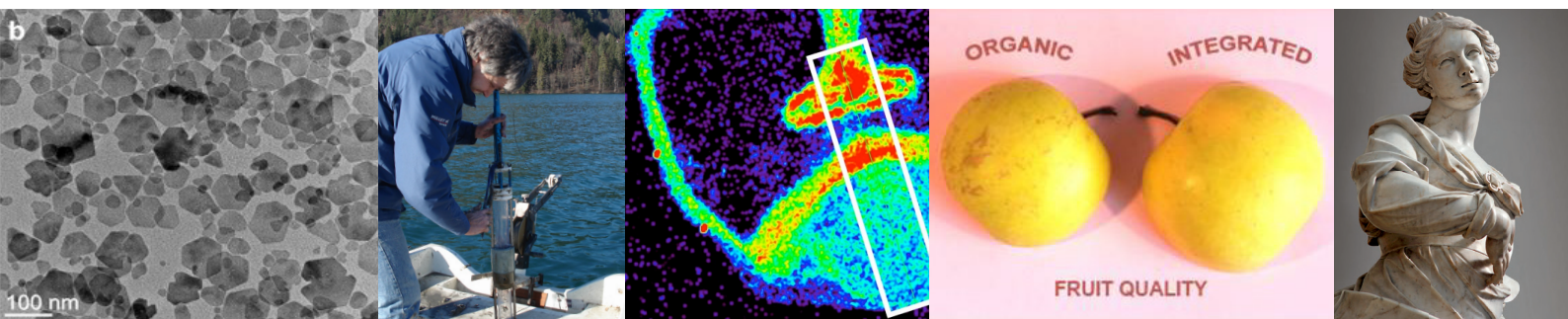


EXCELLENT IN SCIENCE 2013



Natural sciences and mathematics

Mathematics

Bucolic complexes

Physics

Highly polarized light from stable ordered magnetic fields in Gamma-Ray Burst GRB120308A

Physics

Spectroscopic signatures of resilient quasiparticles in bad metals

Physics

Ferromagnetism in suspensions of magnetic platelets in liquid crystal

Biology

Relevance for food sciences of quantitative spatially resolved element profile investigations in wheat (*Triticum aestivum*) grain

Biology

A molecular phylogeny of nephilid spiders: Evolutionary history of a model lineage

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Care of the environment

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The role of individual gastric emptying of pellets in the prediction of diclofenac *in vivo* dissolution

Engineering sciences and technologies

Civil engineering

Energy-efficient timber-glass houses, (Green energy and technology)

Energy engineering

Transfer of natural radionuclides from soil to grass

Materials

Highly Efficient TiO₂-Based Microreactor for Photocatalytic Applications

Materials

Chemical Decomposition as a Likely Source of Ambient and Thermal Instabilities of Layered Sodium Cobaltate

Systems and cybernetics

Sit-to-stand trainer

Computer science and informatics

NoiseRank method for anomaly detection in data

Computer science and informatics

Ground and building extraction from LiDAR data based on differential morphological profiles and locally fitted surfaces

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|------------------------------|---|---|
| | Electronic components and technologies | Donor-Acceptor Shape Matching Drives Performance in Photovoltaics |
| | Electric devices | IM Torque Control Schemes Based on Stator Current Vector |
| | Process engineering | Development of a conceptual electrocaloric cooling device |
| | Metrology | Methods of manufacturing optical devices |
| | Textile and leather | Functional patterning of biopolymer thin films using enzymes and lithographic methods |
| | Interdisciplinary research | Adsorption of blood proteins on plasmacleaned medical devices |
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| | Microbiology and immunology | Suspected early Lyme neuroborreliosis in patients with erythema migrans |
| | Stomatology | Dental pulp and gingivomucosa differ in type of neural cells that innervate them |
| | Oncology | Systemic therapy of advanced non- small cell lung cancer |
| | Oncology | Prospective phase II clinical trial |
| | Cardiovascular system | Long-term effects of CD34+ stem cell therapy in patients with dilated cardiomyopathy |
| | Public health | Gene-gene and gene-environment interactions in asbestosis |
| | Psychiatry | Psychotherapy for schizophrenia |
| Biotechnical sciences | Forestry, wood and paper technology | An article in the journal Soil Biology & Biochemistry (first journal in the field of Soil Science) |
| | Animal production | Development of the bioinformatics tool miRNA SNIper for the analysis of the genetic variability of micro RNA genes in vertebrates |
| | Plant production | Proteomic analysis of drought stress response in leaves of common bean |
| | Plant production | Targeted metabolomic profiling and sensorial quality of 'Golden Delicious', 'Liberty', 'Santana' and 'Topaz' apples grown using organic and integrated production systems |
| | Veterinarian medicine | Improvement of the procedure for the detection of Clostridium difficile in animals |
| | Biotechnology | Book monograph on medicinal plants |
| | Biotechnology | Designed nanoscale polypeptide tetrahedron |
| Social sciences | Educational studies | Organization of HER2013 |

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Economics

Willingness-to-pay for entrance fees as a rationale for adopting segmented pricing

Sociology

"I only have to ask him and he does it." Active fatherhood and (perceptions of) division of family labour in Slovenia

Law

Adjudication (before Constitutional and Regular Courts)

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Institutional quality dataset

Criminology

The individualization of punishment: Sentencing in Slovenia

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Development and application of the approach to territorial impact assessment in the case of European directive

Psychology

Happiness and pathways to reach it

Sport

Aerodynamic drag is not the major determinant of performance during giant slalom skiing at the elite level

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Seismic safety of passive houses founded on thermal insulation

Ethnic studies

Two homelands: Migration studies

Historiography

The cross and capital: Property, Financing and Business Endeavours of the Roman Catholic Church in Slovenia

Anthropology

"We're not one of you!" Antinationalism in post-war Sarajevo

Ethnology

Nationalization of the past

Linguistics

Grammatical morphology as a source of early number word meanings

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Blood and Milk in Medieval Imagery

Literary sciences

Classics and communism

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A Monograph on Francesco Robba

Theology

Spirituality of Balkan women: breaking boundaries: the voices of women of ex- Yugoslavia

Geography

Regional resources of Slovenia, Water resources of Bela Krajina

Interdisciplinary research

The motif of warning birds in Attila's siege of Aquileia and its survival and transformation in the *Origo civitatum Italiae seu Venetiarum*

Area **Mathematics**

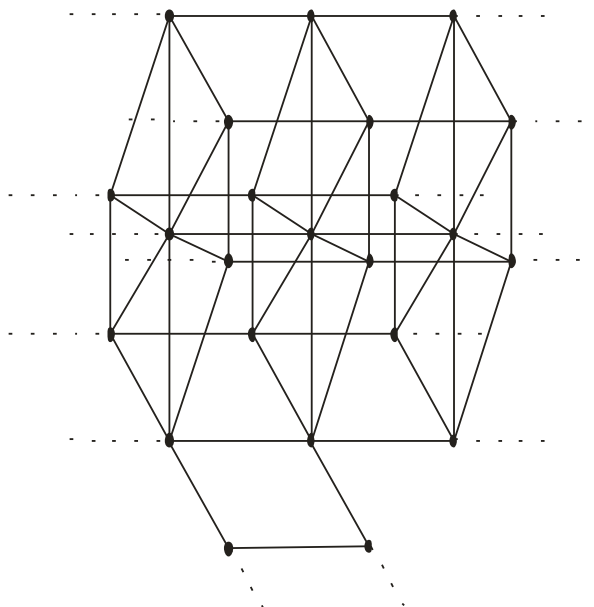
Achievement **Bucolic complexes**

The article in which the authors introduce a new class of complexes was published in 2013 in a prestigious journal *Advances in Mathematics*; bucolic complexes are defined as simply connected prism complexes satisfying certain local combinatorial conditions. The paper joins several mathematical areas, in particular graph theory and geometric group theory.

The skeletons of bucolic complexes – bucolic graphs – present a natural generalization of median graphs, which are one of the most investigated classes of graphs. Their metric and structural properties make them universally useful, and so they were applied or independently discovered in several mathematical areas as well as in the theoretical computer science, mathematical biology, econometry, etc.

The main result of the paper is a local-to-global correspondence, characterizing bucolic complexes via their 2- and 1- skeleta, thus, in particular, via bucolic graphs.

Characterisations obtained for this class of graphs widely generalize some of the most important results in the theory of median-like classes of graphs. On the other hand, various algebraic and geometric properties of bucolic complexes that are proven, like for instance the contractibility of these complexes and the fixed point theorem, make them interesting from geometric group theory perspective, where their further investigation is expected.



Reference B. Brešar, J. Chalopin, V. Chepoi, T. Gologranc, D. Osajda, *Bucolic complexes*, *Advances in Mathematics* 243 (2013) 127-167

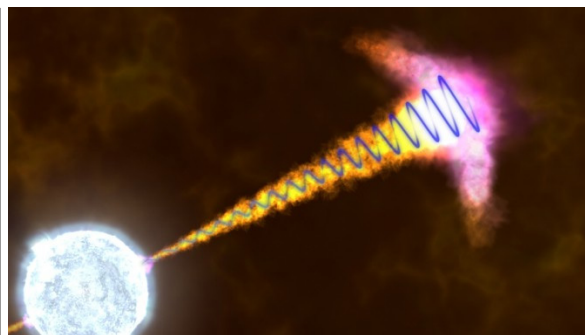
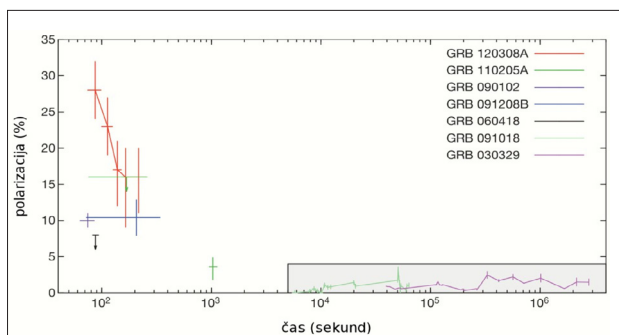
Area **Physics**

Achievement **Highly polarized light from stable ordered magnetic fields in Gamma-Ray Burst GRB 120308A**

Gamma-Ray Bursts (GRBs) are the most powerful explosions in the Universe after the Big Bang. They occur in distant galaxies, when two compact neutron stars in binary system merge or when a core of a massive and rapidly rotating star collapses under its own gravity. In both scenarios, a black hole is formed along with a pair of jets, which propagate into space with speed close to the speed of light. Physical processes inside those jets give rise to gamma-ray emission, which is detected by dedicated space satellites, and later – when expanding ejecta collide with the surrounding environment – to emission at longer wavelengths, so called afterglow, which is detected by e.g. ground-based optical telescopes.

In our paper published in the Nature magazine we report the detection of high degree of linear polarization in the immediate optical afterglow of GRB 120308A. Optical afterglow was observed with RINGO2 polarimeter on the Liverpool Telescope, a 2-m robotic and autonomous optical telescope situated on the Canary Island La Palma. We measured the degree of linear polarization of $P = 28 \pm 4 \%$, 4 minutes after the GRB discovery with the Swift satellite. Temporal evolution showed decrease of polarization to $P = 16\%$ over the subsequent 10 minutes, with the polarization position angle remaining constant.

These measurements rule out plasma or magnetohydrodynamic instabilities. Instead, the polarization properties show that GRBs contain magnetized baryonic jets with large-scale uniform fields that can survive long after the initial explosion. The result is important in the context of theoretical models of GRB emission mechanism and for understanding the role of magnetic fields in GRBs.

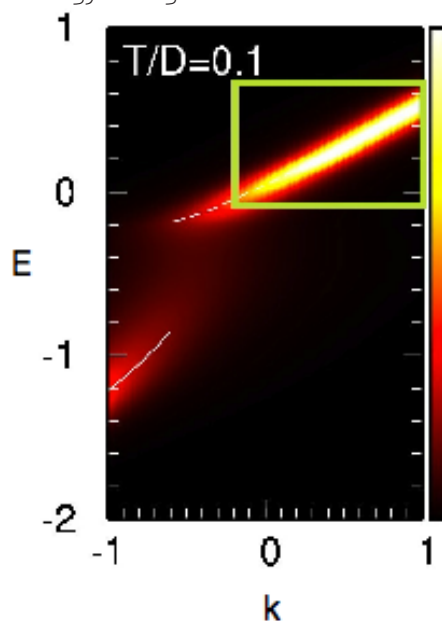


Reference C. Mundell, D. Kopač, D. Arnold, I. Steele, A. Gomboc, S. Kobayashi, R. Harrison, R. Smith, C. Guidorzi, F. Virgili, A. Melandri in J. Japelj, *Nature*, 504, 119 (2013)

Area **Physics**

Achievement **Spectroscopic signatures of resilient quasiparticles in bad metals**

Most materials in the group of high-temperature superconductors are surprisingly poor electrical conductors near room temperature, when they are not in the superconducting state. Their resistivity exceeds values that correspond to repeated collisions of electrons at every single lattice site which had been originally supposed to be the maximal possible values for resistivity in metals. In contrast to "good metals" that are theoretically very well described by an established theory known as the Landau theory of Fermi liquids (one of the paradigmatic theories of the solid-state physics), the mechanism of transport in "bad metals" is still rather poorly understood. We have shown that contrary to the prior knowledge, the electrical current in bad metals is carried by relatively long-lived excitations that we dubbed "resilient quasiparticles". A quasiparticle is a collective excitation of the system which behaves as a single particle, but which actually involves the motion of a large number of constituent particles (electrons) of the system. Our results, obtained using the theoretical approach known as the dynamical mean field theory, show that quasiparticles exist at much higher temperatures than previously thought. We have, furthermore, observed that the scattering of these quasiparticles is such that it may have useful consequences for thermoelectrical devices which could convert waste heat to electrical energy, thereby leading to significant energy saving.



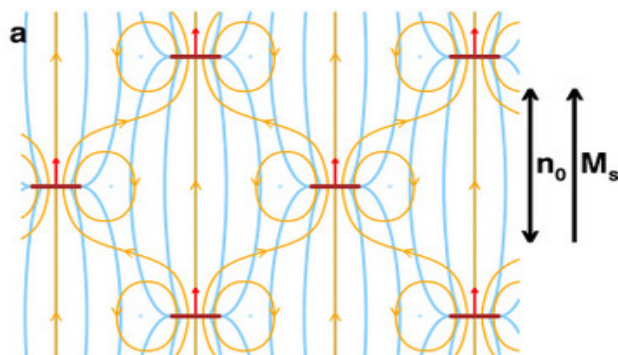
Theoretically predicted photoemission signal in a bad metal. The rectangle indicates the signature of resilient quasiparticles.

Reference X. Deng, J. Mravlje, R. Žitko, M. Ferrero, G. Kotliar, A. Georges, How bad metals turn good: spectroscopic signatures of resilient quasiparticles, *v Phys. Rev. Lett* 110, 086401 (2013).

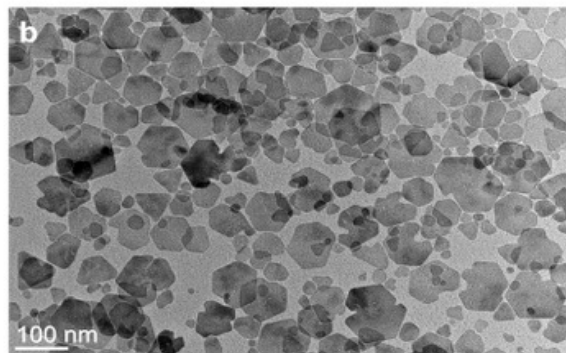
Area **Physics**

Achievement **Ferromagnetism in suspensions of magnetic platelets in liquid crystal**

The idea that magnetic particles suspended in a liquid crystal might spontaneously orient into a ferromagnetic state has been around for decades but had not been confirmed experimentally. We have realized such a state using nanosized ferromagnetic platelets in a nematic liquid crystal. The shape of the thin platelets is key to the development of ferromagnetic ordering. The system has the standard properties of a ferromagnet including inducing monodomain samples by cooling in an external field, hysteretic behaviour, magnetization reversal in a flipped external field, and domain walls and the domain-wall motion. The resulting 'liquid magnet' phase responds to very small magnetic fields and may lead to new magneto-optic devices.



A schematic presentation of distortion of director (blue) and magnetic field (orange) around disk-like platelets. Blue dots present cross sections of disclination lines and red arrows the directions of magnetic moments.



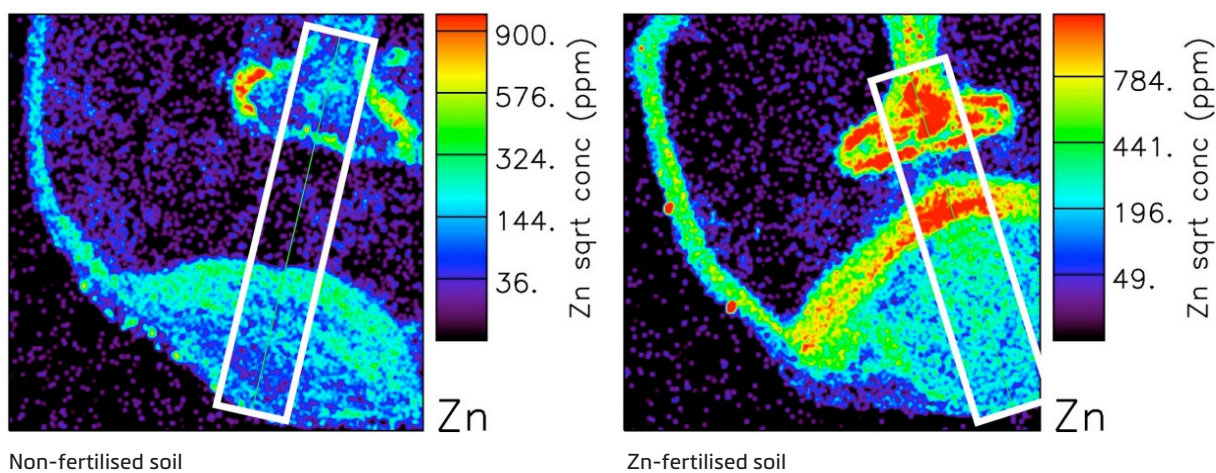
TEM image of magnetic platelets.

Reference MERTELJ, Alenka, LISJAK, Darja, DROFENIK, Mihael, ČOPIČ, Martin. *Ferromagnetism in suspensions of magnetic platelets in liquid crystal*. *Nature*, 2013, 504, 237-241.

Area **Biology**

Achievement **Relevance for food sciences of quantitative spatially resolved element profile investigations in wheat (*Triticum aestivum*) grain**

Dietary Zn malnutrition is significantly related to low concentrations of Zn in staple grains. Using quantitative micro-Proton Induced X-ray Emission we demonstrated that within wheat grain Zn is accumulated in the embryo and in the outer layers of the grain, the aleurone. In addition, alterations in the relative repartitioning of the mineral elements that took place due to Zn fertilisation of wheat plants were defined. Zn fertilisation did not affect the grain yield, but did increase the Zn concentrations. The changes observed in bulk element concentrations were the reflection of tissue-specific variations within the grain, revealing that Zn application to soil can lead to considerable alterations in the element distributions within the grain, which might ultimately influence the quality of the milling fractions and final products.

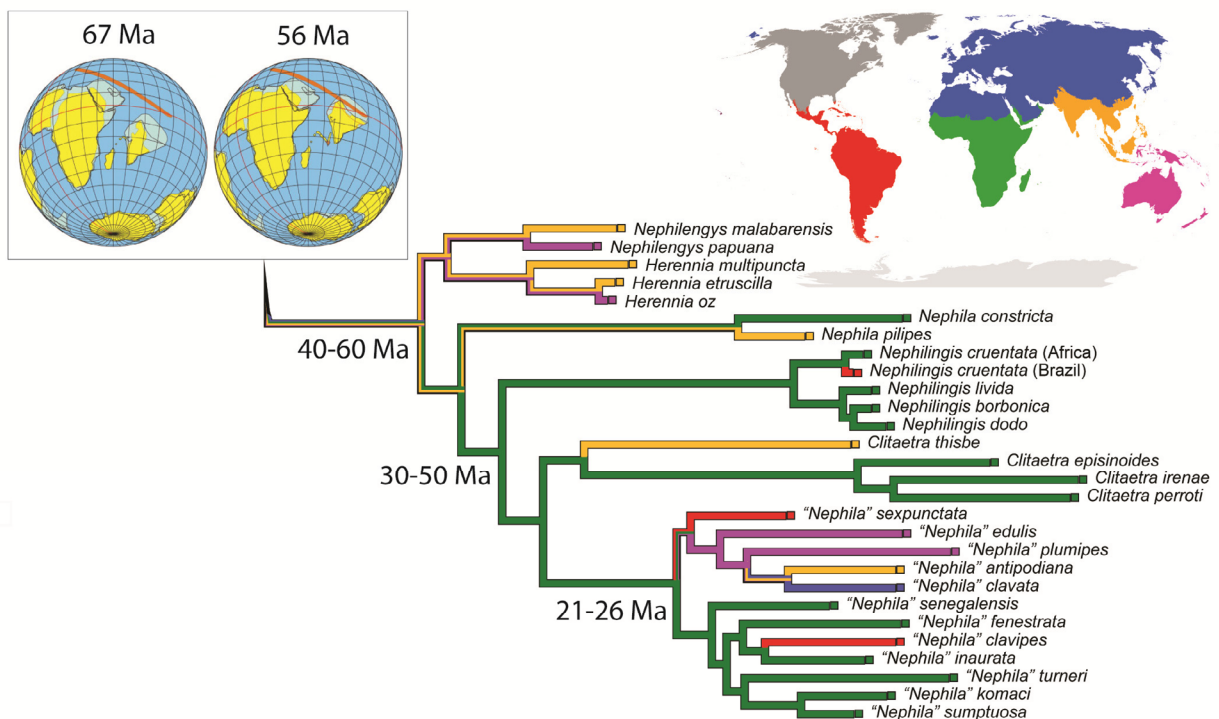


Reference PONGRAC P, KREFT I, VOGEL-MIKUŠ K, REGVAR M, GERM M, VAVPETIČ P, GRLJ N, JEROMEL L, EICHERT D, BUDIČ B, PELICON P. Relevance for food sciences of quantitative spatially resolved element profile investigations in wheat (*Triticum aestivum*) grain. *Journal of the Royal Society interface*, ISSN 1742-5689, 2013, vol. 10, no. 84, str. 1742-5662, doi: 10.1098/rsif.2013.0296. [COBISS.SI-ID 7578745],

Area **Biology**

Achievement **A molecular phylogeny of nephilid spiders: Evolutionary history of a model lineage**

We published the first molecular phylogeny of a model spider group, the family Nephilidae. These spiders, known for female and web gigantism and for extreme sexual size dimorphism (with males over 100 times lighter than the females) are model organisms for varied biological studies, but the only available phylogenetic hypothesis so far has been an outdated morphological one. Our paper adds a new phylogeny, based on massive original molecular data and modern phylogenetic analyses, and this phylogeny sheds a completely new light upon the nephilid evolution. For example, a phylogenetic reconstruction using molecular clock assumptions with fossil calibration established a maximal age of the group at 60 million years, which means that its origin postdates the southern supercontinent Gondwana (Figure). This contribution establishes a new genus (*Nephilingis*) that unites Afrotropical species. The new phylogeny is important for understanding of coevolutionary patterns of sexual dimorphism and behavioral adaptations as well as the evolution of webs and biomaterials.



