecology SAS	European Information System for Alien Species
Institute of Forest Ecology SAS	Forest Land Ownership Changes in Europe: Significance for Management And Policy
Institute of Forest Ecology SAS	Enhancing the resilience capacity of Sensitive mountain Forest ecosystems under environmental change
Institute of Animal Physiology	Large-scale methane measurements on individual ruminants for genetic evaluations

Institute of Animal Physiology	European network on the factors affecting the gastro-intestinal microbial balance and the impact on the health status of pigs
Institute of Animal Physiology	Epigenetics and Periconception Environment - Periconception environment as an epigenomic lever for optimising food production and health in livestock
SAS Institute of Plant Genetics and Biotechnology	Green Infrastructure approach: linking environmental with social aspects in studying and managing urban forests
SAS Institute of Plant Genetics and Biotechnology	Non-native tree species for European forests - experiences, risks and opportunities
SAS Institute of Plant Genetics and Biotechnology	Studying tree responses to extreme events: a synthesis
SAS Institute of Plant Genetics and Biotechnology	Pathogen-informed strategies for sustainable broad-spectrum crop resistance
SAS Institute of Plant Genetics and Biotechnology	Strigolactones: biological roles and applications
SAS Institute of Plant Genetics and Biotechnology	Plant Metabolic Engineering for High Value Products
SAS Institute of Plant Genetics and Biotechnology	The quest for tolerant varieties - Phenotyping at plant and cellular level
SAS Institute of Landscape Ecology	Enhancing the resilience capacity of Sensitive mountain Forest ecosystems under environmental change
SAS Institute of Molecular Biology	Next Generation Sequencing Data Analysis Network
SAS Institute of Molecular Biology	Understanding Movement and Mechanism in Molecular Machines
SAS Institute of Molecular Physiology and Genetics	Reactive Oxygen Species
SAS Institute of Molecular Physiology and Genetics	Gas transmitters: from Basic Research to Biological Applications
SAS Institute of Normal and Pathological Physiology	EU-ROS: The European Network on Oxidative Stress and Redox Biology Research
SAS Institute of Normal and Pathological Physiology	Gas transmitters: from Basic Research to Biological Applications
SAS Polymer Institute	Innovative application of regenerated wood cellulose fibres
SAS Polymer Institute	Sustainable flame retardancy for textiles and related materials based on nanoparticles substituting conventional chemicals
SAS Polymer Institute	New materials and devices based on conducting polymers and their composites– Stage 2.
SAS Polymer Institute	Stable Next-Generation Photovoltaics: Unravelling degradation mechanisms of Organic Solar Cells by complementary characterization techniques (StableNextSol).
SAS Biomedical Research Centre (SAS Institute of Virology)	Sustainable production of high-quality cherries for the European market
SAS Scientific Section 3	
SAS Institute of Archaeology	COSCH – Colour and Space in Cultural Heritage

SAS Institute of History	Reassembling the Republic of Letters, 1500-1800. A digital framework for multi-lateral collaboration on Europe´s intellectual history
SAS Ludovit Stur Institute of Linguistics	European network of electronic lexicography
SAS Ludovit Stur Institute of Linguistics	Parsing and Multi-word Expressions. Towards Linguistic Precision and Computational Efficiency in NLP
SAS Institute of Ethnology	Ageism - the multinational interdisciplinary perspective

TableIV-6
Overview of international research projects by SAV in 2015 as part of ESF

SAS Organisation	Programme title
SAS Institute of Art History	Courtly residence as a place of exchange between the late Middle Ages and early modern (1400-1700) – Palatium
SAS Ludovit Stur Institute of Linguistics	The European Network on Word Structure. Cross-disciplinary approaches to understanding word structure in the languages of Europe (NetWorDS)

TableIV-7
Overview of international research projects by SAV in 2015 as part of ESA

SAS Organisation	Project title
SAS Institute of Experimental Physics	JEM-EUSO, Extreme Universe Space Observatory Onboard Japan Experiment Module
SAS Institute of Materials and Machine Mechanics	Gravity Dependence of CET in Peritectic TiAl Alloys

TableIV-8
Overview of coordination projects with the involvement of SAV as part of the ERA-NET programme in 2015

EU 7th Framework Programme	
SAS Office	From materials science and engineering to innovation in Europe (M-ERA.NET)
SAS Office	Animal Health and Welfare (ANHWA)
SAS Office	Further involvement of Russia in ERA: Coordination of the program of member states and associated EU countries with Russia (ERA.Net RUS Plus)
SAS Office	Connecting and Coordinating European Research and Technology Development with Japan (CONCERT-Japan)
SAS Office	Network of European funding for Neuroscience research (ERA-NET NEURON II)