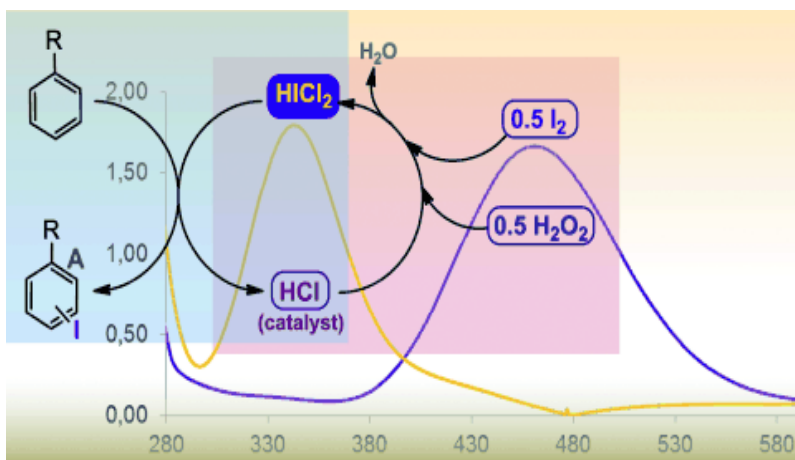
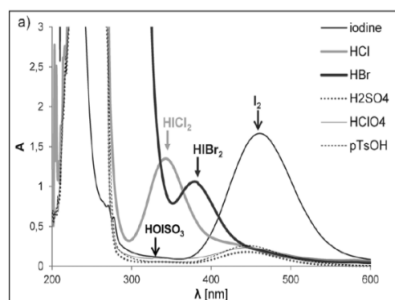
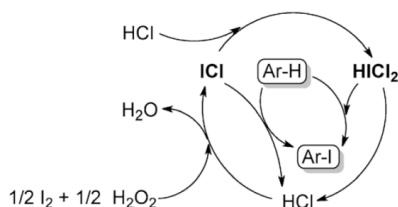
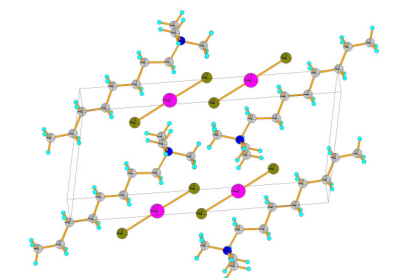
Reference Kuntner Matjaž, Arnedo Miquel A., Trontelj Peter, Lokovšek Tjaša, Agnarsson Ingi: Academic Press; *Molecular Phylogenetics and Evolution*; 2013; Vol. 69, iss. 3; str. 961-979; COBISS ID 36058925.

Area Chemistry

Achievement **Iodine(I) Reagents in Hydrochloric Acid-Catalyzed Oxidative Iodination of Aromatic Compounds by Hydrogen Peroxide and Iodine**

Classical iodination with molecular iodine (I_2) is limited by its weak reactivity, while only one iodine atom out of two gets incorporated into the product. The later problem was successfully solved by oxidative iodination, where hydrogen peroxide or oxygen is used for regeneration of waste HI back into iodine. The problem with weak reactivity of iodine remained and strong acids or heavy metal salts still had to be used for activation of iodination. Iodine(I) reagents (NIS, $IPy_2BF_4...$) are more reactive than iodine. However, iodine atom in these reagents is bound to an organic ligand part of reagent that is wasted after the reaction leading to higher price, lower atom economy and additional separation steps.

We report in this work that we have found a way to join high reactivity of iodine(I) reagents and good environmental parameters of oxidative iodination. We designed simple and economic method, in which we use hydrochloric acid as a catalyst for in situ formation of highly reactive iodine(I) reagent ($HICl_2$). With this method, we avoided the use of organic iodine(I) reagents and we used molecular iodine and hydrogen peroxide as a source of iodine. Due to the use of simple reagents and catalytic quantity of HCl, the only side product of this reaction is water and catalyst. As a consequence, isolation procedure is very simple leading to economical method for iodination with good environmental parameters (E factor).



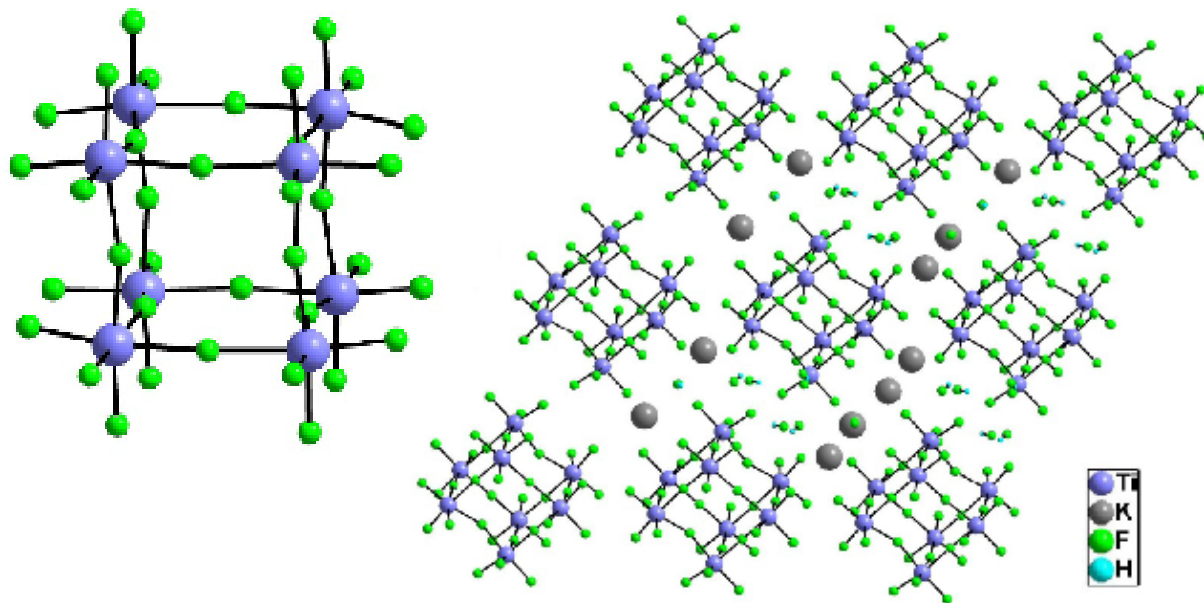
Reference *Iodine(I) Reagents in Hydrochloric Acid-Catalyzed Oxidative Iodination of Aromatic Compounds by Hydrogen Peroxide and Iodine: Leon Bedrač, Jernej Iskra, Advanced Synthesis & Catalysis, 2013, 355, 1243-1248.*

Area **Chemistry**Achievement **Structural architecture of ternary titanium(IV) fluorides**

The achievement published in *Chemical Communications* is part of a broader study how the starting molar ratio of ions, their size and the geometry and the choice of the solvent, which could be incorporated into the crystal structure, influence on the structural dimensionality (D) of the obtained fluorides.

The transition-metal cations (M^{n+}) in fluorides are usually found in octahedral coordination of six fluorine atoms. The octahedral coordination is unaffected by the oxidation state of M^{n+} and by the $M:F$ stoichiometry of the compound. The MF_6 anions could be isolated or linked by sharing vertices, edges and faces. In this way oligomeric units (0D), infinite chains (1D), layers (2D) or three-dimensional frame-works (3D) can be formed. A consequence of this structural diversity is that the obtained products could have various interesting magnetic, electronic, optical, dielectric, catalytic, morphological, etc., properties.

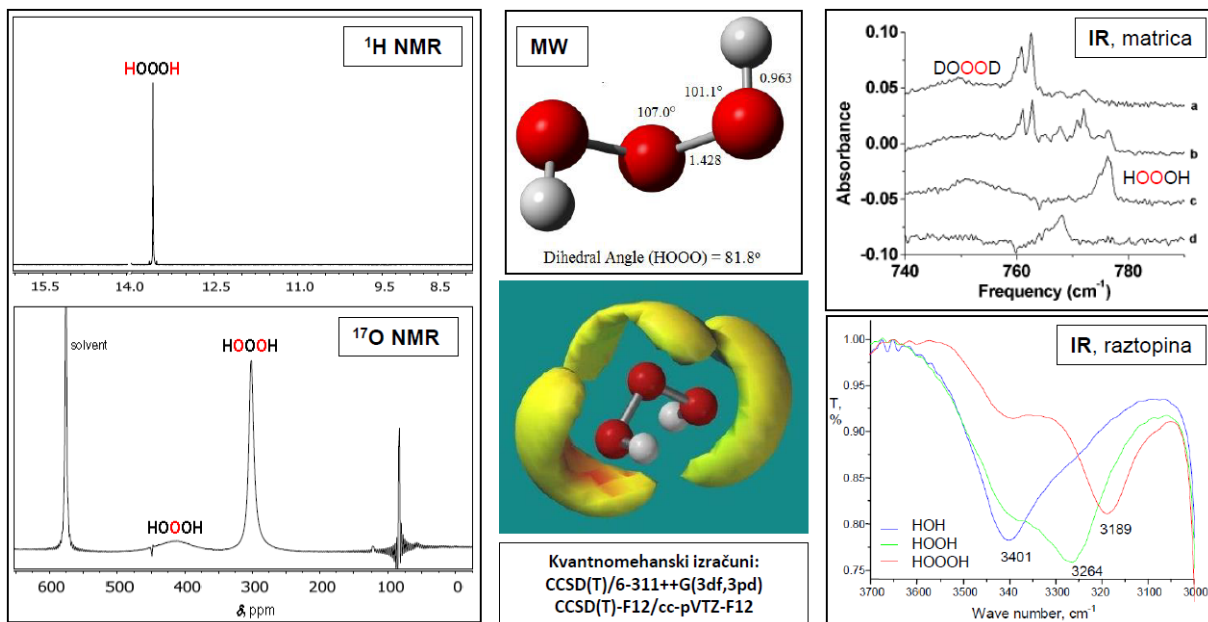
During the investigation of reactions between alkaline metal fluorides and TiF_4 in anhydrous HF, single crystals of $K_4Ti_8F_{36} \cdot 8HF$ and $Rb_4Ti_8F_{36} \cdot 6HF$ were prepared. Both structures contain previously unknown, octameric $[Ti_8F_{36}]^{4-}$ anions. Each of them is constructed from eight TiF_6 octahedral units, sharing joint vertices, and forming in that way a cube. The $[Ti_8F_{36}]^{4-}$ anion represents the largest known example of discrete oligomeric species found in fluoride compounds with the metal in the oxidation state +4.



Reference Igor Shlyapnikov, Evgeny A. Goreshnik, Zoran Mazej. The cubic $[Ti_8F_{36}]^{4-}$ anion found in the crystal structures of $K_4Ti_8F_{36} \cdot 8HF$ and $Rb_4Ti_8F_{36} \cdot 6HF$. *Chem. Commun.* 49 (2013), 2703-2705.

Area **Chemistry**Achievement **Recent Advances in the Chemistry of Hydrogen Trioxide (HOOOH)**

Researchers from University of Ljubljana, Janez Cerkovnik and Božo Plesničar, reported on recent advances in the chemistry of hydrogen trioxide (HOOOH) and its unambiguous characterization by various spectroscopic methods, as supported by theoretical calculations. Hydrogen trioxide is far more stable than previously believed (half-life in acetone at 20 °C is 16 minutes). HOOOH decomposes to form water and singlet oxygen ($\Delta^1\text{O}_2$), while water as a bifunctional catalyst appreciably shortens its half-life. It is interesting to note that hydrogen trioxide is more acidic than hydrogen peroxide (HOOH). Reactions of preparation and decomposition of this simplest of polyoxides involve singlet oxygen ($\Delta^1\text{O}_2$), hydrotrioxyl radicals (HOOO^\bullet) and hydrotrioxide anion (HOOO^-). Most recent findings indicate that all these polyoxide entities (including HOOOH) are key intermediates in biological oxidations of DNA, proteins and lipids (atherosclerosis, cancer, and neurodegenerative disorders), as well as in chain processes in the atmosphere and stratosphere.

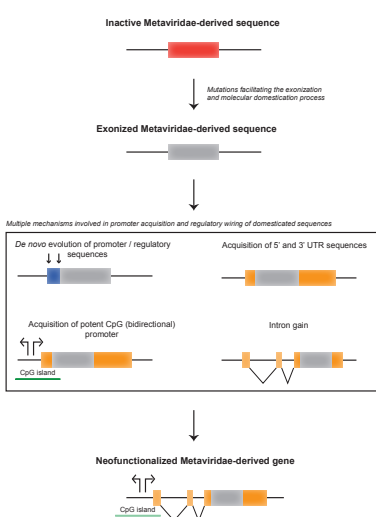


Reference CERKOVNIK, Janez, PLESNIČAR, Božo, *Recent Advances in the Chemistry of Hydrogen Trioxide (HOOOH)* Chemical Reviews, 2013, 113, 7930-7951.

Area **Biochemistry and molecular biology**

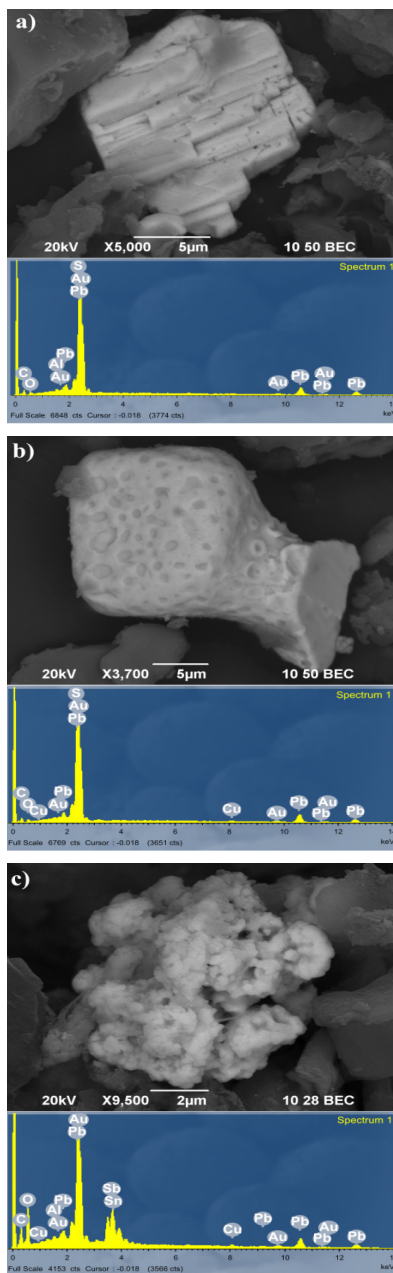
Achievement **Comparative genomics of novel retrotransposon-derived domesticated genes in placental mammals**

Vertebrates, especially mammals, possess numerous single copy genes that originated from diverse multicopy retroelements in the process of molecular domestication. Previous studies provided limited insight into evolutionary relationships between different families of domesticated genes (DGs), either due to insufficient taxonomic sampling or the analysis of a single family of domesticated genes only. We traced the genesis, evolution and regulatory wiring of the retroelement-derived domesticated genes (RDDGs) through phylogenomic analysis, using whole-genome information from more than 90 chordate genomes. Phylogenomic analysis of the DGs in chordate genomes provided direct evidence that major diversification has occurred only in the ancestor of placental mammals. Mammalian RDDGs have been shown to originate in several steps by independent domestication events and to diversify later by gene duplications. We have shown that domesticated genes and their chromosomal positions were fully established in the ancestor of eutherian mammals. We demonstrated that strong adaptive evolution has diversified domesticated genes before their fixation in the ancestor of placental mammals. By analysis of active Metaviridae lineages in amniotes, we have demonstrated that Eutheria-specific domesticated genes originated from retroelement remains, and that domesticated genes gained their promoter and regulatory regions de novo. Phylogenomic analysis provided further insight into the role of domesticated genes in the origin of Eutheria-specific innovations and adaptations.



Mechanisms involved in the process of retroelement-derived domesticated genes (RDDG) neofunctionalization. In the transition phase from retroelement remains to the first RDDGs, many nucleotide changes were necessary for the neofunctionalization. One of the crucial steps in the process of neofunctionalization was the exonization of retroelement domains. To become expressed at a significant level and in the tissues where it can exert a selectively beneficial function, a new gene needs to acquire a core promoter and other structural elements that regulate its expression. Exons and introns are shown as orange (5'- and 3'-UTR regions) or gray (coding part of the exons) boxes and connecting lines. A de novo acquired promoter is shown in blue.

Reference *Kokošar J. & Kordiš D. (2013) Genesis and regulatory wiring of retroelement-derived domesticated genes: a phylogenomic perspective Mol. Biol. Evol. 30, 1015-1031.*

Area **Geology**Achievement **Assessment of metal pollution sources by SEM/EDS analysis of solid particles in snow: A case study of Žerjav, Slovenia**

The environment in the area of Žerjav in the upper Meža Valley has been strongly burdened with metals, particularly lead, zinc, and cadmium, as a consequence of more than 300 years of lead and zinc mining and ore processing. Previous geochemical studies of various environmental media have shown that two potential sources of metals are still active today: 1) dusting due to exploitation of mine and ore processing waste deposit, and 2) emissions from processing of lead waste and lead-acid batteries. Due to insufficient information on forms of occurrence of metals in solid particles and their physical and chemical properties, which are characteristic of each individual source, accurate estimate of the contribution of each source has not been possible until now.

In order to assess contribution of each individual source to the recent metal-pollution, solid metal-bearing particles deposited in snow were characterised by their chemical composition and morphological features using scanning electron microscopy coupled with energy dispersive spectroscopy (SEM/EDS). The investigation showed that solid particles in snow are represented by scarce geogenic-anthropogenic particles occurring as sharp-edged fragments or prismatic crystals of lead carbonate (cerussite), zinc sulphide (sphalerite) and partly lead sulphide (galena), whose morphology and chemical composition agree well with lead-zinc ore minerals from mine and ore processing waste deposit. The most abundant metal-bearing particles are porous aggregates, well-rounded or spherical particles and skeletal-dendritic crystals of lead-antimony-tin oxides and sulphides. Their morphologies and chemical composition indicate that they formed during high-temperature melting of lead-antimony-tin alloys, which are basic components of used discharged lead-acid batteries. Furthermore, quantities of anthropogenic particles decrease with increasing distance from the lead waste processing plant, which confirms that lead waste and lead-acid battery processing is their predominant source.

SEM/EDS images of metal-bearing particles in snow:

- a) galena from mine waste deposit;
- b) Pb-sulphide from processing of Pb-waste and Pb-acid batteries;
- c) Pb-Sb-Sn oxide from processing of Pb-waste and Pb-acid batteries.

Reference

Miloš Miler & Mateja Gosar: *Assessment of metal pollution sources by SEM/EDS analysis of solid particles in snow: a case study of Žerjav, Slovenia, Microscopy and Microanalysis, [COBISS.SI-ID 2193237].*

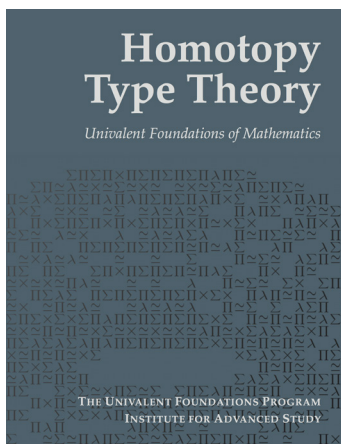
Area **Computer intensive methods and applications**

Achievement **Homotopy Type Theory: Univalent Foundations of Mathematics**

Dr. Andrej Bauer was a member of the Univalent Foundations Program which took place at the Institute for Advanced Study in Princeton (USA) in the academic year 2012/13. The main outcome was the development of homotopy type theory, a new branch of mathematics which combines homotopy theory and type theory. The former is an extensive generalization and abstraction of certain geometric and topological concepts, and the latter a general theory of mathematical constructions which found applications in modern programming languages and computer formalization of mathematics. Such an unusual combination resulted in a number of new techniques in both areas involved, as well as computer formalization of theorems in homotopy theory that were inaccessible with the existing techniques.

Homotopy type theory is a foundation for all of mathematics, just like logic and set theory. However, homotopy type theory provides a much richer mathematical universe in which logic and sets are manifested as just the lowest two levels of types, followed by infinitely many more levels of higher-dimensional homotopical structures.

The team presented homotopy type theory the monograph "*Homotopy Type Theory: Univalent Foundations of Mathematics*" which was written simultaneously by more than 20 authors who took just six months to produce 600 pages. For mathematics that is an unusually large research team that operated with surprising efficiency. The authors used technology that is normally used by large teams of programmers in development of open-source code and systems. The monograph is open-source too, as it is freely available, and anyone can contribute corrections and improvements. Thus in the first year after its release, the book has had more than 700 contributions by 50 people.



Reference *The Univalent Foundations Program: Homotopy Type Theory: Univalent Foundations of Mathematics. Institute for Advanced Study, Princeton (ZDA), 2013, <http://homotopytypetheory.org/book>.*

Area **Care of the environment**

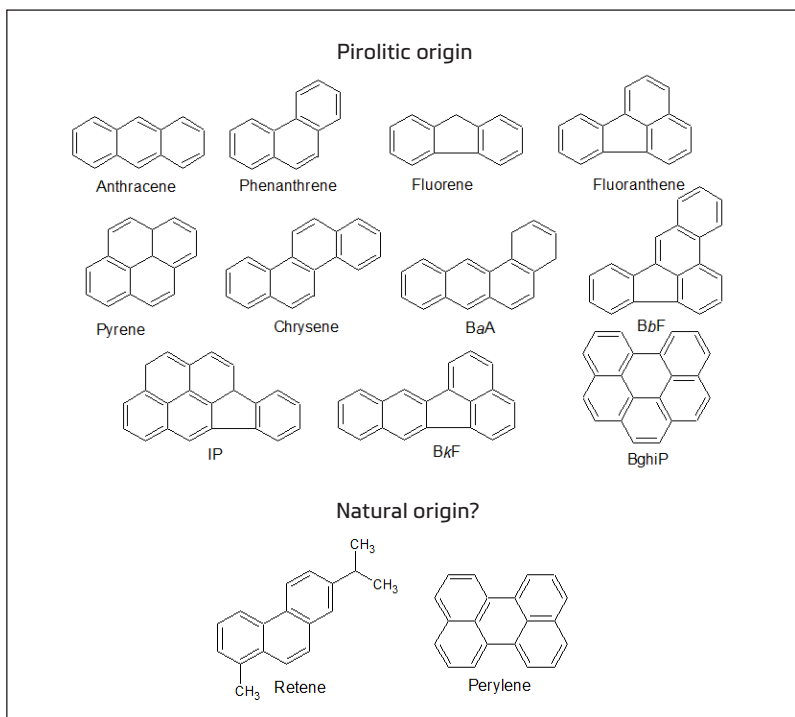
Achievement **Source identification and sedimentary record of polycyclic aromatic hydrocarbons in Lake Bled**



Recent sediments are useful in evaluating and reconstructing historical records of contaminant inputs such as polycyclic aromatic hydrocarbons (PAH). We have used a combined molecular and isotopic approach to trace and identify the sources of PAH in lacustrine sediments of Lake Bled (NW Slovenia).

The distribution of the isotopic composition of individual PAH showed that PAH input to lake sediments was of pyrolytic origin, likely dominated by coal and later in 1950s also by wood burning. PAH from vehicular emissions could also contribute to the overall isotope signatures at the depth of 12-14 cm at station D and Zaka Bay corresponding to the period 1953-1961. It was found that Reten (Re) and Perylene (Per) are both mainly of natural origin in Zaka Bay while, at station D, the value of $\delta^{13}\text{C}$ determined at a depth of 12-14 cm in the 1950s indicated that Re was of pyrolytic origin.

PAH were resistant to weathering reactions in anoxic sediments in Lake Bled and thus useful in identification of paleo-environmental pollution activities.

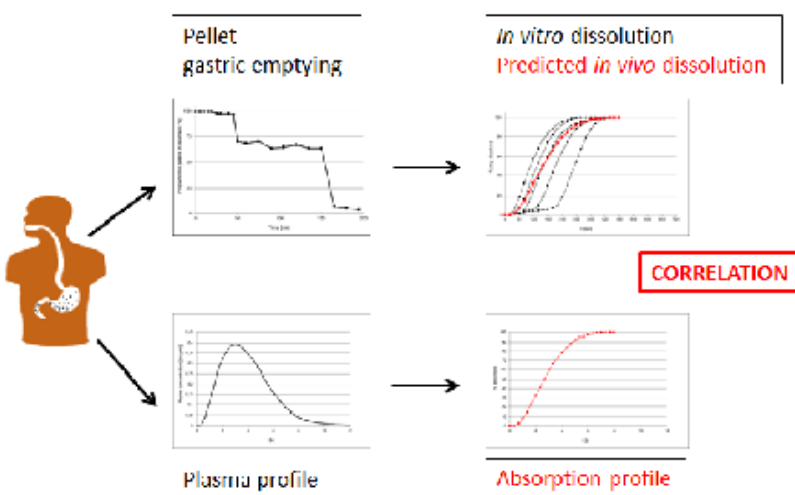


Reference *Marinka Gams Petrišič, Gregor Muri, Nives Ogrinc. 2013. Source identification and sedimentary record of polycyclic aromatic hydrocarbons in Lake Bled (NW Slovenia) using stable carbon isotopes. Environmental Science & Technology 47, 1280-1286. SCI: 5.481*

Area Pharmacy

Achievement **The role of individual gastric emptying of pellets in the prediction of diclofenac *in vivo* dissolution**

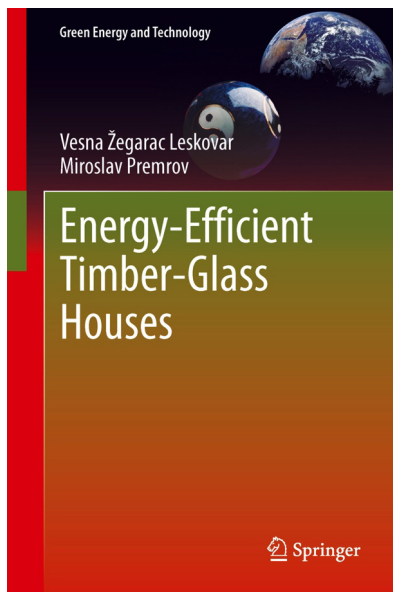
Prediction of a dosage form performance after its administration represents a great challenge, especially due to complexity of involved processes. After oral administration of pellets incorporated in a capsule, pellets quickly release from the capsule in a stomach, and then, usually in a long time interval, empty in the small intestine. During transit of pellets along gastro-intestinal (GI) tract, drug is released and absorbed, most frequently from the small intestine. Drug release is frequently strongly dependent on pellet gastric emptying, so the knowledge of the mechanisms and kinetics of pellet transit through the stomach is extremely important. In the present work *in vitro* drug dissolution from pellets was determined under different conditions close to those *in vivo*. On the basis of previously developed mathematical models describing gastric emptying of pellets in an individual, and the results of *in vitro* dissolution, *in vivo* dissolution in GI tract of an individual was predicted. Good permeability of tested drug enabled also the prediction of its absorption. Additionally, on the basis of drug plasma profiles after administration of the same pellets to individuals, actual absorption profiles were calculated. Predicted absorption profiles correlated well with those determined from plasma profiles of individuals included in *in vivo* study. Thus, the appropriateness of newly developed approach was confirmed, showing also its great potential in prediction of *in vivo* absorption / plasma profiles of drugs after oral administration.



Reference Klein S, Garbacz G, Pišlar M, Locatelli I, Liu C, Weitschies W, Werner S, Mrhar A, Bogataj M.: The role of individual gastric emptying of pellets in the prediction of diclofenac *in vivo* dissolution. *J Control Rel* 2013; 166 (3), 286-293

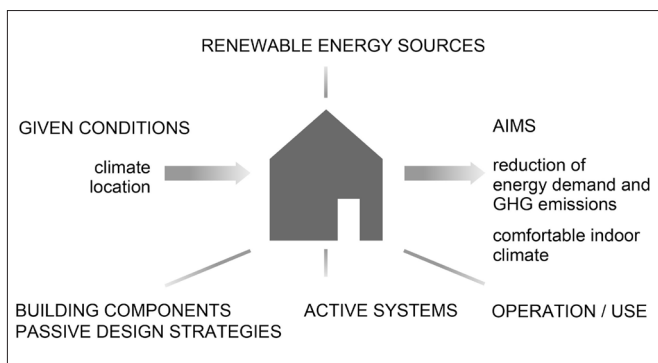
Area **Civil engineering**

Achievement **Energy-efficient timber-glass houses,
(Green energy and technology)**



Cover page of the scientific monograph

The scientific monograph discusses the latest scientific achievements in the field of timber-glass building design with a view to developing an optimal contemporary energy-efficient house. The primary objective of the presented approach is the combination of architectural and structural engineering knowledge already in early design stages. The study is based on integration of timber and glass which used to be rather neglected as construction materials in certain historical periods. With suitable technological development and appropriate use, timber and glass are nowadays becoming essential construction materials as far as the energy efficiency and high living comfort are concerned. Their combined use is extremely complicated, from both the constructional point of view as well as from that of energy efficiency and sets multiple traps for designers. In contemporary timber construction there is an increasing tendency towards the use of enlarged glazing surfaces in order to achieve an attractive architectural form, high level of living comfort, suitable energy efficiency. However the latter can arise the problems related to structural stability which can be avoided through the use of glass as load-bearing material in timber-glass elements. The results of the research can nevertheless serve as a good frame of reference to architects and civil engineers in their planning of optimal energy-efficient timber-glass buildings. The given conclusions can be useful for an approximate estimation of the energy demands accompanying different positioning and proportion of the glazing surfaces as well as determination of building form and the related structural stability problems.



Basic principle of energy-efficient building design



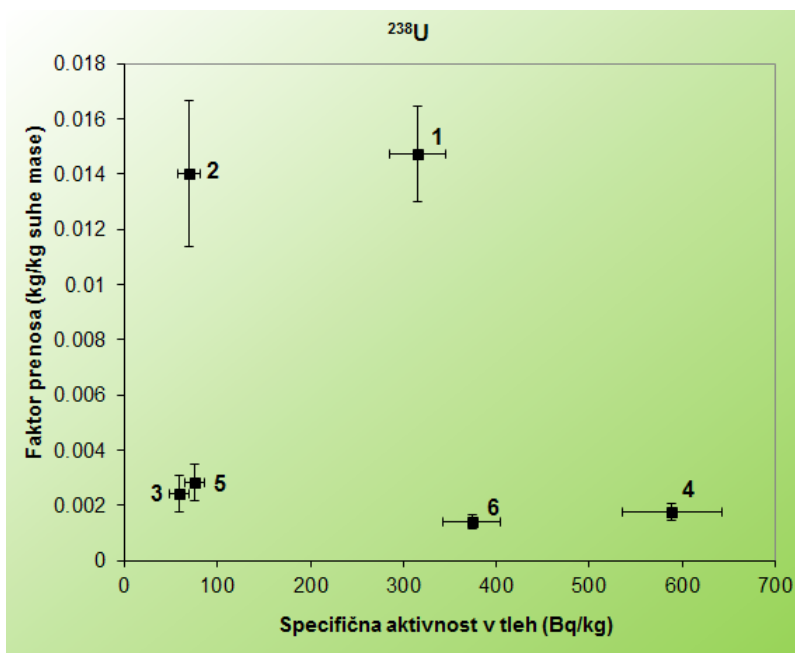
Timber-glass prefabricated walls - replacing the classical sheathing boards with the glass panes

Reference Zegarac Leskovar V., Premrov M. (2013): "Energy-efficient timber-glass houses, (Green energy and technology). London [etc.]: Springer, cop. 2013. VI, 178 str., ilustr., graf. prikazi. ISBN 978-1-4471-5510-2. ISBN 978-1-4471-5511-9, doi: 10.1007/978-1-4471-5511-9. [COBISS.SI-ID 17175062]

Area **Energy engineering**

Achievement **Transfer of natural radionuclides from soil to grass**

The soil-to-plant transfer factors for uranium-radium decay chain from the contaminated soils of the former uranium mine Žirovski vrh were determined. Those factors serve as an input data for the ionising radiation dose calculations for both human populations and biota. The doses can be assessed by several models as ERICA Tool, Normalysa or Resrad. Due to large variability in soil-to-plant transfer factors, this study importantly reduces uncertainties of model calculations and increases accuracy of the model calculations for humans and biota radiation dose assessments. Furthermore, use of grass as a bio-monitor of natural radionuclide migration in soil was tested. It was revealed that grass has potential to be used for tracking of uranium and radium migration, but not the other members of uranium-radium decay chain, in soil.



Determination of the soil-to-plant transfer factors from contaminated soils to grass at the past uranium Mine area

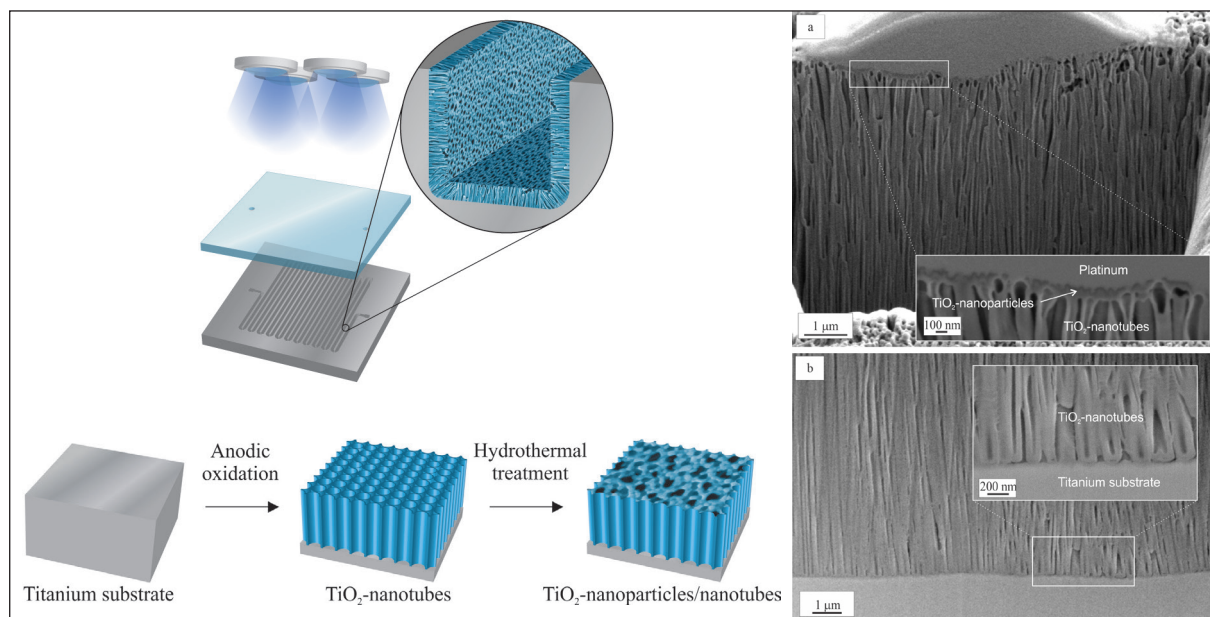
Grass as a potential Bio-monitor of uranium and radium migration in soil

Reference Štok, Marko, Smodiš, Borut. Soil-to-plant transfer factors for natural radionuclides in grass in the vicinity of a former uranium mine. Nuclear Engineering and Design, 2013, vol. 261, str. 279-284.

Area **Materials**

Achievement **Highly Efficient TiO₂-Based Microreactor for Photocatalytic Applications**

A micro-device capable of efficiently utilizing an immobilized TiO₂ layer for the long-term and continuous degradation of several organic pollutants was constructed within the program P2-0084 and project J2-4309. We used a two-step synthesis (anodic oxidation and subsequent hydrothermal treatment) for the immobilization of a homogeneous and highly stable TiO₂ nanoparticle/nanotube dual-layer inside a titanium microchannel. The as prepared photocatalytic microreactor showed a significant photocatalytic activity towards the degradation of several molecules. The results show that our device utilizes the photocatalytic surface more efficiently than in the case of the suspended commercial Degussa P25 powder in a conventional slurry reactor, while a more than 10 times higher standardized photonic efficiency was observed in the case of the microreactor. Moreover, the device still exhibited 60 % of its initial activity after intensive photocatalytic use during a 12-month operational cycle.



Reference Krivec M, Žagar K, Suhadolnik L, Čeh M, Dražič G. Highly Efficient TiO₂-Based Microreactor for Photocatalytic Applications. *ACS Appl Mater Interfaces*. 2013; 5 (18): 9088-9094.

Area **Materials**Achievement **Chemical Decomposition as a Likely Source of Ambient and Thermal Instabilities of Layered Sodium Cobaltate**

The combination of the measured high conductivity and high thermopower of layered sodium cobaltate initiated the research of oxide materials as candidates for thermoelectric elements at the end of the nineties. However the physical values from the identical material reported in the different literature vary beyond the expectations. Our research has shown that the reason for such large differences could be ascribed to unusually high chemical reactivity of the latter. By using the high-pressure synthesis in a pure oxygen atmosphere we synthesised highly pure and highly textured material. We studied the influence of humidity, and the amount of carbon dioxide and oxygen from the atmosphere, on the properties of this material. Results clarify the differences in the literature however at the same time new challenges in the development of ceramic materials in general.

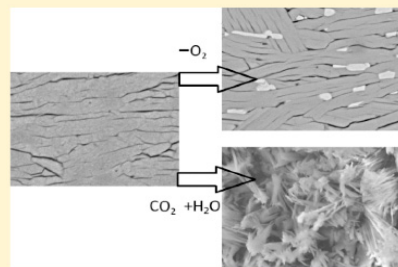
CHEMISTRY OF
MATERIALS

Article

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Chemical Decomposition as a Likely Source of Ambient and Thermal Instabilities of Layered Sodium CobaltateDamjan Vengust,^{*,†} Bostjan Jancar,[†] Andreja Sestan,[†] Maja Ponikvar Svet,[‡] Bojan Budic,[§] and Danilo Suvorov[†][†]Advanced Materials Department and [‡]Department of Inorganic Chemistry and Technology, Jozef Stefan Institute, Jamova 39, 1000 Ljubljana, Slovenia[§]Laboratory for Analytical Chemistry, National Institute of Chemistry, Hajdrihova 19, 1000 Ljubljana, Slovenia

ABSTRACT: With the application of an oxygen atmosphere, we synthesized a highly textured sodium cobaltate, $\text{Na}_{0.75}\text{CoO}_2$. At the same time, we identified its peculiarities that influence the measured parameters to a degree that poses serious questions about this material's potential for use. We have systematically studied the influence of humidity on the ceramic pellets and identified the conditions under which the material completely deteriorates. By performing microstructural and thermal analyses, coupled with a determination of the evolved gases, we identified the chemical reactions that are involved in this process. In addition, we re-examined the performance of sodium cobaltate under the working conditions and found that the material behaves in a manner different from the expected manner. We have shown, in contrast to many other reports, that the oxygen vacancies do not play a very important role because the changes in the physical parameters can be attributed to the reduction of cobalt and consequently to the formation of CoO inclusions, which increases the amount of sodium in the sodium cobaltate lattice.

KEYWORDS: thermoelectric oxide materials, hydrated $\text{Na}_{0.75}\text{CoO}_2$, oxygen vacancies, CoO

Reference *Chemical Decomposition as a Likely Source of Ambient and Thermal Instabilities of Layered Sodium Cobaltate* VENGUST, Damjan, JANČAR, Boštjan, ŠESTAN, Andreja, PONIKVARSVET, Maja, BUDIČ, Bojan, SUVOROV, Danilo. *Chemical decomposition as a likely source of ambient and thermal instabilities of layered sodium cobaltate. Chemistry of materials, ISSN 0897-4756, 2013, vol. 25, no. 23, str. 4791-4797,*

Area **Systems and cybernetics**

Achievement **Sit-to-stand trainer**

An important part of rehabilitation treatment in people with movement disabilities is training of sit-to-stand movement, which may be considered as the most demanding part of the overall movement training because it requires dynamic and well-coordinated movement of the trunk on the lower extremities. Several devices for training sit-to-stand movement exist on the market and in the clinical practice; however, the movement in these devices is quasi-static where the kinematics, kinetics and electromyography of the main muscles considerably differ from "normal" sit-to-stand maneuver. We have conceived and developed a prototype of a Sit-to-stand trainer where the main part represents an innovative mechanism which to the largest extent resembles natural sit-to-stand kinematics and is driven by a single motor. German patent office has granted a patent for the described device and the German company medica Medizintechnik GmbH has bought patent rights and intends to market a device in the next two years.

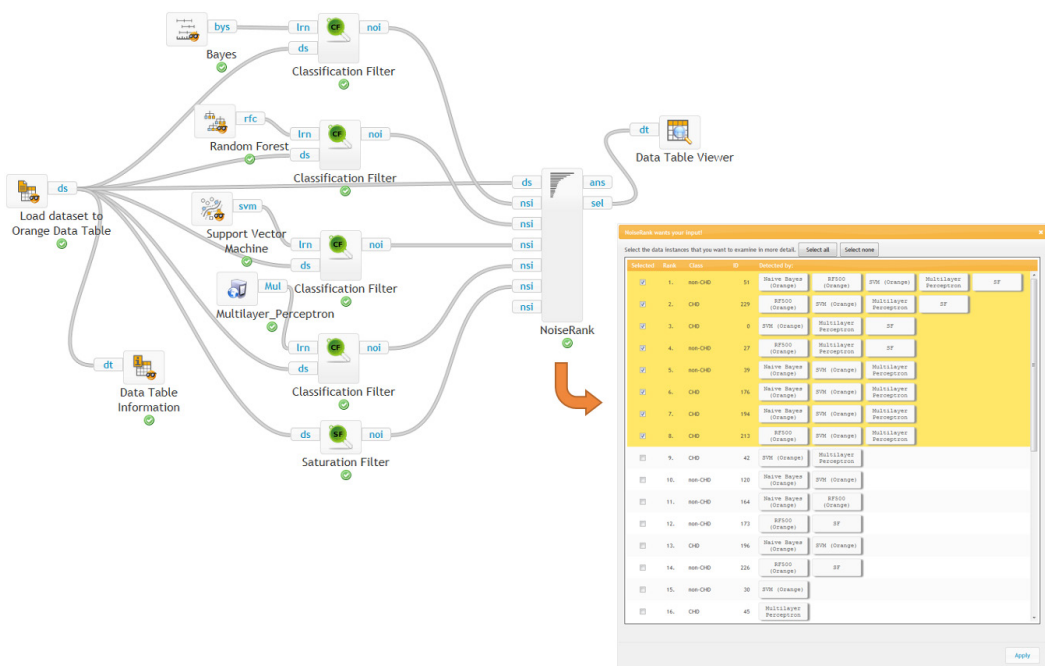


Reference OBLAK, Jakob, MATJAČIĆ, Zlatko. Aufstehtrainer: Patentschrift DE 10 2012 102 699 B4 2013.10.17. [München]: Deutsches Patent- und Markenamt, 2013. 11 str., ilustr. [COBISS.SI-ID 1812329]

Area **Computer science and informatics**

Achievement **NoiseRank method for anomaly detection in data**

The success of knowledge discovery and data mining methods largely depends on the quality of the data. Real-life data inevitably contains errors and unusual instances, which are referred to as *noise* or *anomalies*. While the presence of noisy instances usually degrades data mining results, detected unusual or outlier instances may provide new insights into the phenomenon being investigated. NoiseRank is an ensemble-based method for detection and ranking of noisy instances in data. The method enables to use arbitrary noise detection algorithms and offers to explore the detected noisy instances. NoiseRank was successfully applied in a medical domain for detection of atypical and falsely diagnosed cases, as well as in the analysis of textual data for the detection of unusual articles and errors in the corpus collection process. Public use of the NoiseRank method was enabled by its implementation in the web-based data mining platform ClowdFlows (<http://www.clowdflows.org>). Additionally, the ViperCharts (<http://viper.ijs.si>) web environment was developed for performance evaluation of noise and outlier detection algorithms, as well as for the evaluation of other machine learning and data mining algorithms. The work was published in the prestigious *Data Mining and Knowledge Discovery journal*.