SAS Office	Korean scientific cooperation network with the European Research Area (KORANET)
SAS Office	Strengthening STI Cooperation between EU and Korea (KONNECT)
SAS Office	European Innovative Research & Technological Development Projects in Nanomedicine (EuroNanoMed II)
SAS Office	Innovation and Commercialization in the NMP thematic area (INCOMERA)
SAS Office	Coordinating National and Regional Funding for the FET Flagships (FLAG-ERA: (the FLAGSHIP ERA-NET)
Horizont 2020	
SAS Office	HC08 – 2014: ERA-NET: Aligning national/regional translational cancer research programmes and activities (TRANSCAN II)
SAS Office	Collaboration and alignment of national programmes and activities in the area of brain-related diseases and disorders of the nervous system (ERA-NET NEURON III)
SAS Office	ERA-NET Cofund Initiative in Quantum Technologies (QUANT ERA)
SAS Office	Coordinating National and Regional Funding for the FET Flagships (FLAG-ERA II (the FLAGSHIP ERA-NET)
SAS Office	ERA-NET: Systems medicine to address clinical needs (ERACoSysMed Cofund)
SAS Office	ERA-NET on Materials (including Materials for Energy) (M ERA.NET 2)
SAS Office	ERA-NET: Cardiovascular diseases (CVD – ERA)
SAS Office	Sustainable Animal Production (SusAn)
SAS Office	H2020-NMBP-ERA-NET-2016 Cofund on Nanomedicine (EuroNanoMed III)

TableIV-9
Overview of international research projects by SAV in 2015 as part of the ERA.NET (7. RP EÚ, HORIZONT 2020) programme

SAS Organisation	Project title(acronym)
M – ERA.NET	
SAS Institute of Experimental Physics	Magnetically active anisotropic composite systems (MACOSIS)
SAS Institute of Physics	Surface engineering and advanced coatings for the next generation of X-ray diffractive optics (XOPTICS)
SAS Polymer Institute	Multifunctional Materials for advanced Neural interfaces. (M2Neural)
SAS Institute of Materials Research SAS Institute of Inorganic Chemistry	Graphene-ceramic composites for tribological application in aqueous environments (GRACE)

SAS Institute of Materials Research	Novel explosive welded corrosion resistant clad materials for geothermal plants (ExploGuard)
SAS Institute of Physics	New Exchange-Coupled Manganese-Based Magnetic Materials (NEXMAG)
ERA-NET NEURON II	
SAS Institute of Experimental Endocrinology, BMC SAV	Mechanisms of Lymphocytes Transmigration Across the Blood Brain Barrier; NEURON ERA Net II) (MELTRA-BBB)
ERA.Net RUS Plus	
SAS Institute of Materials and Machine Mechanics	Lightweight nanocrystalline aluminium based material for space applications (modelling and technology verification) (LightMat4Space)
SAS institute of Virology	Development of the galectin-ranking therapeutics for the treatment of hantavirus hemorrhagic fever (GalHant)

TableIV-10b
Projects handled as part of bilateral scientific cooperation between SAS and MOST Taiwan in 2015

SAS Organisation	Project title(acronym)
2012 call	
SAS Institute of Inorganic Chemistry	New inorganic phosphors for energy-efficient lighting sources which are free of rare earth elements.
SAS Institute of Chemistry	The development of potent and selective inhibitors of glycosyltransferases
2013 call	
SAS Institute of Experimental Endocrinology	Skeletal muscle as a mediator of beneficial effects of regular exercise on cognitive functions and metabolism in patients with Alzheimer's disease: the role of muscle myokines and microRNAs
SAS Institute of plant genetics and biotechnology	Studying the mechanisms of male sterility regulated DAF, genome-RING finger E3 ligase, and its use in agriculture
SAS Institute of Construction and Architecture	Applications of meshless methods in computational mechanics
2014 call	
SAS Polymer Institute	The synthesis of well-defined new copolymers using living polymerization methods and advanced chromatographic techniques
SAS Institute of Virology	ONC-CA9 - Association of the hypoxia-induced carbonic anhydrase IX with drug response, miRNA profile and oncogenic pathways: from integrative analysis of the NCI60 cancer cell panel to cancer patients
SAS Institute of Molecular Biology	Exploring Microbial Diversity and Functionality in Thermophilic Bioreactors for Innovation in Biotechnology

TableIV-11
Projects approved as part of bilateral scientific cooperation between SAV and TÜBİTAK in 2015