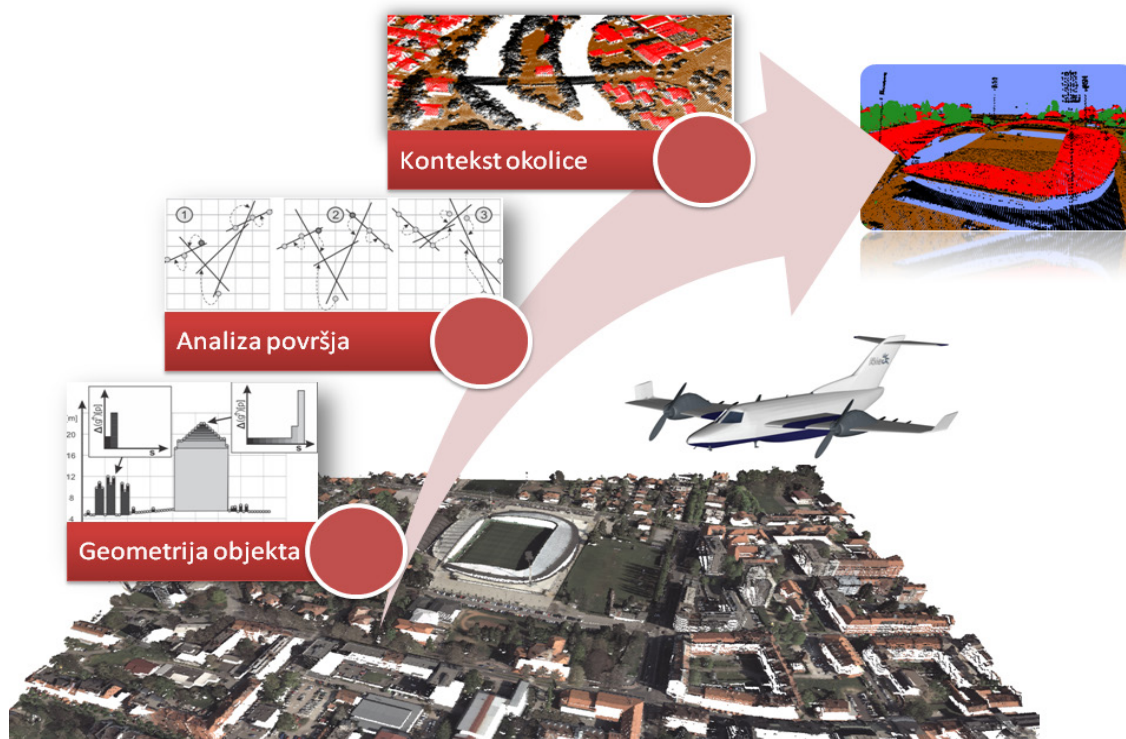


Reference SLUBAN, Borut, GAMBERGER, Dragan, LAVRAČ, Nada. Ensemble-based noise detection: noise ranking and visual performance evaluation. *Data mining and knowledge discovery*, vol. 28, no. 2. str. 265-303, 2014 (na spletu dostopno od Januarja 2013). [COBISS.SI 27385383].

Area **Computer science and informatics**

Achievement **Ground and building extraction from LiDAR data based on differential morphological profiles and locally fitted surfaces**

This research led to a new approach for analyzing the surfaces of geometric objects by fitting patches onto the local neighborhoods of points. The method allows for identifying points following any arbitrary polynomial functions by which their contexts can be defined. In addition to its computational efficiency, which is linear in regard to the number of points, the presented method is distinguishable by its noise-resistance. Subsequently, a new algorithm for building recognition within LiDAR data has been developed based on these theoretical foundations. According to the evaluation of the International Society of Photogrammetry and Remote Sensing, this method is currently recognized as the most accurate one. Its advantages are especially evident during particularly difficult circumstances when the geometries of the buildings are obstructed by vegetation cover or noisy points within them. For these reasons this method is, in these cases, superior even to those methods which rely on complementary information obtained from areal images.

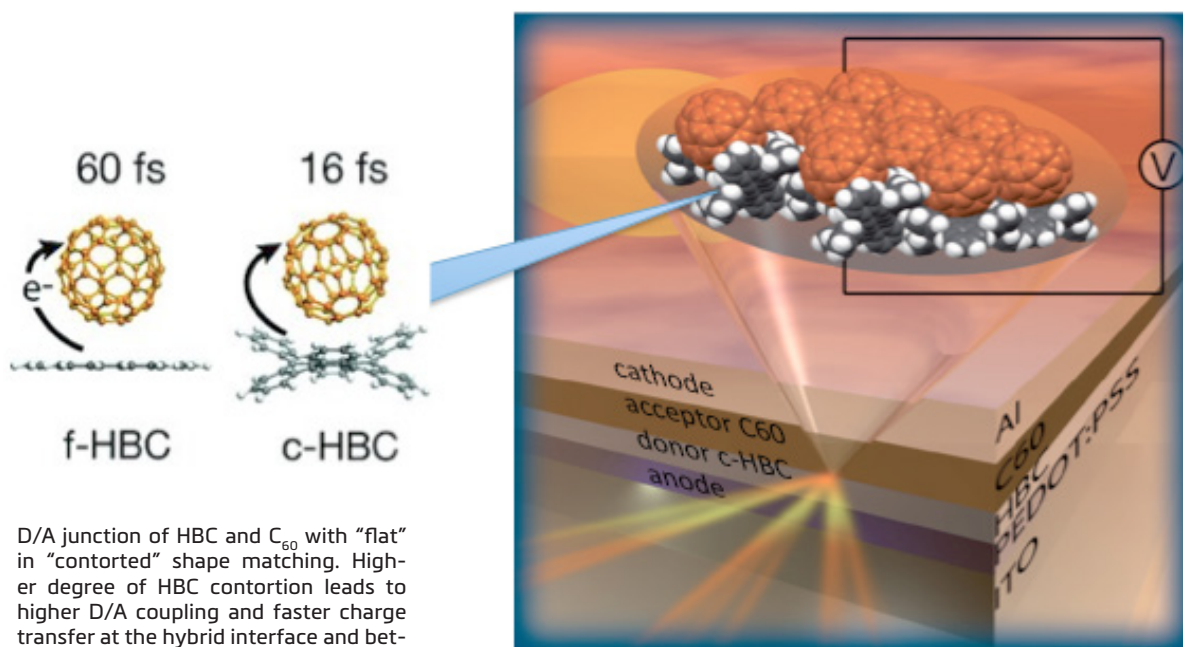


Reference Mongus, D., Lukač, N., Žalik, B., Ground and building extraction from LiDAR data based on differential morphological profiles and locally fitted surfaces. *ISPRS journal of photogrammetry and remote sensing*, In press, pp. 1-12. DOI: 10.1016/j.isprsjprs.2013.12.002

Area **Electronic components and technologies**

Achievement **Donor-Acceptor Shape Matching Drives Performance in Photovoltaics**

An international team of scientists with dr. Gregor Kladnik and prof. dr. Dean Cvetko as co-authors from the Physics department, University of Ljubljana has published the article "Donor-Acceptor Shape Matching Drives Performance in Photovoltaics" in the prestigious scientific journal *Advanced Energy Materials*. Authors show that molecular shape-complementarity between donors and acceptors can drive performance in organic photovoltaic (OPV) devices. Using resonant photoemission with synchrotron radiation and density functional theory they compare the electronic coupling, assembly, and charge transfer rates at the interface between C_{60} acceptors (A) and flat- or contorted-hexabenzocoronene (HBC) donors (D). They find that shape-complementarity drives self-assembly of an intermixed morphology with a D/A ball-and-socket interface, which enables faster electron transfer from HBC to C_{60} . The supramolecular assembly and faster electron transfer rates in the shape matched hetero-junction lead to a larger active volume and enhanced exciton dissociation rate. This work provides fundamental mechanistic insights on the improved efficiency of OPV devices that incorporate concave/convex D/A materials.



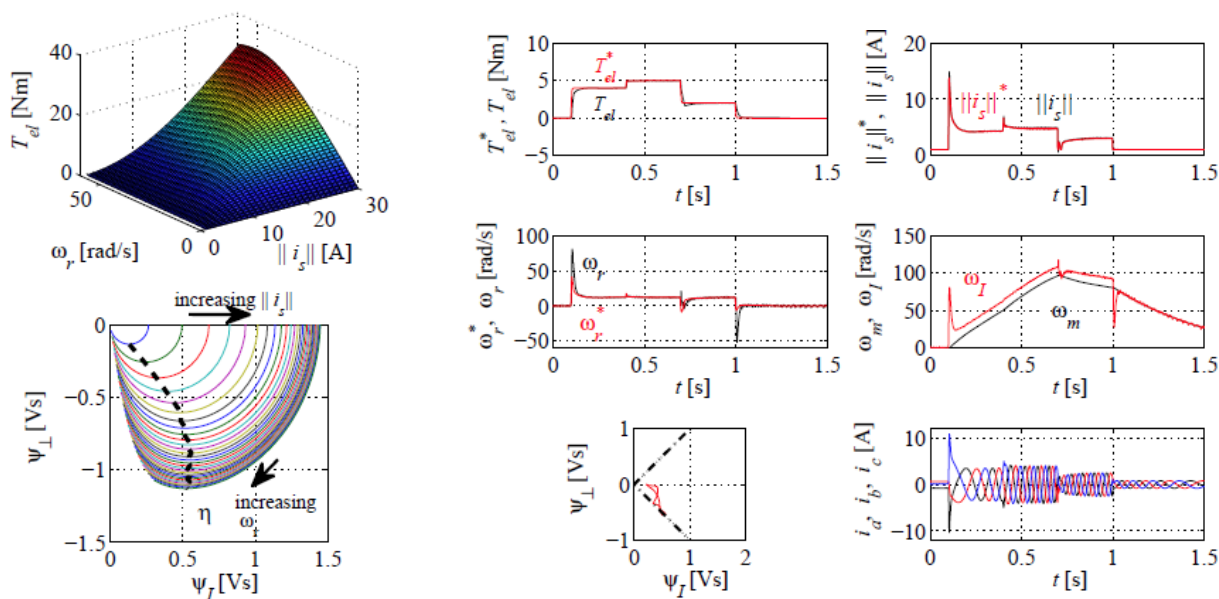
D/A junction of HBC and C_{60} with "flat" in "contorted" shape matching. Higher degree of HBC contortion leads to higher D/A coupling and faster charge transfer at the hybrid interface and better performance of hetero-organic photovoltaic element.

Reference T. Schiros, Gregor Kladnik, D. Prezzi, A. Ferretti, G. Olivieri, A. Cossaro, L. Floreano, A. Verdini, C. Schenck, M. Cox, A.A. Gorodetsky, K. Plunkett, D. Delongchamp, C. Nuckolls, A. Morgante, Dean Cvetko, I. Kymissis, "Donor-Acceptor Shape Matching Drives Performance in Photovoltaics", *Advanced Energy Materials*, Volume 3, Issue 7, str. 894–902, July, 2013

Area **Electric devices**

Achievement **IM Torque Control Schemes Based on Stator Current Vector**

Research group developed an IM torque control derived from the model in the stator current vector reference frame. The required torque is produced by amplitude and frequency modulation of the stator current vector thus forcing the rotor flux linkage vector to change implicitly in such a way that overall stability is preserved. Additional control features include maximal torque per ampere ratio in steady state and almost perfect command tracking even if the machine is magnetically saturated. The control adopts a cascaded structure and is based on a partial dynamic inversion of the reduced model that assures existence and uniqueness of the inverse mapping between the required torque, the rotor flux linkage vector and the stator current vector. Singularity at zero rotor flux linkage represents no restriction for the control performance in the admissible machine operating range. The implementation of the proposed control requires the estimation of the torque producing rotor flux component and cascaded stator current controllers. Experimental results confirm the key expectations and show the potential and benefits of the proposed control schemes.

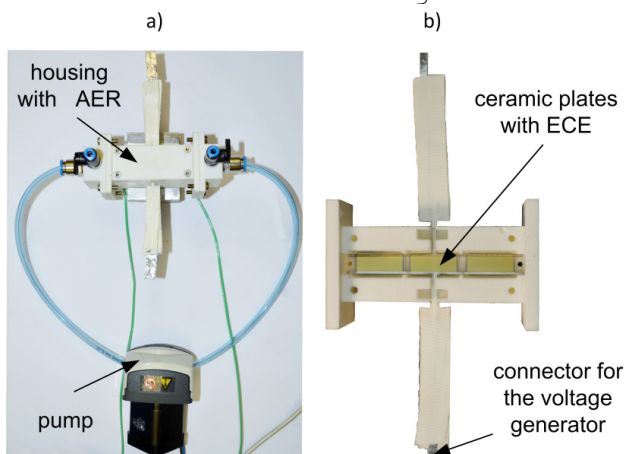


Reference GRČAR, Bojan, ŠTUMBERGER, Gorazd, HOFER, Anton, CAFUTA, Peter. IM torque control schemes based on stator current vector. IEEE transactions on industrial electronics, ISSN 0278-0046. [Print ed.], Jan. 2014, vol. 61, iss. 1, str. 126-138, doi: 10.1109/TIE.2013.2247016. [COBISS.SI-ID 16731414] /1/

Area **Process engineering**Achievement **Development of a conceptual electrocaloric cooling device**

Electrocaloric cooling represents an alternative to the existing vapour-compression technology. Especially due to the potentially higher energy efficiency and lower impact on the environment. The technology is based on the electrocaloric effect (ECE), which is a property of some dielectric materials. The material with the ECE will heat up when subjected to an increase of the electric field and cool down as the field is turned off. In Laboratory for Refrigeration and District Energy in collaboration with the Institute „Jožef Stefan“ (IJS), one of the World's first small scale electrocaloric cooling devices was developed. The ECE material used in a device was $[\text{PbMg}_{1/3}\text{Nb}_{2/3}\text{O}_3]_{0.90}-[\text{PbTiO}_3]_{0.10}$ ceramics, processed and characterized by the IJS.

The thin ceramic plates were assembled in a special porous form, named the active electrocaloric regenerator (AER). The AER was placed in a sealed housing, filled with silicone oil. A peristaltic pump was used to pump the fluid through the AER and while operating, the ECE material was exposed to changes of the electric field. A special characteristic of such a device is the ability to achieve a temperature span between the hot and the cold side of the device, which can be for a factor higher than the adiabatic temperature change of the electrocaloric material. Under the electric field change of 50 kVcm^{-1} a temperature span of 3.3 K was achieved. That means that the temperature span of the device was enlarged approximately four times in comparison with the adiabatic temperature change. We are aware that such a device is far from being competitive to vapour-compression devices. However, since the concept has been proven, this represents one of the first steps to the final goal of developing the market available future electrocaloric cooling devices.

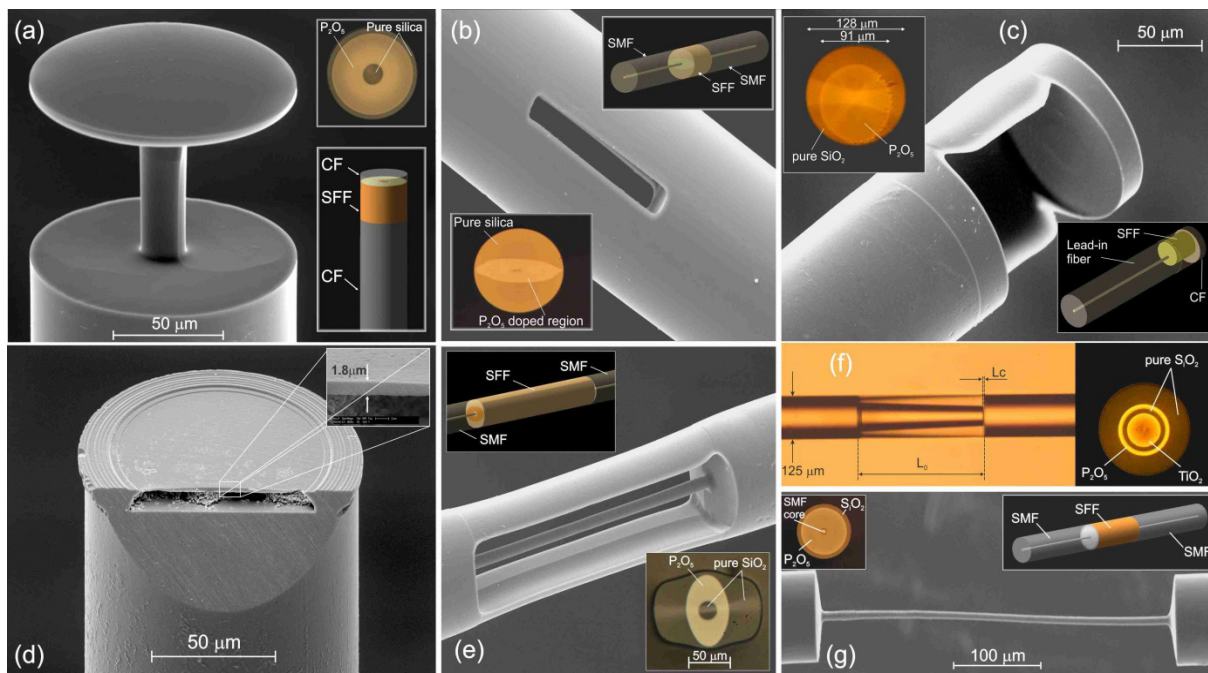


Reference *PLAZNIK, Uroš, KITANOVSKI, Andrej, TUŠEK, Jaka, OŽBOLT, Marko, POREDOŠ, Alojz. Numerical study of an electrocaloric cooling device. V: European Conference on Materials and Technologies for Sustainable Growth, Bled, 19.-21, September 2013. VALANT, Matjaž (ur.), et al. Book of abstracts. Nova Gorica: University, 2013, datoteka OR-SA29 (1 f.). [COBISS.SI-ID 13112347]*

Area **Metrology**

 Achievement **Methods of manufacturing optical devices**

In 2013 the US patent entitled »Methods of manufacturing optical devices« was granted. Patent is covering methods and technology for micromachining of optical fibers. Methods based on design of special structure forming fibers and selective etching. The structure-forming fiber having a preferentially-etchable portion, that may be removed through one or more radial openings in the structure-forming fiber. This opens up possibilities for creating complex all-fiber microphotonic devices, like in-line devices, in-fiber mirrors, micro-cells, cantilevers, micro-resonators and conical structures on the tip of an optical fiber. Since the single sensor forming fiber production cycle usually yields kilometers to tens of kilometers of fiber, which is sufficient to produce 10^5 - 10^7 sensors, and since etching can be performed in large batches, the proposed production technology has good potential for low-cost high volume production and consequently may easily penetrate in industrial environment.



Microstructure devices:(a)Micro-resonator, (b) Micro-cell, (c) micro-cell on the fiber tip, (d) Pressure sensor (side polished to expose diaphragm), (e) Evanescent In-line device with side support, (f) Strain sensor, (g) In-line micro-wire.

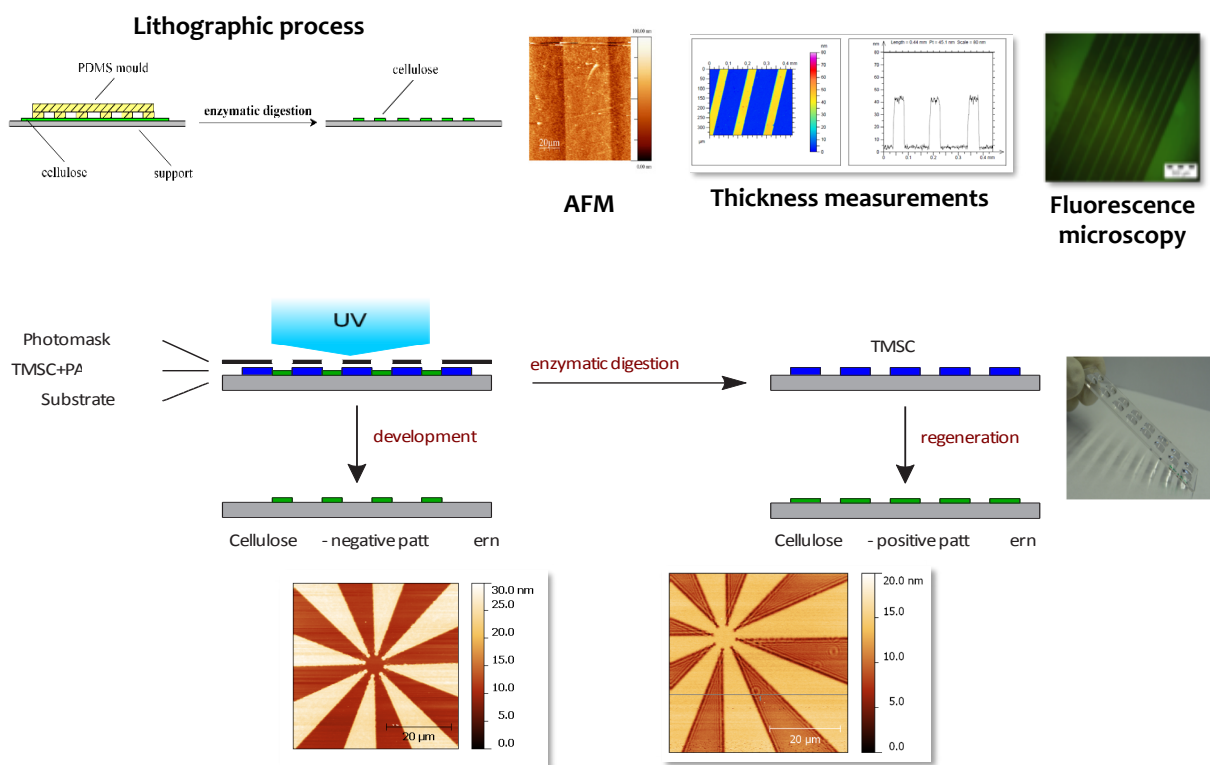
Reference ĐONLAGIĆ, Denis, PEVEC, Simon. *Methods of manufacturing optical devices* : United States Patent, No.: US 8,557,129 B2, Date of Patent: Oct. 15, 2013, Appl. no.: 13/046,659; filed: Mar. 11, 2011, Prior Publication Data US 2012/0228259 A1, Sept. 13, 2012, Int. Cl. B29D 11/00, G02B 6/00. [S. l.: s. n.], 2013. [36] f., ilustr. [COBISS.SI-ID 17241110]

Area **Textile and leather**

Achievement **Functional patterning of biopolymer thin films using enzymes and lithographic methods**

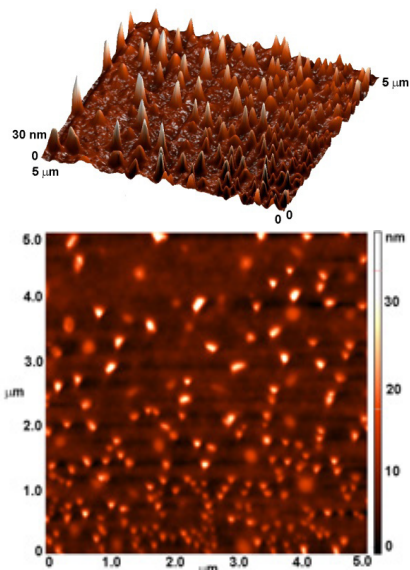
Two different lithographic techniques for the patterning of thin biopolymer films are developed. The first is based on using a microstructured elastomeric mold and enzymes. The second is based on the structured regeneration of TMSC. Model films are protected with metal masks and exposed to vapors of hydrochloric acid. These treatments result in hydrophilic cellulose structures surrounded by hydrophobic TMSC with differing physicochemical properties. The developed methods allow microstructuring of biopolymer thin films suitable for further functionalization and application as biosensors.

Lithography on renewable polymers



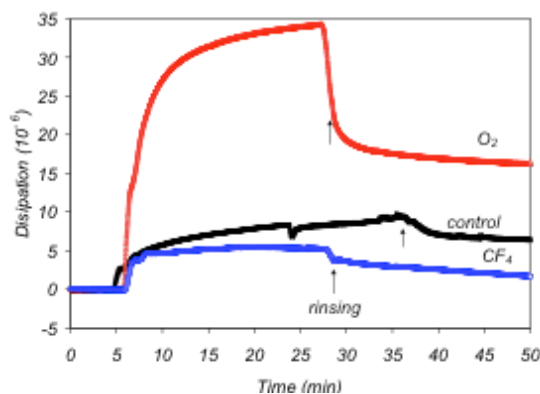
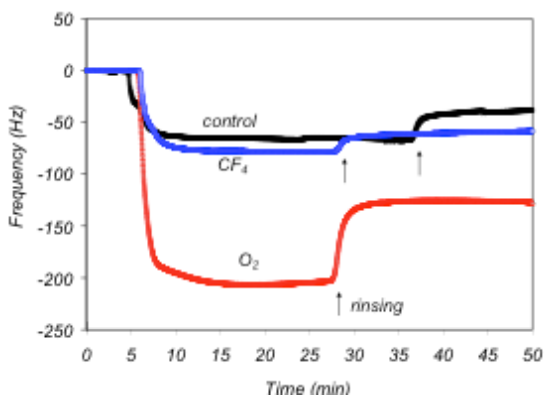
Reference *KARGL, Rupert, et al. Functional patterning of biopolymer thin films using enzymes and lithographic methods. Advanced functional materials, ISSN 1616-301X, Jan 21, 2013, vol. 23, iss. 3, str. 308-315, [COBISS.SI-ID 16217878]; Faktor vpliva 2012/1616-301X; 9.765; A''*

Area Interdisciplinary research

Achievement **Adsorption of blood proteins on plasma-cleaned medical devices**

Blood proteins adsorb on polymer surfaces in islets. The three-dimensional image was obtained by atomic force microscopy.

Scientific aspects of innovative methods for final cleaning of delicate medical devices made from polymers have been addressed. The methods are based on application of non-equilibrium gaseous plasma created in oxygen. Gaseous molecules dissociate to parent atoms under non-equilibrium conditions and the atoms interact chemically with organic materials even at room temperature. We have proved that etching rates of proteins upon treatment with oxygen plasma are orders of magnitude higher than for polymer substrates so the contaminants are removed from the polymer surfaces selectively. The drawback of such a treatment, however, is simultaneous functionalization of the substrate surface with polar groups causing modification of device functional properties, especially abnormal adsorption of blood proteins. In order to annihilate the polar functional groups after successful removal of the contaminants we performed a brief treatment with plasma created in tetrafluormethane (CF_4). Such a treatment allowed for recovery of the initial functional properties of cleaned devices since the adsorption kinetics was almost identical as for unused devices. The results of experiments on adsorption of blood proteins on polymer substrates treated either with O_2 or CF_4 plasma therefore allow for development of an innovative, environmental friendly technology for cleaning of medical devices made from polymer materials and thus cost reduction in medical praxis.



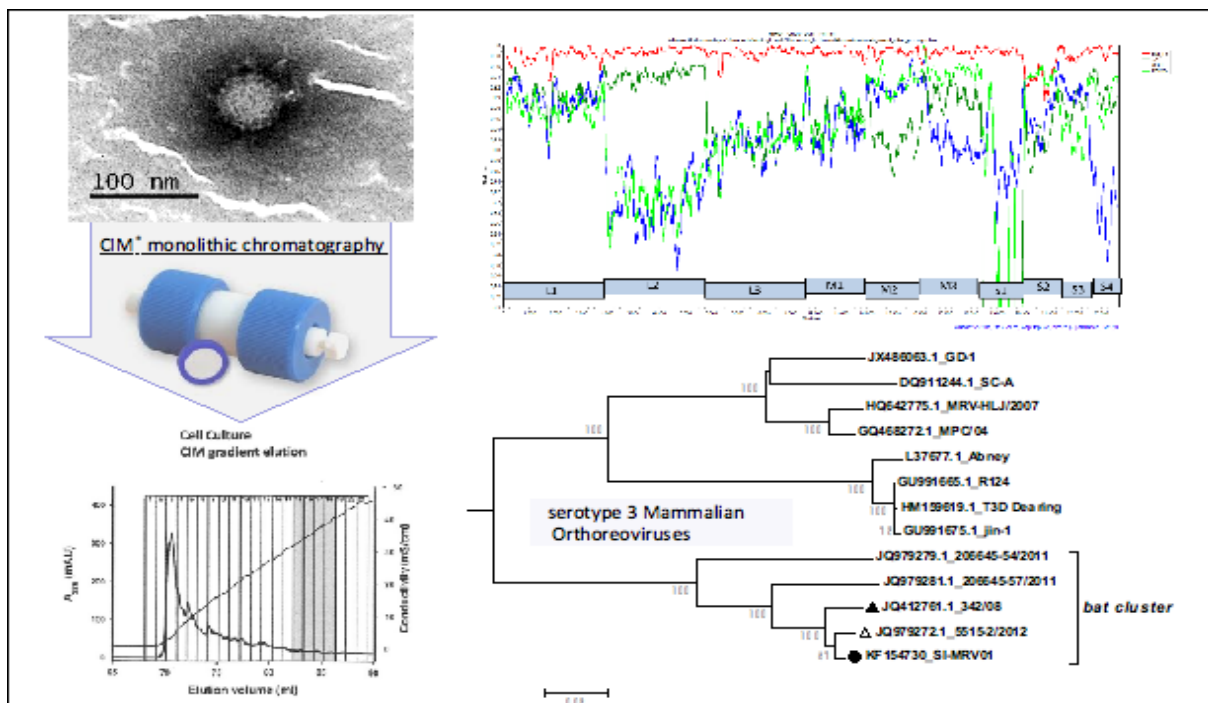
Measurements of adsorption kinetics using a quartz-crystal microbalance indicate extensive adsorption of blood proteins on substrates treated with O_2 plasma. The kinetics becomes almost identical as for untreated materials providing the cleaned substrate is briefly exposed to CF_4 plasma. The right-hand figure shows stiffness of adsorbed proteins.

Reference *Protein Adsorption on Various Plasma-Treated Polyethylene Terephthalate Substrates*, N. Recek, M. Jaganjac, M. Kolar, L. Milkovič, M. Mozetič, K. Stana-Kleinschek, A. Vesel, *Molecules* 18 (2013) 12441-12463.

Area **Microbiology and immunology**

Achievement **Bat Orthoreovirus in human infection; whole genome analysis and new sample preparation method for metagenomic analysis**

In this article, the first detection of bat Orthoreovirus strain with high similarity to the strains isolated from bats in Italy and Germany was described in human. The virus was isolated in cell culture and characterized with whole genome analysis at nucleotide level. The case described in this study emphasized again the importance of bat species as reservoir of new and emerging viruses, capable to cross the species barrier. In addition, a new sample preparation method was described for metagenomic analysis in virus detection. The Convective Interaction Media (CIM® – the high technology product of Slovenian company BIA Separations) monolithic chromatography was implemented, enabling virus concentration and enrichment, simultaneously. Comparing to the existing pre-treatment protocols, our new method showed improved quality in metagenomic data output, which is important in accurate and rapid detection of viral pathogens and their genome analysis. The developed method presented a good alternative in sample preparation for metagenomic analysis in viral diagnostics and research.



Reference Steyer A., Gutiérrez- Aguire I., Kolenc M., Koren S., Kutnjak D., Pokorn M., Poljšak-Prijatelj M., Rački N., Ravnikar M., Sagadin M., Fratnik Steyer A., Toplak N. High Similarity of Novel Orthoreovirus Detected in a Child Hospitalized with Acute Gastroenteritis to Mammalian Orthoreoviruses Found in Bats in Europe. *J Clin Microbiol* 2013;51(11):3818-25.

Area **Microbiology and immunology**

Achievement **Suspected early Lyme neuroborreliosis in patients with erythema migrans**

Background. To obtain data on patients with erythema migrans (EM) who have symptoms/signs suggesting nervous system involvement, and to compare epidemiologic, clinical and microbiologic findings in patients with and without cerebrospinal fluid (CSF) pleocytosis.

Methods. Adult patients with EM and suspected early Lyme neuroborreliosis were included in this study.

Results. Of 161 patients, 31 (19%) had elevated and 130 (81%) had normal CSF cell counts. In contrast to patients with normal CSF cell counts, those with pleocytosis: i) more often reported radicular pain and more often presented with meningeal signs but less frequently complained of malaise; ii) had larger EM skin lesions in spite of similar duration; iii) more commonly had *B. garinii* isolated from EM skin lesions (odds ratio for pleocytosis was 31 times higher in patients with established *B. garinii* skin infection in comparison to patients with other *Borrelia* species isolated from their EM skin lesion) and from CSF; and iiiii) more frequently fulfilled microbiologic criteria for established borrelial infection of the central nervous system. The positive predictive value of pleocytosis for microbiologically proven borrelial infection of the central nervous system (defined by isolation of *Borrelia* from CSF and/or demonstration of intrathecal synthesis of borrelial antibodies) was 67.9%, whereas normal CSF white cell counts ruled out Lyme neuroborreliosis with a predictive value of 91.9%.

Conclusions. Comparison of European patients with EM who had symptoms/signs suggesting early Lyme neuroborreliosis revealed several differences in the clinical presentation and in microbiologic test results according to CSF findings.

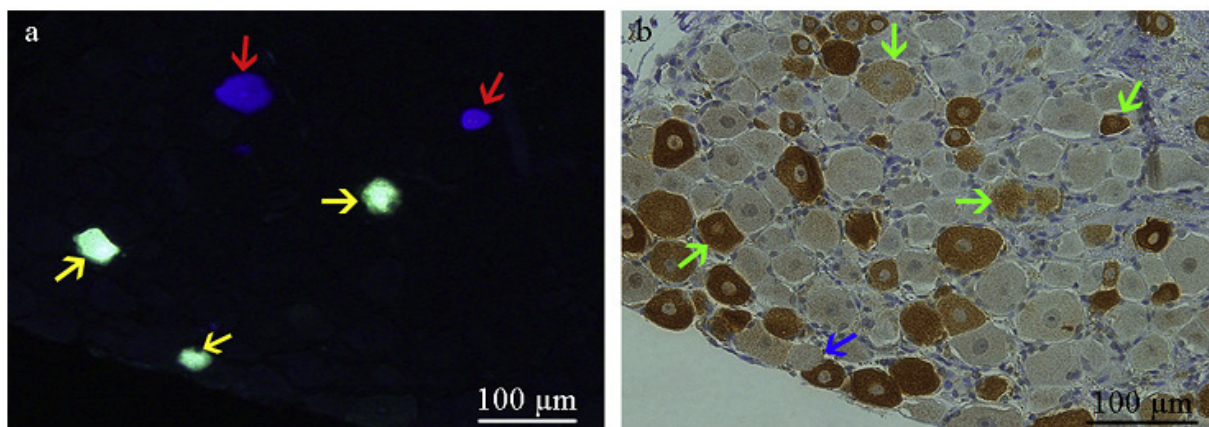


Reference Ogrinc K, Lotrič-Furlan S, Maraspin V, Lusa L, Cerar T, Ružič-Sabljic E, Strle F. Clin Suspected early Lyme neuroborreliosis in patients with erythema migrans. *Infect Dis* 2013; 57: 501-9.

Area **Stomatology**Achievement **Dental pulp and gingivomucosa differ in type of neural cells that innervate them**

The difference in sensitivity of dental pulp and gingivomucosa during normal and pathological conditions might be related to difference in type of sensory neurons innervating both tissues. This information could be helpful in treatment of pain. Therefore, in a rat model, we labeled neurons, innervating both tissues, by fluorescent markers (Figure) and classified them according to their size and neurochemical characteristics of pain sensitive neurons (nociceptors), their TrkA (receptor for nerve growth factor) expression and isolectin IB4 binding.

Dental pulp and gingivomucosa are richly innervated by nociceptive TrkA expressing neurons. However, while the great majority of pulpal neurons are larger NGF dependent A-fibre nociceptors without affinity to bind IB4, almost half of the gingival neurons are smaller IB4 binding C-fibre nociceptors. These may explain intense pain sensations in acute pulpitis in contrast to relatively painless periodontitis.



A: Trigeminal ganglion (TG) tissue section after retrograde marker application to dental pulp (Fluorogold; green-yellow colored neurons in TG; yellow arrows) and to gingivomucosa (TrueBlue; blue colored neurons in TG; red arrows).

B: The same section after immunohistological procedure; TrkA positive neurons (green arrows), TrkA negative neuron (blue arrow).



Reference Kovačič U, Tesovnik B, Molnar N, Côr A, Skalerič U, Gašperšič R. Dental pulp and gingivomucosa in rats are innervated by two morphologically and neurochemically different Arch Oral Biol. 2013 Jul;58(7):788-95.

Area **Oncology**Achievement **Systemic therapy of advanced non- small cell lung cancer**

In the review article entitled "Systemic therapy of advanced non-small cell lung cancer: Major developments of the last 5-years" the authors present the most recent relevant progress in systemic anti-cancer therapy of advanced NSCLC achieved over the last 5 years as well as delineate today's new treatment options. This important article was published in the prestigious European Journal of Cancer in 2013. It provides medical doctors and other scientists involved in global lung cancer research with an insight into major practice changing developments in the field of personalized systemic therapy of NSCLC. Given the fact that the first author, professor Tanja Cufer is a long standing and very active member of the European Organization for Research and Treatment of Cancer (EORTC) and the co-author professor Mary O'Brien is currently chairing the EORTC Lung cancer group (LCG) it is not surprising that the EORTC trials leading to major developments in the targeted therapy of NSCLC are presented in depth. The article has already been cited in many important papers and journals.

European Journal of Cancer (2013) 49, 1216–1225

Available at www.sciencedirect.com

 **SciVerse ScienceDirect** 

journal homepage: www.ejcancer.info

Systemic therapy of advanced non-small cell lung cancer: Major-developments of the last 5-years

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Available online 19 December 2012

KEYWORDS
 Non-small cell lung cancer
 Advanced disease
 New systemic therapies

Abstract The standard palliative treatment for advanced stage NSCLC remains a platinum doublet but by tailoring chemotherapy according to tumour histology the results can be improved through using pemetrexed-containing schemas in non-squamous-cell disease. In addition, maintenance chemotherapy appears to be effective in patients achieving clinical benefit by induction therapy. Targeted therapy based on the presence of activating epidermal growth factor receptor (EGFR) activating mutations or *EML4-ALK* gene rearrangement is becoming standard practice with high median survival rates, up to 30 months. There are still numerous other molecular targeted drugs in development. This review presents the most recent relevant progress in systemic anti-cancer therapy of advanced NSCLC in the past 5 years and delineates today's new treatment options.
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Reference Čufer Tanja, Ovcariček Tanja, O'Brien, Mary E. R., Systemic therapy of advanced non-small cell lung cancer : major-developments of the last 5-years. *European Journal of Cancer* ISSN: 0959-8049.- Vol. 49, iss. 6 (Apr. 2013), str. 1216-1225 COBISS ID: 36823557

Area **Oncology**Achievement **Prospective phase II clinical trial****TPF induction chemotherapy and concomitant irradiation with cisplatin and cetuximab in unresectable squamous cell carcinoma of the head and neck**

The aim of this single-arm, open-label, phase II clinical trial was to assess locoregional control and toxicity of docetaxel, cisplatin and 5-fluorouracil (TPF) induction chemotherapy and concomitant immunochemoradiotherapy with cetuximab (CMB) and cisplatin in unresectable squamous cell carcinoma of the head and neck (SCCHN). Thirty patients entered the study and all had stage IV disease (IVB, 56.7%), 60% had oropharyngeal primary. There were 26 active smokers (86.7%) and three patients (10%), all active smokers, had HPV-positive oropharyngeal primary tumors. The study protocol consisted of four cycles of TPF induction chemotherapy (docetaxel 75 mg/m² day 2; cisplatin, 75 mg/m² day 2; and 5-fluorouracil 750 mg/m² days 1-4), followed by radiotherapy (RT) and concomitant weekly applications of CMB, 250 mg/m² (after a loading dose of 400 mg/m²) and cisplatin, 30 mg/m². Of 30 patients included, 25 patients (83.3%) completed four cycles of induction chemotherapy. Four of these 25 patients (16%) experienced grade ≥ 3 infusion reaction to CMB. Six or more concomitant infusions of cisplatin and CMB were administered in 13/25 (52%) and 18/25 (72%) of patients, respectively. The 2-year locoregional control, disease-free survival and overall survival were 47%, 47%, and 50%, respectively. Patients with grade ≥ 2 skin reaction to CMB had a superior outcome compared to those with grade ≤ 1 reaction: the 2-year locoregional control was 67% vs. 44% ($P=0.025$), the disease-free survival 73% vs. 33% ($P=0.021$), and the overall survival 67% vs. 33% ($P=0.051$). To summarize, in a prognostically extremely unfavorable group with unresectable tumors of low HPV prevalence and active or former smoker preponderance, the tested regimen showed encouraging efficacy. The combination of CMB and low-dose cisplatin after induction TPF increases the treatment toxicity, potentially jeopardizing the delivery of one of the two drugs. A prominent skin rash appears to correlate with improved efficacy of CMB when combined with RT.



Reference *Strojan P, Grašič-Kuhar C, Žumer B, et al. TPF induction chemotherapy and concomitant irradiation with cisplatin and cetuximab in unresectable squamous cell carcinoma of the head and neck. Head Neck 2013 (in press). [COBISS.SI-ID 1624443]*

Area **Cardiovascular system**Achievement **Long-term effects of CD34+ stem cell therapy in patients with dilated cardiomyopathy**

The incidence and prevalence of chronic heart failure is steadily increasing. Despite recent therapeutic advances, a growing number of patients reach an advanced stage of the disease, which is associated with high mortality rates. In a prospective randomized study performed at UMC Ljubljana we sought to investigate the long-term effects of intracoronary transplantation of CD34+ cells in patients with heart failure due to dilated cardiomyopathy (DCM). Of 110 DCM patients, 55 were randomized to CD34+ cell transplantation, and 55 patients received no cell therapy. In the stem cell group, peripheral CD34+ cells were mobilized by G-CSF and collected via apheresis. Patients underwent myocardial scintigraphy and CD34+ cells were injected in the artery supplying the segments with reduced viability. At 5 years after the procedure, intracoronary stem cell transplantation was associated with improved heart function, exercise tolerance, and long-term survival in patients with DCM. This is the first study to date investigating the long-term effects of stem cell therapy in chronic heart failure. The positive results of this trial may serve as a fundament to further improve the management and decrease the mortality rates in this patient population.



Imaging of myocardial CD34+ stem cell retention at 18 hours after the procedure.

Reference VRTOVEC, Bojan, POGLAJEN, Gregor, LEŽAIČ, Luka, SEVER, Matjaž, DOMANOVIČ, Dragoslav, ČERNELČ, Peter, SOČAN, Aljaž, et al. Effects of Intracoronary CD34+ Stem Cell Transplantation in Nonischemic Dilated Cardiomyopathy Patients. *Circulation Research*, ISSN 0009-7330, 4. jan. 2013, no. 1, vol. 112, str. 165-173, ilustr. <http://circres.ahajournals.org/content/112/1/165.long>, doi: 10.1161/CIRCRESAHA.112.276519. [COBISS.SI-ID 883628]

Area **Public health**

Achievement **Gene-gene and gene-environment interactions in asbestosis**

Asbestos-related diseases are among the most extensively studied occupational diseases and the causal relationship between asbestos exposure and asbestosis has been well proved. However, little has been known about the genetic factors that may modify the individual's susceptibility to the development of these diseases. We have shown that genetic polymorphisms in genes coding for antioxidative enzymes influence the risk of developing asbestosis in workers occupationally exposed to asbestos. We have performed statistical modelling of interactions between genetic and environmental factors and confirmed the causal relationships between asbestos exposure, genetic factors and the risk of developing asbestosis. The findings that genetic factors modify the association between cumulative exposure to asbestos and asbestosis will have a major impact on future research in the field of occupational/environmental diseases because we have clearly shown that interactions between genetic and environmental factors have to be accounted for.



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Research Article

The Influence of Gene-Gene and Gene-Environment Interactions on the Risk of Asbestosis

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Reference A.Franko, V.Dolžan, N.Arnerič, M. Dodič-Fikfak: The Influence of Gene-Gene and Gene-Environment Interactions on the Risk of Asbestosis *Biomed Res Int.* 2013;2013:405743

Area **Psychiatry**Achievement **Psychotherapy for schizophrenia**

Schizophrenia, as one of the most severe and, at the same time, interesting mental disorders, is a great challenge for psychotherapy. In the history of psychiatry, variety of approaches in the treatment of schizophrenia was used. In recent years, cognitive-behavioral therapy with support of clinical studies and meta-analyses attracted most of scientific attention. Cognitive-behavioral therapy operates through change of thought processes and behavior in order to alleviate patients' symptoms and improve their quality of life. However, clinical and phenomenological research has shown that patients' difficulties stem from much more foundational disorders – encompassing patients' total experience – and cannot be reached only by change of cognitive or behavioral patterns. Phenomenology strives for a thorough investigation of what is it like to be a patient with schizophrenia and how is it like to live with it. From this research we know that schizophrenia patients feel basically different from other people, they suffer from a variety of anomalous self-experience, which they have great difficulties to verbalize, and they feel profoundly defenseless, especially in interactions with others. Thorough understanding of such basic anomalies of patients' self-experience enables us to design effective psychotherapeutic strategies.