SAS Organisation	Project title(acronym)
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SAS Institute of Physics	Physically processed rapidly quenched alloys for detection of low magnetic fields
SAS Institute of Physics	Towards Low-Cost and Highly Efficient Polymer Based Organic Photovoltaics via Incorporation of Graphene and Noble Metal Nanoparticles
SAS Institute of Inorganic Chemistry	Development of ceramics composites materials for bio-applications
SAS Institute of Materials and Machine Mechanics	Investment casting of turbine blades from nickel based superalloys
SAS Institute of Materials and Machine Mechanics	Magnesium Nanocomposites for Biodegradable Medical Implants
SAS Polymer Institute	Photovoltaic and Sensor Properties of Plasma and Chemical Functionalized Graphene and Carbon Nanotubes

TableIV-12
Projects approved and handled within the 1st call for the V4-Japan Programme in 2015

SAS Organisation	Project title(acronym)
SAS Institute of Electrical Engineering	Highly Safe GaN Metal-Oxide-Semiconductor
SAS Institute of Physics	Nanophotonics with metal – group-IV-semiconductor nanocomposites: From single nanoobjects to functional ensembles
SAS Institute of Geotechnics	Structure-function relationship of advanced nanooxides for energy storage devices

Statistics on published and editorial activity

SCIENTIFIC SECTION I

Published works and editorials	No. in 2015/ vs 2014
1. Scientific monographs published at domestic publishing houses (AAB, ABB, CAB)	9 / 1
2. Scientific monographs published at foreign publishing houses (AAA, ABA, CAA)	3 / 0
3. Expert monographs, university textbooks and textbooks published at domestic publishing houses (BAB, ACB)	11 / 0
4. Expert monographs, university textbooks and textbooks published at foreign publishing houses (BAA, ACA)	0 / 0
5. Chapters in scientific monographs published at domestic publishing houses (ABD, ACD)	0 / 1
6. Chapters in scientific monographs published at foreign publishing houses (ABC, ACC)	25 / 1
7. Chapters in specialized monographs, university textbooks and textbooks published at domestic publishing houses(BBB, ACD)	3 / 1
8. Chapters in specialized monographs, university textbooks and textbooks published at foreign publishing houses (BBA, ACC)	5 / 0
9. Scientific and expert works in publications and featured in Current Contents (ADC, ADCA, ADCB, ADD, ADDA, ADDB, CDC, CDCA, CDCB, CDD, CDDA, CDDB, BDC, BDCA, BDCB, BDD, BDDA, BDDB)	763 / 29
10. Scientific and expert works in journals (ADE, ADEA, ADEB, ADF, ADFA, ADFB, CDE, CDEA, CDEB, CDF, CDFA, CDFB, BDE, BDEA, BDEB, BDF, BDFA, BDFB)	153 / 19
11. Scientific and expert works in textbooks (conference and non-conference, publications or on CD)	

a/ reviewed (AEC, AED, AFA, AFB, AFBA, AFBB, BEC, BED, CEC, CED)	157 / 3
b/ reviewed (AEE, AEF, AFC, AFD, AFDA, AFDB, BEE, BEF)	57 / 7
12. Other periodicals recorded in Current Contents	11
13. Other published periodicals	7
14. Published or edited textbooks from scientific events (FAI)	23 / 1
15. Scientific works published on the internet (GHG)	19 / 0
16. Translations of scientific and expert texts (EAJ)	0 / 0
17. Keywords in expert terminological dictionaries and encyclopaedic publications *	0 / 0

Table2 Citations

CITATIONS	Number vs 2014
Citations in WOS (1.1, 2.1)	10523 / 266
Citations in SCOPUS (1.2, 2.2)	1522 / 146
Citations in other citation indexes and databases (9, 10)	212 / 46
Citations in publications not registered in citation indexes (3, 4)	1076 / 131
Reviews on the works of authors from the organisations (5, 6, 7, 8)	6 / 0