Psychopathology**Original Paper**Psychopathology 2013;46:249–265
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Cognitive-Behavioral Therapy for Schizophrenia: A Critical Evaluation of Its Theoretical Framework from a Clinical-Phenomenological Perspective

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Reference ŠKODLAR, Borut, HENRIKSEN, Mads G., SASS, Louis Amorsson, NELSON, Barnaby, PARNAS, Josef. Cognitive-behavioral therapy for schizophrenia: a critical evaluation of its theoretical framework from a clinical-phenomenological perspective. *Psychopathology*, ISSN 0254-4962, 2013, vol. 46, iss. 4, str. 249-265, doi: 10.1159/000342536. [COBISS.SI-ID 30395097]

Area **Forestry, wood and paper technology**

Achievement **An article in the journal
Soil Biology & Biochemistry
(first journal in the field of Soil Science)**

Mycorrhizal fungi constitute a considerable sink for carbon in most ecosystems. This carbon is used for building extensive mycelial networks in the soil as well as for metabolic activity related to nutrient uptake. A number of methods have been developed recently to quantify production, standing biomass and turnover of extramatrical mycorrhizal mycelia (EMM) in the field. These methods include minirhizotrons, in-growth mesh bags and cores, and indirect measurements of EMM based on classification of ectomycorrhizal fungi into exploration types. Here we review the state of the art of this methodology and discuss how it can be developed and applied most effectively in the field. Furthermore, we also discuss different ways to quantify fungal biomass based on biomarkers such as chitin, ergosterol and PLFAs, as well as molecular methods, such as qPCR. The evidence thus far indicates that mycorrhizal fungi are key components of microbial biomass in many ecosystems. We highlight the need to extend the application of current methods to focus on a greater range of habitats and mycorrhizal types enabling incorporation of mycorrhizal fungal biomass and turnover into biogeochemical cycling models.

| ET | Fungal genus ⁵ | | | |
|------------------------------|--|--|--|--|
| Contact (CET) | <i>Arcangeliiella</i> , <i>Balsamia</i> , <i>Chroogomphus</i> , <i>Craterellus</i> ² , <i>Lactarius</i> ³ , <i>Leucangium</i> , <i>Russula</i> , <i>Tomentella</i> | | | |
| Short distance (SET) | <i>Acephala</i> , <i>Byssocorticium</i> , <i>Cenococcum</i> , <i>Coltricia</i> , <i>Coltriciella</i> , <i>Craterellus</i> ² , <i>Descolea</i> , <i>Descomyces</i> , <i>Elaphomyces</i> , <i>Genea</i> , <i>Hebeloma</i> , <i>Humaria</i> , <i>Hyarophorus</i> , <i>Inocybe</i> , <i>Pseudotomentella</i> , <i>Rhodocollybia</i> , <i>Rozites</i> , <i>Russula</i> , <i>Sebacina</i> , <i>Sphaerosporella</i> , <i>Sphaerozone</i> , <i>Tomentella</i> , <i>Tricharina</i> , <i>Tuber</i> , <i>Tylospora</i> | | | |
| Medium (MET): fringe subtype | <i>Amphinema</i> , <i>Cortinarius</i> , <i>Dermocybe</i> , <i>Hyalnum</i> , <i>Lyophyllum</i> , <i>Piloderma</i> , <i>Sistotrema</i> , <i>Stephanopus</i> , <i>Thaxterogaster</i> , <i>Tricholoma</i> | | | |
| MET: mat subtype | <i>Bankera</i> , <i>Boletopsis</i> , <i>Clavariadelphus</i> , <i>Cortinarius</i> , <i>Gautieria</i> , <i>Geastrum</i> , <i>Gomphus</i> , <i>Hydnellum</i> , <i>Hysterangium</i> , <i>Phellodon</i> , <i>Ramaria</i> , <i>Sarcodon</i> | | | |
| MET: smooth subtype | <i>Albatrellus</i> , <i>Amanita</i> ⁴ , <i>Byssosporia</i> , <i>Cantharellus</i> , <i>Entoloma</i> , <i>Gomphidius</i> , <i>Hyarophorus</i> , <i>Laccaria</i> , <i>Lactarius</i> , <i>Naucaria</i> , <i>Polyporoletus</i> , <i>Pseudotomentella</i> , <i>Russula</i> , <i>Thelephora</i> , <i>Tomentella</i> , <i>Tomentellopsis</i> | | | |
| Long distance (LET) | <i>Alpova</i> , <i>Amanita</i> ⁴ , <i>Austropaxillus</i> , <i>Boletinus</i> , <i>Boletus</i> , <i>Chamonixia</i> , <i>Gyrodon</i> , <i>Gyroporus</i> , <i>Leccinum</i> , <i>Melanogaster</i> , <i>Paxillus</i> , <i>Pisolithus</i> , <i>Porphyrellus</i> , <i>Rhizopogon</i> , <i>Scleroderma</i> , <i>Suillus</i> , <i>Truncocolumella</i> , <i>Tricholoma</i> , <i>Tylopilus</i> , <i>Xerocomus</i> | | | |

| Exploration type | Max. dist. from root tip (cm) | Projected area per mycelial system (mm ²) | Specific EMM length (m cm ⁻¹ ECM tip ⁻¹) | Specific EMM biomass ¹ (μg cm ⁻¹ ECM tip ⁻¹) |
|------------------|-------------------------------|---|---|--|
| Short distance | 1.2 | 33 ± 9 | 3.72±1.19 | 3.24±1.03 |
| Medium distance | 1.9 | 84 ± 5 | 6.91±0.54 | 6.02±0.47 |
| Long distance | 9.6 | 630 ± 181 | 55.91±20.25 | 48.67±17.62 |

Reference Wallander, H., Kraigher, H. Evaluation of methods to estimate production, biomass and turnover of ectomycorrhizal mycelium in forests soils - a review. *Soil biology & biochemistry* ISSN: 0038-0717.- Vol. 57 (2013), str. 1034-1047. COBISS.SI-ID 3432102

Area **Animal production**

Achievement **Development of the bioinformatics tool miRNA SNIPer for the analysis of the genetic variability of micro RNA genes in vertebrates**

MicroRNAs are a class of non-coding RNAs that are involved in the regulation of gene expression and have great potential for the development of biomarkers in medicine, veterinary medicine and livestock. We have developed a bioinformatics tool miRNA SNIPer for identification of polymorphisms within microRNA genes in vertebrates. The current version of the tool 4.0 enables the analysis of 15 genomes. The tool is regularly updated because of increasing amounts of available genomic data. Using the miRNA SNIPer tool at the genome-wide level, we identified several genomic regions comprising promising biomarkers in human, domestic animals and model organisms. Some polymorphisms with unknown validation status were experimentally confirmed. Similarly, we are developing the tools for the analysis of other classes of non-coding RNA, such as snoRNA and ultraconserved regions (UCR). The collected polymorphisms and the developed tools will contribute to a better understanding of the role of non-coding RNAs in shaping of phenotypes and development of diseases and for development of novel molecular biomarkers.



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miRNA SNIPer

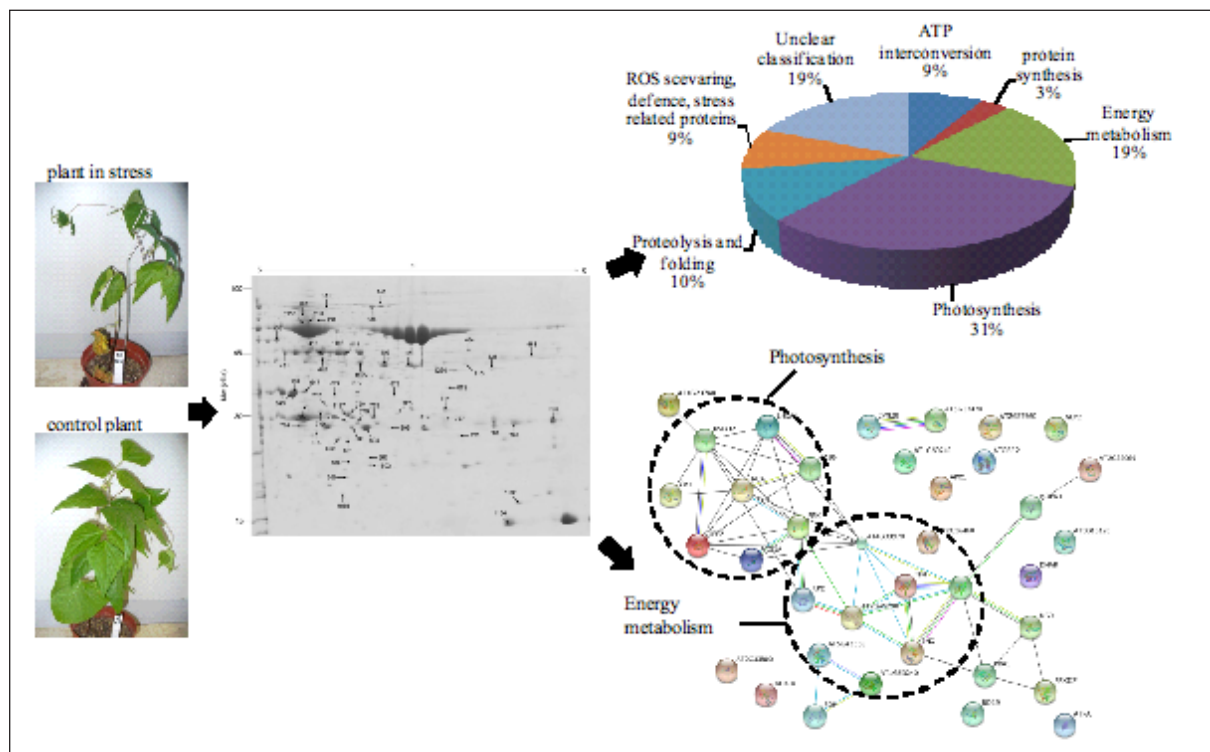
| miRNA name | miRNA | mature miRNA | variation | details |
|-----------------------------|---|---|-----------------------------|--|
| bta-mir-29e | Bos taurus 16:77561999-77562079[+] | bta-miR-29e Mature: 77562050-77562073 Seed: 77562051-77562057 from TargetScan CUUCUGGAAGCUGGUUUCACAUGGUGGCUUAGA UUUUCCAUCUUUGUAUCUAGCAUCAUUUGAA AUCAGUGUUU UAGGAG | rs481270961 | In pre-mature 77562010 SNP (T > G) |
| | | | rs443247673 | In pre-mature 77562023 SNP (T > G) |
| | | | rs463508738 | In pre-mature 77562042 SNP (T > C) |
| | | | rs41825418 | In seed 77562055 SNP (T > C) |

Reference Jevšinek Skok Daša, Godnič Irena, Zorc Minja, Horvat Simon, Dovč Peter, Kovač Milena, Kunej Tanja. Genome-wide in silico screening for microRNA genetic variability in livestock species. *Animal Genetics* 2013;44(6):669-77.

Area **Plant production**

Achievement **Proteomic analysis of drought stress response in leaves of common bean**

Drought stress is one of the major factors that limit yields of many important crop species, including common bean. Stress causes changes at gene and protein level. A proteomic approach was used for the analysis of drought-responsive proteins in leaves of two cultivars of common bean - Tiber and Starozagorski čern. Protein extracts were separated by gel electrophoresis and protein spots with changed abundance between control and stressed plants were determined. These protein spots were identified by mass spectrometry. Sixty-four proteins were identified in Starozagorski čern and 58 in Tiber. The majority of identified proteins were classified into functional categories that include energy metabolism, photosynthesis, protein synthesis and proteolysis, stress and defence related proteins. Interactions between identified proteins were demonstrated by bioinformatic analysis, enabling a more complete insight into biological pathways and molecular functions affected by drought stress.

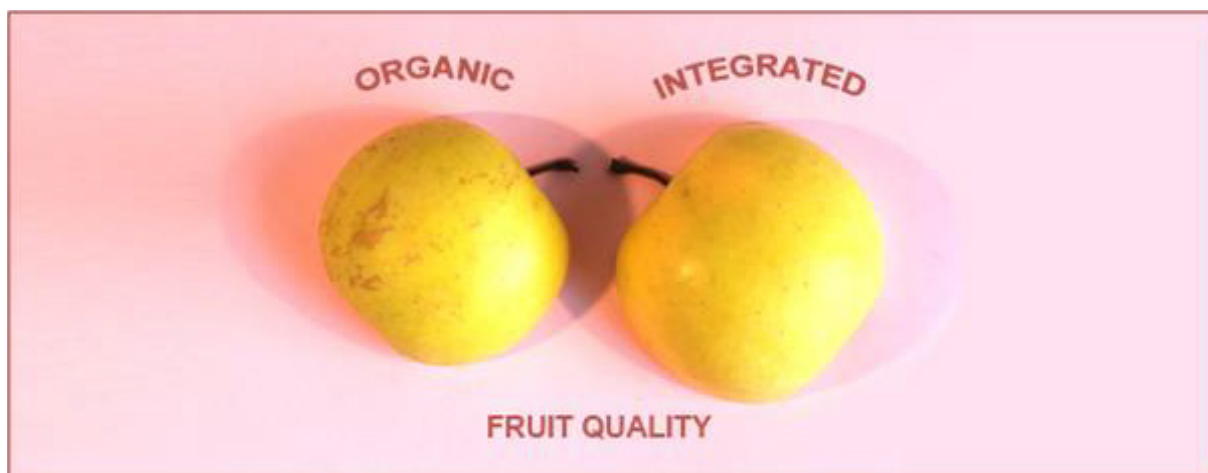


Reference ZADRAŽNIK, Tanja, HOLLUNG, Kristin, EGGE-JACOBSEN, Wolfgang, MEGLIČ, Vladimir, ŠUŠTAR VOZLIČ, Jelka. Diferencialna proteomska analiza odziva listov navadnega fižola (*Phaseolus vulgaris* L.) na sušni stres. *Journal of proteomics*, 2013, vol. 78, str. 254-272.

Area **Plant production**

Achievement **Targeted metabolomic profiling and sensorial quality of 'Golden Delicious', 'Liberty', 'Santana' and 'Topaz' apples grown using organic and integrated production systems**

The article on apple fruit quality originating from organic (ORG) and integrated production (IP) systems was published in the top acknowledged food chemistry research journal in 2013. Apple quality was investigated in the scab-resistant 'Liberty', 'Santana', and 'Topaz' cultivars and the scab susceptible 'Golden Delicious' cultivar. Trees subjected to the same crop load were cultivated using ORG or an IP system. Apple production in Europe has mostly been managed according to IP guidelines; however, the quantity of ORG-produced apples is increasing constantly. The aim of this study was to investigate how the ORG or IP agricultural system affects both phenolic content of fruit and its sensorial quality. Targeted metabolomic profiling of multiple classes of phenolics was performed on four cultivars from both production systems. Only scab-susceptible 'Golden Delicious' fruit grown from ORG production showed significantly higher level of phenolics comparing to IP fruit. It could be surmised that scab resistance is one of the factors which differentially affect multiple classes of phenolic biosynthesis in relation to the agricultural system. Sensorial evaluation indicated significantly better flavor and appearance of IP fruit. Presented research indicated progress in understanding both quality parameters of ORG/IP fruits and apple scab-resistance mechanisms.



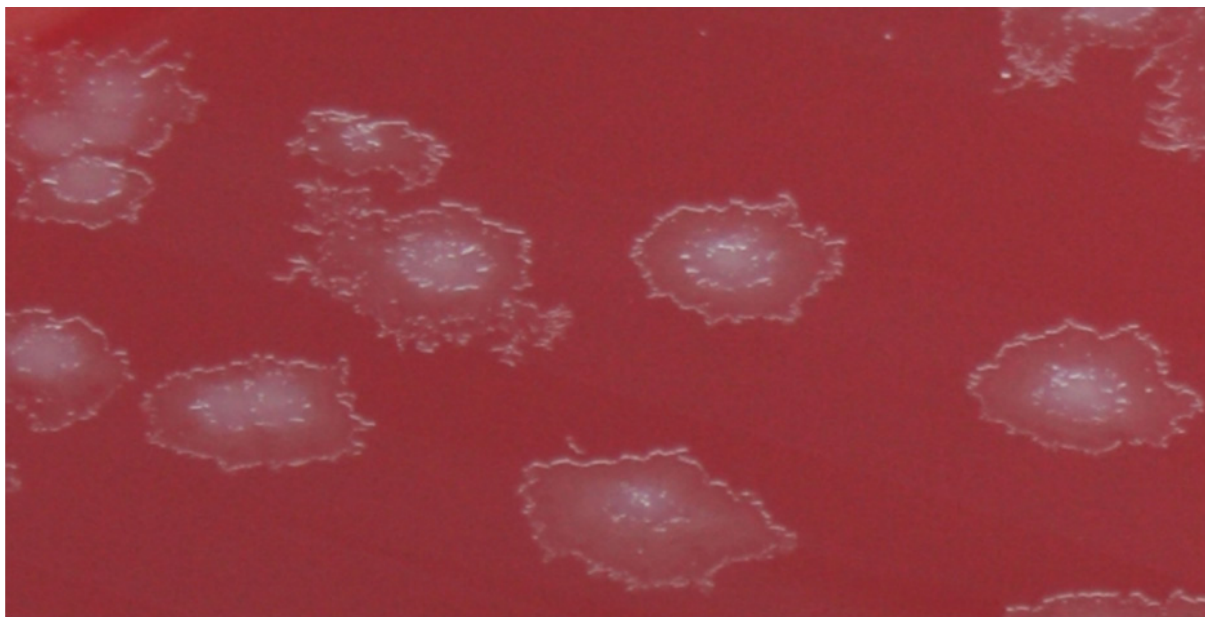
Organic grown 'Golden Delicious' apples were on the average smaller than integrated and had more russet on fruit surface, mostly near the fruit pedicel cavity.

Reference VANZO, Andreja, JENKO, Mojca, VRHOVŠEK, Urška, STOPAR, Matej. *Metabolomic profiling and sensorial quality of 'Golden Delicious', 'Liberty', 'Santana', and 'Topaz' apples grown using organic and integrated production systems. Journal of agricultural and food chemistry*, ISSN 0021-8561, 2013, vol. 61, iss. 26, str. 6580-6587, doi: 10.1021/jf4011142. [COBISS.SI-ID 4220776]

Area **Veterinarian medicine**

Achievement **Improvement of the procedure for the detection of *Clostridium difficile* in animals**

Clostridium difficile is known as an important cause of hospital-acquired infections in humans, but an increased frequency of community-acquired infections has been reported. *C. difficile* is frequently detected in domestic animals, which could be the reservoir for human infections. Commercially available tests intended for diagnostics in humans are of limited use for diagnostics in animals. In animal samples, a time-consuming culture method is mostly used. We improved the procedure for the detection of *C. difficile* in samples with low number of bacteria. Pre-enrichment step was added prior to real-time PCR (rtPCR) with the purpose to increase the number of *C. difficile* in samples. One day enrichment culture for *C. difficile*, followed by rtPCR assay targeting all three toxin genes, can be applied as an accurate and rapid screening test. Beside the information about the presence of *C. difficile*, it also provides the data about the toxin genes. This procedure can be used for a large-scale monitoring purposes, as samples with rtPCR negative result after one day of enrichment need no further investigation. This method is also useful for testing food and environmental samples, which could broaden the knowledge about their role as a potential source of *C. difficile*.



Reference AVBERŠEK J, et al. Improved detection of *Clostridium difficile* in animals by using enrichment culture followed by LightCycler real-time PCR. *Vet Microbiol* 2013; 164: 93-100.

Area **Biotechnology**

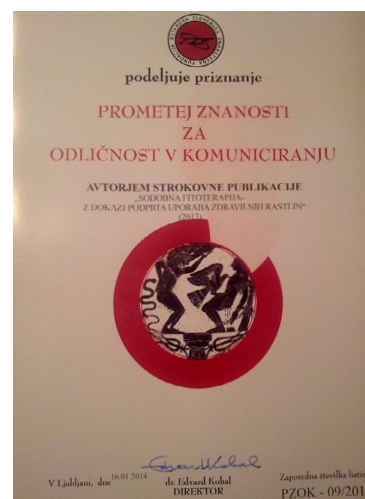
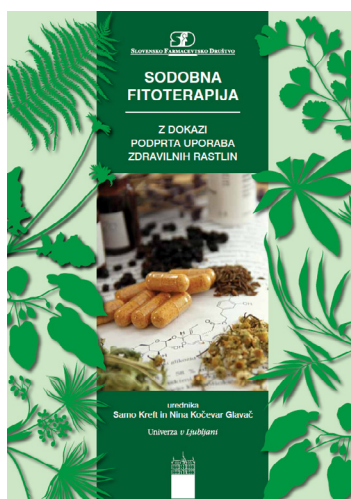
Achievement **Book monograph on medicinal plants**

"Modern phytotherapy" is a professional scientific book on medicinal plants, on the results of the latest scientific research as well as clinical practice and tradition in this area. On 700 pages, the book written by 16 Slovenian authors describes 100 medicinal plants, 14 most investigated medicinal mushrooms, 31 isolated plant compounds, and 3 most important groups of plant antioxidants. The introductory part of the book presents the legal regulation of medicinal plants, pharmaceutical forms used in phytotherapy, and the basics of clinical research as an important tool for demonstrating the efficacy and safety of medicinal plants. The main part of the book is devoted to medicinal plants, which are classified according to the effects on the organ systems (the central nervous system, immune system, respiratory system, cardiovascular system, gastrointestinal tract, urogenital tract, the skin and mucosa). Individual medicinal plants are described in the form of constant sections: scientific name of plant and herbal drug, botanical description, ingredients, pharmacological research, clinical studies, side effects and warnings.

The book is designed so that it can be used as a textbook for students of pharmacy, handbook for healthcare professionals (doctors and pharmacists), as well as an interesting reading for fans of medicinal plants, irrespective of their education.

The book was published in May 2013 in 2,000 copies, which were sold out in 6 months. In November 2013, a second edition was printed.

The book was awarded by the Slovenian Science Foundation's prize: Prometheus of Science.

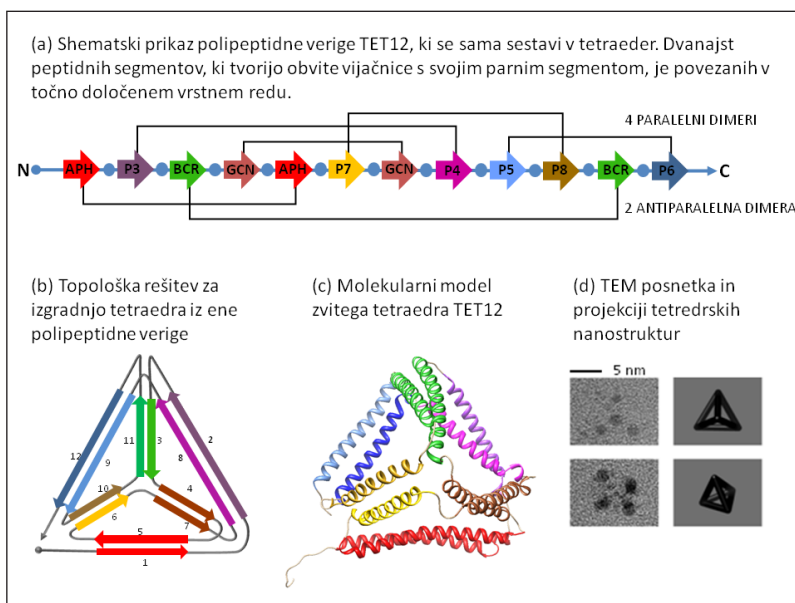


Reference *Sodobna fitoterapija: z dokazi podprta uporaba zdravilnih rastlin. Avtorji: Samo Kreft et al.; Urednika: Samo Kreft in Nina Kočevar Glavač; Slovensko farmaceutsko društvo, 2013; Ljubljana: 692 strani. ISBN 978-961-92900-4-0*

Area **Biotechnology**

Achievement **Designed nanoscale polypeptide tetrahedron**

The research group from the Laboratory of biotechnology at the National institute of chemistry has succeeded in an important scientific achievement by publishing an invention of a new modular type of polypeptide nanostructure formation based on the concatenated polypeptide segments that form dimeric coiled-coils. We designed and experimentally demonstrated formation of the tetrahedron that self-assembles from a single polypeptide chain comprising twelve coiled-coil-forming segments separated by flexible peptide hinges. The path of the polypeptide chain is guided by a defined order of segments that traverse each of the six edges of the tetrahedron exactly twice. This design platform provides the foundation for constructing **new topological polypeptide folds** based on the set of orthogonal interacting polypeptide segments. This is an important breakthrough in the field of synthetic biology, and the article published in *Nature Chemical Biology* has been acclaimed in comments in journals *Nature*, *Science*, *Nature Biotechnology*, *C&E News* as well as on the numerous invited lectures at scientific meetings and at the universities.



Reference GRADIŠAR, Helena, BOŽIČ ABRAM, Sabina, DOLES, Tibor, VENGUST, Damjan, HAFNER BRATKOVIČ, Iva, MERTELJ, Alenka, WEBB, Ben, ŠALI, Andrej, KLAVŽAR, Sandi, JERALA, Roman. *Design of a single-chain polypeptide tetrahedron assembled from coiled-coil segments. Nature chemical biology*, 2013, vol. 9, issue 6, str. 362-366, doi: 10.1038/nChEMBio.1248. [COBISS.SI-ID 5222682]

Area **Educational studies**

Achievement **Organization of HER2013**

Initiated by the University of British Columbia, a global research network "International Workshop on Higher Education Reform" (HER) has been created in 2003. Its primary purpose is to establish a forum for global cooperation of researchers from this thematic field. The Center for Educational Policy Studies (CEPS) at the Faculty of Education, University of Ljubljana, which is a member of the network, organized its anniversary, the tenth conference in October 2013. Previous conferences were in Vancouver (twice), Vienna, Tokyo, Dublin, Shanghai, Mexico City, Berlin and Pittsburgh. The central theme of the jubilee conference was "Higher education reforms: Looking back – looking forward." The focus was on changes in the understanding of academic freedom and university autonomy; globalization, privatization, financial crisis and the future of public higher education; new forms of teaching and learning in higher education and the mission of higher education institutions in a rapidly changing environment. The conference was attended by 100 researchers from all continents with 38 papers; plenary speakers were Sir Peter Scott, Ulrich Teichler and Catherine Odora Hoppers. The organizer published the conference proceedings (2013), some selected articles were published in the *CEPS Journal* (2014, 2) and a thematic monograph will be published by Sense (2015).



Reference *Higher education reforms: Looking back - looking forward: workshop proceedings / 10th International Workshop on Higher Education Reform (HER), University of Ljubljana, Faculty of Education, October 2-4, 2013. - Ljubljana: CEPS - Centre for Education Policy Studies, Faculty of Education, 2013. - ISBN 978-961-253-153-9*

Area **Economics**

Achievement **Willingness-to-pay for entrance fees as a rationale for adopting segmented pricing**

We examine the relationship between the visitors' willingness-to-pay the entrance fee and their various socio-economic, geographical, and psychological characteristics. By applying the contingent valuation method, we established that different segments of visitors differ substantially, both in their characteristics and in their behaviour. They are willing to pay various entrance fees, the majority of these being higher than the prevalent single entrance fee. Higher willingness-to-pay originates not only from higher income or higher standard of living, but also from their sociological, geographical, and psychological characteristics. By estimating the demand curves, we established that (substantially) higher entrance fees would not decrease the consumer surplus (significantly). The findings, if applied with caution, could provide museum managers with the rationale for adopting segmented pricing and with practical directions for setting such schemes.



Pergamon

Annals of Tourism Research, Vol. 43, pp. 58–80, 2013
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<http://dx.doi.org/10.1016/j.annals.2013.04.001>

**AN ANALYSIS OF ADOPTING DUAL
PRICING FOR MUSEUMS
THE CASE OF THE NATIONAL MUSEUM OF
IRAN**

Mohammad Sharifi-Tehrani

Allameh Tabataba'i University, Iran

Miroslav Verbič

University of Ljubljana, Slovenia

Jin Young Chung

University of Wisconsin, USA

Reference SHARIFI TEHRANI, Mohammad, VERBIČ, Miroslav, CHUNG, Jin Young. An analysis of adopting dual pricing for museums: The case of the national museum of Iran. *Annals of Tourism Research*, 43(2013), 58-80, ISSN 0160-7383 (JCR IF 3.683), doi: 10.1016/j.annals.2013.04.001. [COBISS.SI-ID 1683854]

Area **Sociology**

Achievement **"I only have to ask him and he does it."
Active fatherhood and (perceptions of)
division of family labour in Slovenia**

The paper analyzes changes in the gendered division of family labour and the recent phenomenon of active fatherhood in Slovenia. Based on qualitative empirical evidence, the authors argue that changes in the relocation of care between women and men in family life are significant in the values and expectations of individuals rather than in practices. The article focuses especially on changes in the paternal role and the consequences for the gendered division of labour within the family. The so-called new or active fatherhood in Slovenia is chiefly present in the form of a supporting paternal role, which strengthens and maintains the position of motherhood and mothering as the primary family role, and puts the fathering role in a secondary, supportive position. The authors discuss social contexts, subjective and structural factors/obstacles to changes in the gendered division of family labour in Slovenia.



Reference Švab A., Humer Ž., "I only have to ask him and he does it": active fatherhood and (perceptions of) division of family labour in Slovenia *Journal of comparative family studies*, ISSN 0047-2328, 2013, vol. 44, no. 1, str. 57-78.

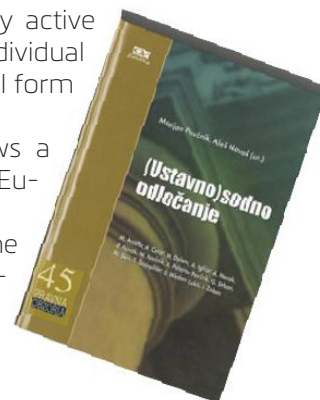
Area **Law**

Achievement **Adjudication
(before Constitutional and Regular Courts)**

Interdisciplinary research bringing together lawyers from different fields, among others former President of the Constitutional Court, former Vice President of the Constitutional Court, sitting Judge of the Constitutional Court, Supreme Court judge and a number of distinguished legal academics.

Short summary of research achievements:

- Adjudication before Constitutional Court and regular courts is gaining the same standing as formal sources of law commonly recognised in civil law countries.
- Foreign and domestic jurisprudence of constitutional courts display an emerging trend of increasingly active involvement in shaping the profile of individual legal fields, replacing a more deferential form of judicial review.
- Adjudication in Slovenian courts shows a growing influence of international and European law.
- Adjudication can significantly reinforce the rule of law provided the highest standards of professional legal ethics (especially judicial ethics) are adhered to.



*»[the book outlining the results of the research]
... underlines the importance of the jurisprudence
of the Constitutional Court and regular courts
for continuing development of legal theory
and provides an excellent feed-back
to judges, thus promoting higher quality
of (constitutional) adjudication.*

*This is not a book to be forgotten on a book-shelf
once it has been read, but one of those
which we are well-advised to keep close at hand
and continue to reread them*

*(dr. Jadranka Sovdat, Vice President
of the Constitutional Court
of the Republic of Slovenia)*

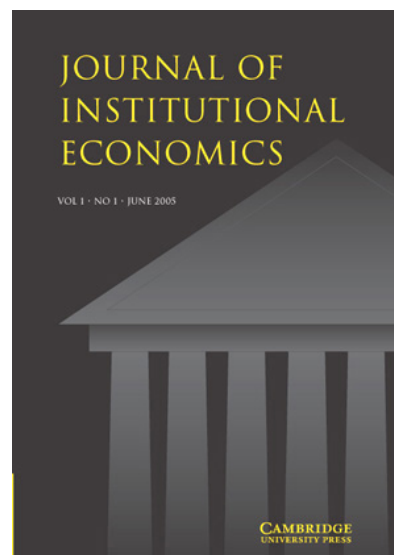
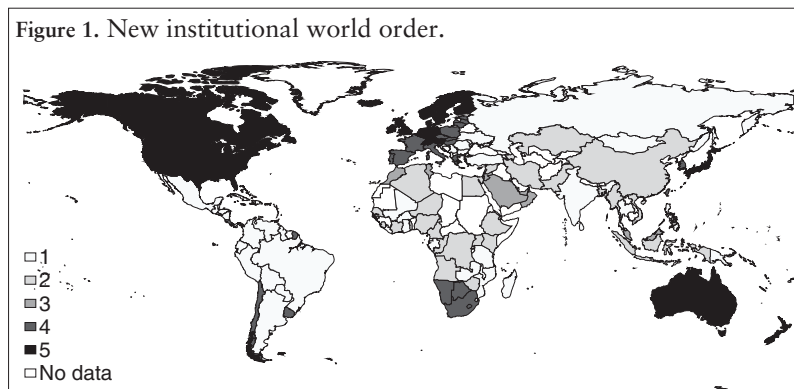
Reference *(Ustavno) sodno odločanje. ur. akad. prof. dr. Marijan Pavčnik, doc.dr. Aleš Novak, Gospodarski vestnik, Ljubljana 2013*

Area **Political science**

Achievement **Institutional quality dataset**

In this contribution, the role of institutions (formal and informal rules in the society) as the underlying basis for economic and social activity is emphasized. Different institutional classification systems are described and compared, which is rarely done in the literature, empirical operationalization of institutional concepts is shown. More than 30 established institutional indicators can be clustered into three homogeneous groups of formal institutions: legal, political and economic, which capture to a large extent the complete formal institutional environment of a country. The latent quality of legal, political and economic institutions for every country in the world and for every year is computed. On this basis, a legal, political and economic 'World Institutional Quality Ranking' is proposed, through which it can be followed whether a country is improving or worsening its relative institutional environment. The calculated latent institutional quality measures can be especially useful in further panel data applications in social sciences and add to the usual practice of using simply one or another index of institutional quality to capture the institutional environment. The Institutional Quality Dataset, covering up to 197 countries and territories from 1990 to 2010, is freely available online, and presented also in the renowned SSCI indexed Journal of Institutional Economics, while already being used by the research community.

Figure 1. New institutional world order.



Reference KUNČIČ, Aljaž. *Institutional quality dataset*. *Journal of institutional economics*, 2013, 27 str. [COBISS.SI-ID 32093277]

Area **Criminology**

Achievement

The individualization of punishment: Sentencing in Slovenia

Sentencing has been a hot topic in contemporary discussions on punishment and the criminal justice system. Limiting the judge's discretion in choosing a sentence is one of the main gateways that politicians use to shape the picture of modern punishment. The US federal system is the most infamous in this respect, structuring a two-dimensional sentencing table that allows the judge a very minimal field of discretion. The system aimed at achieving equality at sentencing failed rather miserably and only resulted in a huge prison complex and the state's inability to operate it. Criticisms of this type are common; however, there is a significant gap in academic literature on sentencing. For the most part, the authors and their ideas linger in the Anglo-American systems, only very rarely different options, common in continental Europe or elsewhere are sought or analysed. This is far from ideal as it does not allow for a nuanced academic debate and comparison.

This article, published in a prominent criminological journal – the *European Journal of Criminology*, aims at partially aiding this lacuna in knowledge. The individualisation of punishment as one of the main principles of the Slovenian sentencing system, while having its shortcomings, does appear to be a viable option to other solutions and seems less prone to political pressures than its common law alternatives. The contribution extensively analyses it and puts into an international perspective, allowing for a more educated discussion in the field. The article thus importantly contributes to our shared comparative knowledge on the topic by presenting original Slovenian findings.

**The individualization of punishment: Sentencing in Slovenia**

Mojca M. Plesničar

Institute of Criminology at the Faculty of Law Ljubljana, Slovenia

Mojca M. Plesničar, Institute of Criminology at the Faculty of Law Ljubljana, Poljanski nasip 2, Ljubljana, S1-1000, Slovenia. Email: mojca.plesnicar@of.uni-lj.si**Abstract**

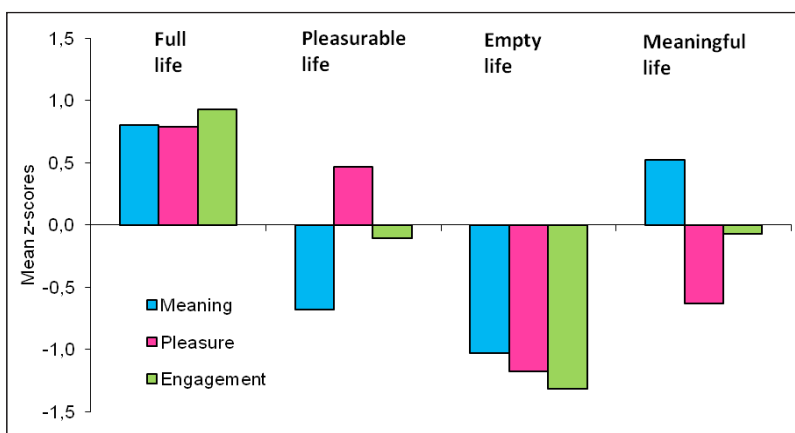
Sentencing issues are discussed at length in common law systems, but discussions infrequently include civil law systems. In an attempt to remedy this oversight somewhat, the article analyses the sentencing system in Slovenia, a fairly typical civil law country. The basis of the sentencing system is the concept of individualization of punishment, where proportionality is of the utmost importance and is set first by legislation determining sentencing ranges for specific offences and then by the judiciary aiming to narrow the ranges to an appropriate sentence in individual cases. The system is far from perfect, especially on the procedural side, but it offers a valid alternative to other sentencing solutions.

[Civil law systems](#) [individualization of punishment](#) [punishment](#) [sentencing](#) [Slovenia](#)

Mojca M. Plesničar *The individualization of punishment: Sentencing in Slovenia* *European Journal of Criminology*, July 2013, vol. 10, no. 4, 462-478

Area **Psychology**Achievement **Happiness and pathways to reach it**

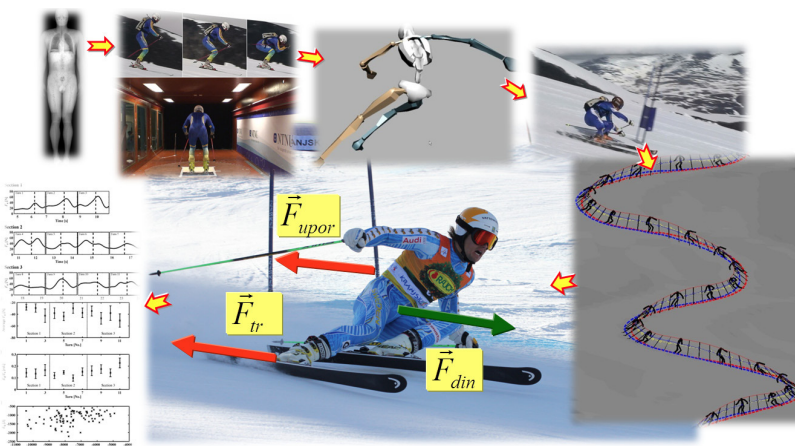
Using two approaches, the study investigates ways in which people reach happiness (orientation to pleasure, meaning and engagement) in a large sample of Slovene adults. The first, i.e. dimension-centred approach focuses on the three orientations to happiness, while a person-centred approach enables the identification of groups of people with characteristic patterns of these three orientations. The study provided theoretically as well as practically relevant findings, showing that all three orientations to happiness represent possible and appropriate ways to achieve emotional, psychological, and social well-being. Four groups of individuals with different profiles of ways towards happiness were identified and membership of these groups was associated with well-being. Leading an empty life (rarely following any of the three paths to happiness) was associated with the poorest outcomes and full life (high in all three orientations) with the highest well-being. Individuals pursuing pleasurable (high orientation to pleasure and moderate engagement) and meaningful life (high orientation to meaning and moderate engagement) were characterized by moderate well-being with pleasurable life associated with somewhat higher emotional well-being and meaningful life with somewhat higher social well-being. Thus, all three paths to happiness contribute significantly to individuals' well-being, though the combination of the three orientations towards happiness is also important for different aspects of well-being.



Reference KAVČIČ, Tina, AVSEC, Andreja. Happiness and pathways to reach it: dimension centred versus person-centred approach. *Social indicators research*, ISSN 0303-8300, 25. Sep. 2013, str. [1-16], tabele, graf. Prikazi COBISS ID 53014114

Area **Sport**Achievement **Aerodynamic drag is not the major determinant of performance during giant slalom skiing at the elite level**

Measurement of aerodynamic drag has been so far in alpine skiing possible only in static positions in the wind tunnel and it was not possible to directly determine the influence of aerodynamic drag to competitive performance. The same has been true for complex non-linear friction between the skis and the snow surface, which is in praxis complicated also with side sleeping/skidding of skis. In this study, we succeeded to: measure the aerodynamic drag while skiing and calculate the energy dissipation caused by aerodynamic drag as well as friction between the skis and the snow for every turn. For this purpose, an individualized mechanical model for measuring aerodynamic drag was developed, which is based on more than 600 measurements in a wind tunnel with elite skiers. The model of aerodynamic drag was in this study further combined with the model of inverted pendulum, which was specifically developed for alpine skiing measurements using high-end global navigation satellite system. This enabled to analyse a sufficiently large sample of subjects and number of turns per subject. The new approach moved the boundaries of measurement in alpine skiing a step further and demonstrated that the aerodynamic drag in the giant slalom at the highest level cause only ~5% to 28% of total energy dissipation, while the rest of dissipation can be attributed to generalized friction. The applicative conclusions of this study were that in the competition giant slalom: 1) the friction is more important than the aerodynamic drag and 2) there is primary need to train the technique for guiding skis in order to reduce friction and thereafter, if necessary, adjust the position of the skier in order to reduce aerodynamic drag.

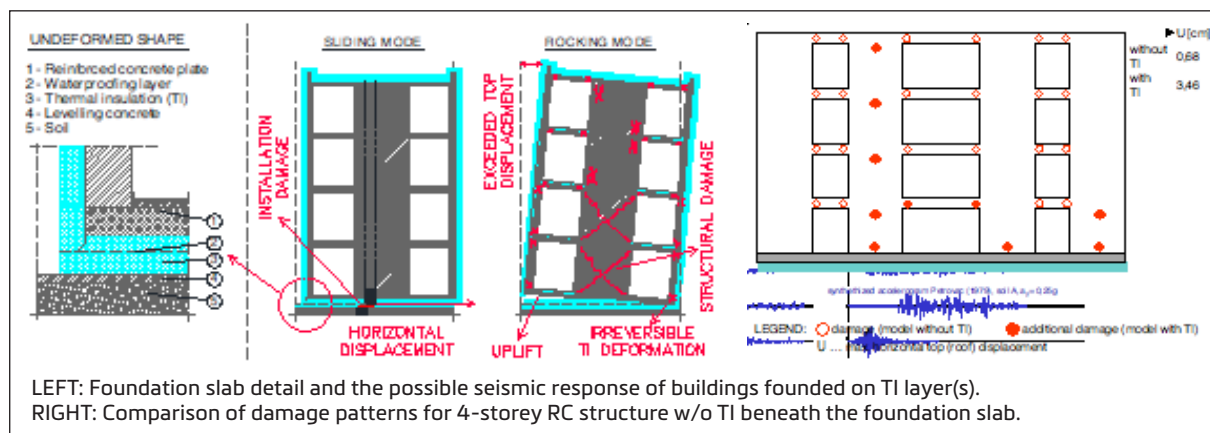


Reference Supej, M, Sætran, L., Oggiano, L, Ettema, G, Šarabon, N, Nemeč, B, Holmberg, HC. Aerodynamic drag is not the major determinant of performance during giant slalom skiing at the elite level. *Scandinavian journal of medicine & science in sports*, 2013, 23(1), str. e38-e47.

Area **Architecture and Design**

Achievement **Seismic safety of passive houses founded on thermal insulation**

The seismic safety of buildings founded on TI layer was investigated within the project L5-4319 (leader V. Kilar), where also a young researcher B. Azinović took an active part. Initially, an extensive experimental research of the extruded polystyrene boards was performed. The obtained data were then utilized in numerous simulations on the seismic response of buildings founded on TI layer(s). The results have shown that in general the structural safety of such buildings is not of critical concern, especially for buildings with embedded basement. Opposite response might be observed in the case of higher/heavier/slenderer buildings without basements. The maximum allowable number of storeys is limited to 2 or 3 storeys for buildings with narrow floor plans and to 4 or 5 storeys for buildings with larger floor plans, depending on the building's dimensions, mass and materials. One of the very important findings is that in some cases buildings might be exposed to horizontal sliding on the contact layer between the foundation slab and the TI or between the individual layers of TI. Uncontrolled sliding could result in large irreversible horizontal shifts what is not in compliance with Eurocode 8 requirements. Based on the obtained findings some patent applications with technically improved solutions for the buildings founded on TI layer(s) have been proposed.



In order to prevent thermal bridges in energy efficient buildings the use of thermal insulation (TI) layer beneath the foundations is required. For such applications the TI material with suitable compressive strength must be utilized to withstand the vertical loads. It should be noted that the insertion of soft TI layers under the foundations changes the building's dynamic characteristics. For this reason the design of such building in earthquake-prone regions should pay additional attention to: a) control of maximum shear and axial stresses/strains in TI layer and b) control of eventual increase of displacements and earthquake induced forces (damage) to the superstructure.

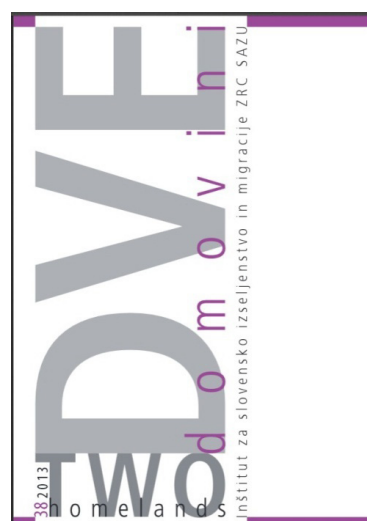
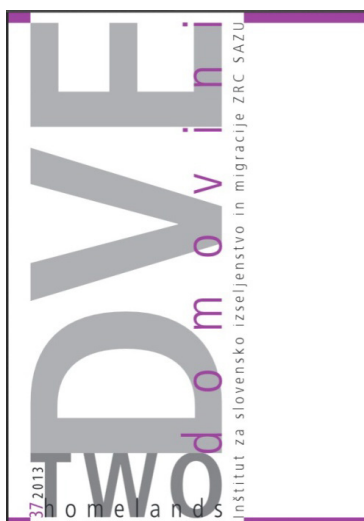
Reference V. Kilar, D. Koren, M. Zbašnik-Senegačnik, *Građevinar*, 65(5), 2013, 423–433.

Area **Ethnic studies**

Achievement **Two homelands: Migration studies**

The journal **Dve domovini / Two Homelands: Razprave o izseljenstvu / Migration Studies** welcomes the submission of scientific and professional articles, reports, debates and book reviews from the fields of humanities and social sciences, focusing on migration and related phenomena. The journal, published since 1990, is multidisciplinary, bilingual and published biannually. Two thematic sections were published in year 2013: *Intercultural Relations in East Asian Societies* (no. 37) and *Marginal Mobilities* (no. 38).