SCIENTIFIC SECTION II

Published works and editorials	No. In 2015 vs 2014
1. Scientific monographs published at domestic publishing houses (AAB, ABB, CAB)	8/0
2. Scientific monographs published at foreign publishing houses (AAA, ABA, CAA)	2/0
3. Expert monographs, university textbooks and textbooks published at domestic publishing houses (BAB, ACB)	5/0
4. Expert monographs, university textbooks and textbooks published at foreign publishing houses (BAA, ACA)	1/0
5. Chapters in scientific monographs published at domestic publishing houses (ABD, ACD)	19/0
6. Chapters in scientific monographs published at foreign publishing houses (ABC, ACC)	17/3
7. Chapters in expert monographs, university textbooks and textbooks published at domestic publishing houses (BBB, ACD)	13/0
8. Chapters in expert monographs, university textbooks and textbooks published at foreign publishing houses (BBA, ACC)	1/0
9. Scientific and expert works in journals recorded in Current Contents (ADC, ADCA, ADCB, ADD, ADDA, ADDB, CDC, CDCA, CDCB, CDD, CDDA, CDDB, BDC, BDCA, BDCB, BDD, BDDA, BDDB)	783/12
10. Scientific and expert works magazines (ADE, ADEA, ADEB, ADF, ADFA, ADFB, CDE, CDEA, CDEB, CDF, CDFA, CDFB, BDE, BDEA, BDEB, BDF, BDFa, BDFB)	192/17
11. Scientific and expert works in journals (conference and non-conference, published or on CD): a/ reviewed (AEC, AED, AFA, AFB, AFBA, AFBB, BEC, BED, CEC, CED) b/ not reviewed (AEE, AEF, AFC, AFD, AFDA, AFDB, BEE, BEF)	158/27 19/1
12. Published periodicals recorded in Current Contents	8
13. Other published periodicals	7
14. Published or recorded textbooks from scientific events (FAI)	26/0
15. Scientific works published on the internet (GHG)	11/1
16. Translations of scientific and expert texts (EAJ)	1/0
17. Keywords in expert terminological dictionaries and published encyclopaedias *	0/0

CITATIONS	No. In 2014
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Citations in WOS (1.1, 2.1)	14796/329
Citations in SCOPUS (1.2, 2.2)	2755/136
Citations in other indexes and databases (9, 10)	89/27
Citations in publications not registered in citation indexes (3, 4)	1169/118
Reviews from the work of authors from organisations (5, 6, 7, 8)	0/1

SAS Organisations

31. 12. 2015

Slovak Academy of Sciences

SECTION I – PHYSICAL, SPACE, EARTH AND ENGINEERING SCIENCES

Earth and Space Sciences

SAS Astronomical Institute
SAS Institute of Geography
SAS Institute of Hydrology
SAS Institute of Earth Science (Institutes of Geophysics and Geotechnics combined as of 1. 7. 2015)

Mathematical, Physical and Computer Sciences

SAS Institute of Physics
SAS Mathematical Institute
SAS Institute of Experimental Physics

Technical Sciences

SAS Institute of Electrical Engineering
SAS Institute of Geotechnics
SAS Institute of Informatics
SAS Institute of Materials and Machine Mechanics
SAS Institute of Materials Research
SAS Institute of Measurement Science
SAS Institute of Construction and Architecture

SECTION II – LIFE, CHEMICAL, MEDICAL AND ENVIRONMENTAL SCIENCES

Medical Sciences

- Biomedical Research Center
 - Cancer Research Institute BMC SAS
 - Institute for Clinical and Translational Research BMC
 - Institute of Experimental Endocrinology BMC
- Institute of Virology BMC
- Institute for Heart Research
- Institute of Experimental Pharmacology & Toxicology
- Institute of Molecular Physiology and Genetics
- Institute of Neurobiology
- Institute of Neuroimmunology
- Institute of Normal and Pathological Physiology

Biological and Chemical Sciences

Institute of Chemistry SAS
Institute of Inorganic Chemistry, Slovak Academy of Sciences
Institute of Molecular Biology
Institute of Zoology
Polymer Institute

Agricultural and Veterinary Sciences

Institute of Animal Biochemistry and Genetics
Institute of Animal Physiology
Institute of Botany
Institute of Forest Ecology SAS
Institute of Landscape Ecology
Institute of Parasitology SAS
Institute of Plant Genetics and Biotechnology

Section III – Social Sciences, Humanities, Arts and Culture

Historical Sciences

Institute of Archaeology
Institute of Ethnology
Institute of History

Humanities and Social Sciences

Center of social and psychological sciences
Institute for Research in Social Communication
Institute for Sociology
Institute of Economic Research
Institute of Philosophy
Institute of Political Sciences
Institute of State and Law

Arts and Culture

Institute of Art History
Institute of Musicology
Institute of Oriental Studies
Institute of Slovak Literature
Institute of World Literature
Institute of Theatre and Film Research
Jan Stanislav Institute of Slavistics
Ludovit Stur Institute of Linguistics

SPECIALIZED WORKPLACES

SAS Institute of Technology
SAS Encyclopaedic Institute
SAS Central Archives
SAS Central Library
VEDA, SAS Publishing House
SAS Computing Centre

SERVICE ORGANISATIONS

SAS Congress Center Smolenice
SAS Technical and Administrative Office for Institutes in Košice
Technical and Administrative Office for the Social Sciences Institutes