The journal is published by Slovenian Migration Institute at the ZRC SAZU. Website: <http://twohomelands.zrc-sazu.si/>

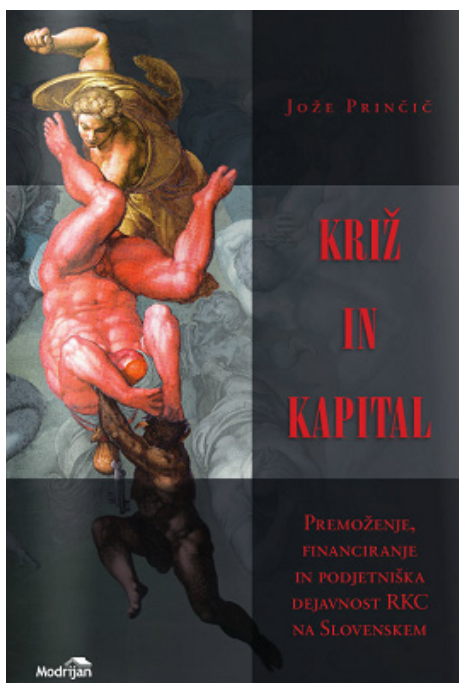


Reference Editor: Mirjam Hladnik Milharčič <http://twohomelands.zrc-sazu.si/>

Area **Historiography**

Achievement **The cross and capital: Property, Financing and Business Endeavours of the Roman Catholic Church in Slovenia**

In his scientific monograph the author describes the property, financing and business undertakings of the Catholic Church in the last century and a half. While focusing on this topic the researcher established that hardly any historical primary sources about this issue could be found, and that the Catholic Church has enjoyed quite a privileged position during various regimes, especially during the Austrian period and after the attainment of the Slovenian independence. Even in the tougher times of socialism the Church was able to come to many agreements with the authorities. In the Austrian period the Church may have criticized the capitalist system, but it still managed to integrate with it successfully, and thus brought together the centres of the Slovenian economic and political power under its influence. Thus, until the year of 1941, it kept strengthening its political and economical position, but this changed after the occupation that took place in that year. The nationalisations that took place after World War II resulted in the confiscation of much of the Church's property. However, with the denationalisation after 1990 the Church got its assets back, thus reinventing itself as a prominent economic and political factor.



The monograph written by Jože Prinčič represents a complete novelty, since this topic has not yet been explored by any historians, even though in the past the Catholic Church has been among the biggest owners of capital. The reason for this – which the author of the monograph points out – is that the Church has left hardly any traces of its gainful operations, since the religious institutions do not offer any information, and they do not maintain any records of their conduct of financial operations, otherwise regulated by law.

Reference *Jože Prinčič: The Cross and Capital: Property, Financing and Business Endeavours of the Roman Catholic Church in Slovenia. Ljubljana: Modrijan, 2013, 310 pages. COBISS.SI-ID 268869888*

Area **Anthropology**Achievement **“We’re not one of you!”
Antinationalism in post-war Sarajevo**

The war in Bosnia-Herzegovina in the early 1990’s has attracted considerable academic and public interest. The (post)war Bosnia-Herzegovina has been often depicted through the limited interpretative framework of dangerous »ethnic nationalism«. Scholarly monograph, which is result of doctoral research project, demonstrate the flaws of such generalisations by analysing the complex strategies of cultural identification, which cannot be reduced to individuals’ mere allegiance to the Bosniak, Croatian, or Serbian national (»imagined«) community. A particular emphasis is placed on alternative, resistant anti-nationalist discursive practices expressed through an active and deliberate engagement of individuals, the everyday life of the people in Sarajevo, and life stories where an individual’s fragmented identification is embedded in the narrative framework of Bosnia-Herzegovina’s past, present, and future. In addition, the research offers an insight into different appropriations of Western, Eurocentric discourses and their blending with regional ideological legacies of the past, which play a crucial role in identity processes on the South-Eastern fringes of Europe. Among other things, monograph uncovers the mechanisms, guiding principles, and motives for preserving, reshaping, or even re-inventing Bosnian-Herzegovinian cultural specificities as identity anchors for Bosnians and Herzegovinians in the 21st century.



Reference *Bartulović, Alenka. “We’re not one of you!” Antinationalism in post-war Sarajevo. Ljubljana: Znanstvena založba Filozofske fakultete, 2013, 452 pp.*

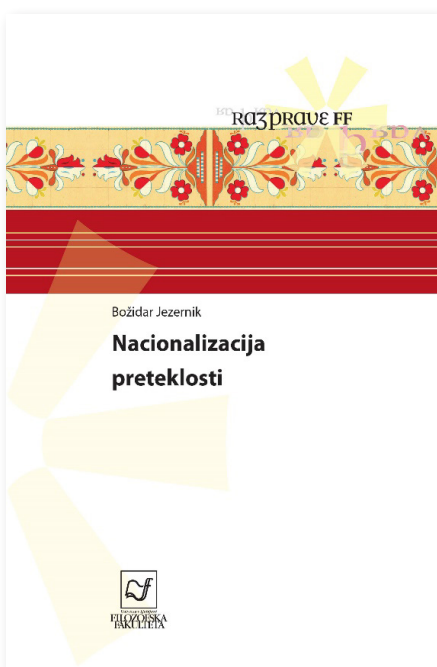
Area **Ethnology**

Achievement **Nationalization of the past**

Although we are geographically, economically, politically, and culturally part of Europe and full members of the EU, we still associate our fate with our national affiliation.

Nation, nationality, heritage, and identity retain their magic power. When we think about ourselves, these concepts are still our primary tools. However, the national framework is not sufficient for an understanding of the broader processes. On the contrary, often it even results in our view being limited, our comprehension of reality being unclear.

As with all other products of historical development, also nations are subject to change. Just as we think of the Egyptian pyramids as a monumental absurdity, since belief in the afterlife of the deceased buried in them has extinguished, so also does a nation only make sense within a certain context.

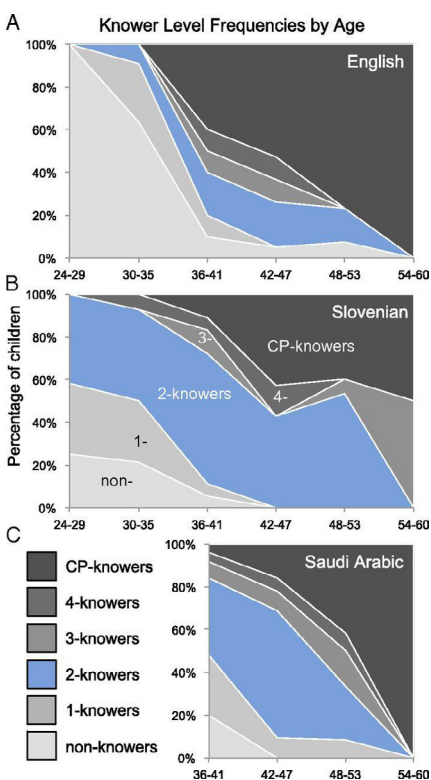


Reference JEZERNIK, Božidar. *Nacionalizacija preteklosti, (Razprave FF)*. 1. izd. V Ljubljani: Znanstvena založba Filozofske fakultete, 2013. 370 str., ilustr. ISBN 978-961-237-614-7. COBISS ID: 269928960

Area Linguistics

Achievement **Grammatical morphology as a source of early number word meanings**

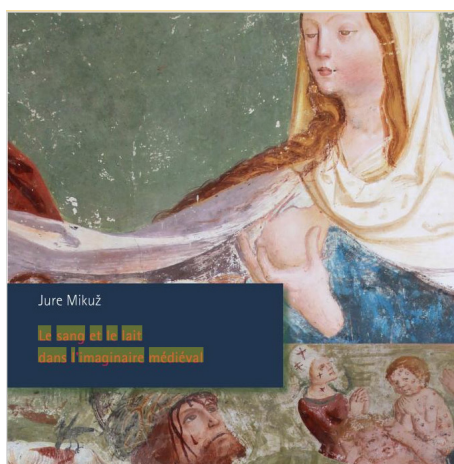
The question of whether and how grammatical structure affects children's acquisition of the meaning of number words was addressed experimentally through comparative studies on English as a language with two grammatical numbers (singular, plural) and on two unrelated languages with three grammatical numbers (singular, dual, plural): Slovenian and Saudi Arabic. The presence of dual number was found to have an effect. Both dual languages show a significantly higher proportion of children who know 'two'. Compared to English-speaking children, Slovenian-speaking children are also faster to acquire the number word 'two', even though they are worse at reciting the count list. Both the Slovenian and the Saudi Arabic samples show a correlation between the comprehension of the dual and the knowledge of the number words for 'two' and higher. However, grammatical structure is not the only factor influencing the rate of early number-word acquisition. Slovenian and Saudi Arabic children remain 'two'-knowers for longer than their English-speaking peers, which is attributed to cultural differences.



Reference A. Almoammer, J. Sullivan, C. Donlan, F. Marušič, R. Žaucer, T. O'Donnell, D. Barner. 2013. Grammatical morphology as a source of early number word meanings. *PNAS* 110.46:18448-18453

Area **Culturology**Achievement **Blood and Milk in Medieval Imagery**

The wall painting Plague Image (also named the *Image of Scourge*, *Mater omnium*, *The Virgin of Mercy*, *Our Lady of Protection*, *Mary the Mediatrix*, *Double Intercession*, *Combined Intercession*, *Our Lady's Intercession*, etc.) in the Church of St. Primus near Kamnik in Slovenia was executed in 1504, at the end of the Middle Ages and the dawn of the Renaissance in Central Europe, and it reflects well the passage between the two worlds of imagination and their visual representation. The triangular composition – with God the Father, the universal entity, at its apex, and lower with Christ exposing his wounds (*Man of Sorrows*, *Imago pietatis*) on the left, and Virgin Mary on the right, with her bosom bare – determines the believer's perception. The scene combines the notions of birth, symbolized by the charity of Mary offering her milk, and death, symbolized by the cruelty of blood shed by Christ and the menacing sword of God the Father. At the time of their realization, the figures of Christ and Mary were meant to be spiritual, imaging the mysteries of the Eucharist and the Incarnation. The present text examines the question as to what extent the believers of the past connected, in their imagination, Christ's nakedness and Mary's bosom with parts of the body of a common human. The masked eroticism of the two figures put a stamp on this suggestive image which in the course of history provoked various reactions..



Reference Mikuž, Jure. *Le sang et le lait dans l'imaginaire médiéval*, (Opera Instituti Artis Historiae). Ljubljana: Založba ZRC, 2013. ISBN 978-961-254-484-3. <http://zalozba.zrc-sazu.si/p/U01>. [COBISS.SI-ID 268792576]

Area **Literary sciences**

Achievement **Classics and communism**

The book, co-published by academic institutions in Ljubljana, Budapest and Warsaw, is the first synthetic scholarly attempt to understand the fortunes of Greek and Latin in former people's democracies. While several influential studies have analysed the reception of both classical languages under fascist and national-socialist governments (Volker Losemann, Beat Nöf), the difficult symbiosis of the dictatorship of proletariat and Latin and Greek has received far less attention. The book is the first attempt at a synthesis of various studies produced during recent years. It is structured geographically, moving its focus from the Soviet Russia towards Central Europe and the Balkans, eventually turning towards Western Europe. More than twenty scholars from across Europe have participated. Working together with colleagues from these countries, sharing and comparing common experience, scholars were able to acquire a better grasp of a subject not yet examined in detail, peeling layer after layer off the still unknown history. The book was also published in Slovenian, as a special issue of the national classics journal *Keria: studia Latina et Graeca* 15, no. 2 (2013).



Reference *Classics and Communism: Greek and Latin behind the Iron Curtain*. Edited by György Karsai, Gábor Klaniczay, David Movrin, and Elżbieta Olechowska. Ljubljana–Budapest–Warsaw, 2013

Area **Musicology**Achievement **Medieval Plainchant in the Charterhouse Žiče**

The third e-monograph of the series Slovenska glasbena dediščina (Slovenian Musical Heritage) is discussing the earliest preserved musical manuscript from the Charterhouse Žiče (Seitz) - a late 13-century antiphoner which was one of the fundamental manuscripts of the plainchant singing tradition in this monastery, spanning over several centuries. The work presents the most relevant aspects of the medieval liturgical book: its liturgical contents and its palaeographical and musical details. Special attention is given to later emendations and additions which reflect the changing musical reality (i.e. changes in perception and performance of the liturgical music) in the Žiče community through the centuries. In this way, the manuscript gives us a precious insight into a longer period of the medieval plainchant singing in Žiče.

The monograph follows the latest approaches in the field of research of the medieval musical manuscripts and adapts them to the specialities of the Žiče manuscript, but it also takes into account the latest findings on the musical practice of the medieval Carthusians. Such an approach makes it possible for a Žiče manuscript to become visible in the wider European context of the important medieval musical codices.

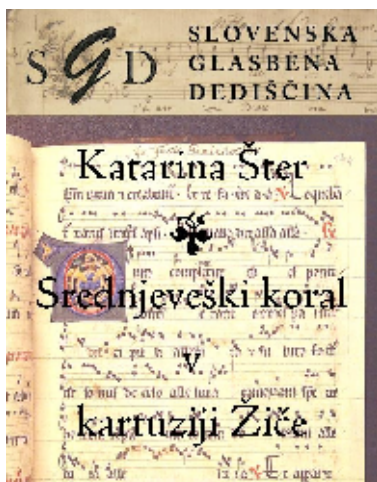


Tabela 7.1: Notni znaki in notne figure v rokopisu Gradec 273

| Notni znak / figura | / |
|--|--------|
| Punctum (znak za en ton) | ■ |
| Nagnjeni punctum- punctum inclinatum (znak za en ton) | ◄ |
| * Virga (znak za en ton) | ┘ |
| Vertikalni pes (postop dveh tonov navzgor; noti sta zapisani navpično ena nad drugo) | ■ ■ |
| * Diagonalni pes (postop dveh tonov navzgor; noti sta zapisani diagonalno navzgor ena ob drugi) | ■ ■ |



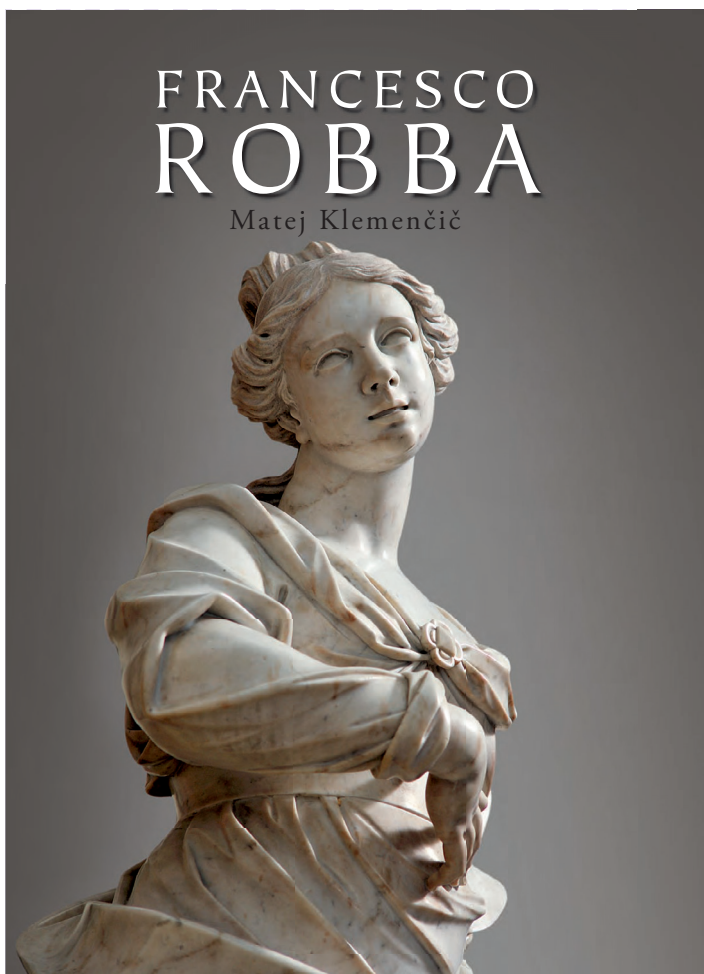
Reference ŠTER, Katarina. *Medieval Plainchant in the Charterhouse Žiče: A look through the Eyes of the Earliest Žiče Antiphoner (Slovenian Musical Heritage, 3)*. Electronic edition. Ljubljana: Muzikološki inštitut ZRC SAZU, 2013. ISBN 978-961-254-437-9. <http://ezb.ijs.si/fedora/get/ezmono:skkz/VIEW/>. [COBISS.SI-ID 2663271040]

Area **Art history**

Achievement **A Monograph on Francesco Robba**

Francesco Robba (1698–1757). A Venetian Sculptor and Architect in the Baroque Ljubljana is a monograph on sculptor and architect who was trained as a sculptor in the studio of Pietro Baratta in Venice. Afterwards, around 1720, he moved into Habsburg lands and settled down in Ljubljana. Capital of Carniola remained the main location of his work, even though some of his important sculptures and altarpieces can also be found in Carinthia and Croatia. Through early local historiography and later art historical studies Robba has already been recognised as the most important sculptor of the 18th century in Carniola. After an important dissertation

by Anton Vodnik, written in 1927 and based on extensive archival research (but never published in a book form), a monograph on Robba – this time focused mostly on formal analysis – was written by Vera Horvat Pintarič and published in Zagreb in 1961. After years of research in Slovenia, Croatia, Austria and Italy, the new monograph by Matej Klemenčič presents and discusses the oeuvre of Francesco Robba in wider context of sculpture between Rome and Venice on one side and Vienna as the centre of Habsburg lands on the other. The formative years in Venice and later contacts with contemporary sculptors there are carefully analysed with the help of extensive comparative illustrative material; moreover, Robba's connections with patrons are studied to show their involvement in enlarging the activities of his workshop to neighbouring lands; his working procedures and the work of his collaborators is presented; and the importance of his work in a wider context of contemporary Italian sculpture is also discussed. At the end, an annotated catalogue of Robba's entire oeuvre is included in the book.

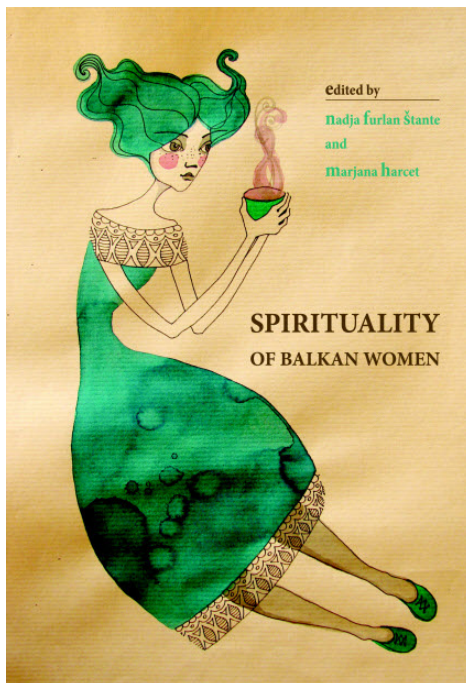


Reference *Matej Klemenčič, Francesco Robba (1698-1757). Beneški kipar in arhitekt v baročni Ljubljani, Maribor: Umetniški kabinet Primož Premzl 2013, 311 strani, COBISS.SI-ID 75424769*

Area **Theology**

Achievement **Spirituality of Balkan women:
Breaking boundaries: the voices of
women of ex- Yugoslavia**

The monograph contains twelve contributions in English, which are addressing different forms of women spirituality from the former Yugoslavia. They present tabooed forms of spirituality of women and ecofeminism from different angles and in this perspective this is the pioneering work in the field. Its originality is, inter alia, in the fact that it establishes a ground for dialogue for various voices, of which some of them were so far unheard. The stories of Balkan women give us the insight into travel from new-age spiritualities (aboriginal women's spirituality to Tibetan Buddhism) and Christian charity, they deal with Islamic religious revitalisation, new catholic feminism and discuss the effects of religiosity and spirituality on gender roles, and they question the maleness of God. While dealing with catholic monastic life and spirituality in convent and with Islamic concept of spirituality, they also focus on the more subtle notions like spirit of *suživot* (active coexistence or mutual life), supernatural beings known as *vilas* and on nature of serpent symbolism and its possible connection to the social determinants of women's identity.



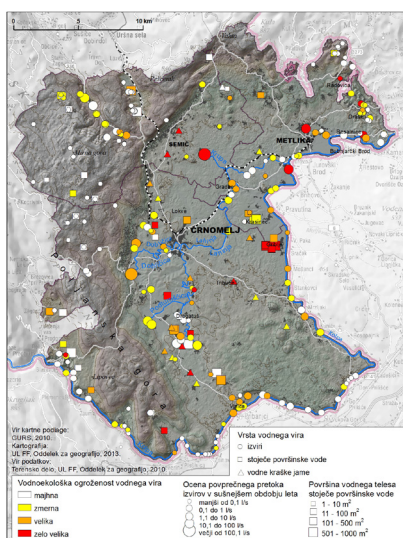
Reference FURLAN-ŠTANTE, Nadja (urednik), HARCET, Marjana (urednik). *Spirituality of Balkan women: breaking boundaries: the voices of women of ex- Yugoslavia*. Ljubljana: University of Primorska, Science and Research Centre, Annales University Press, 2013. 226 str., ilustr., graf. prikazi. ISBN 978-961-6862-61-5.

Area **Geography**Achievement **Regional resources of Slovenia,
Water resources of Bela Krajina**

Through a range of major human activities this monograph represents the importance of the past and present water resources of the Bela Krajina region, which in general are characterized by very high hydrological sensitivity. Especially the role of karst as well as its influence on the relationship between humans and water resources is being outlined. Among other findings it is worth mentioning that, despite the fact that local population has less and less knowledge about local water resources, the role of water as a strategic good of vulnerable karst environments is slowly regaining its recognition.

A database of 261 water resources of the entire Bela Krajina region has been established based on extensive field inventory and analysis. For each type of water resources (springs, standing surface water, and water-containing karst caves) its susceptibility to pollution and its overall vulnerability has been evaluated.

Harmonious regional development is one of the strategic priorities of Slovenia and its inhabitants. It could be achieved mainly by the sustainable use of relevant regional resources. In the present work the water as one of the key regional environmental resources is put in the forefront. Since the water often represents one of the major limiting factors for development of the karstified Bela Krajina region, especially drinking water supply remains one of the most sensitive future issues. Therefore the examination of the current state of water supply and its future potential is even more decisive.



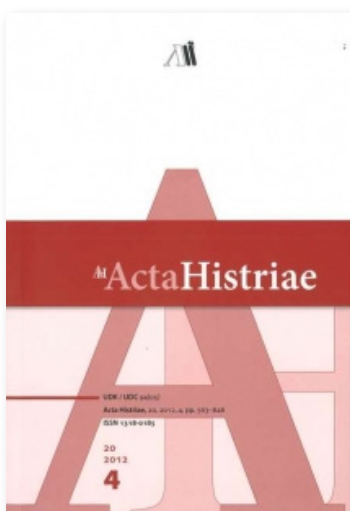
Reference Dušan Plut, Tajan Trobec, Barbara Lampič *Regionalni viri Slovenije, Vodni viri Bele krajine (E-GeograFF 7)*, Ljubljana: Znanstvena založba Filozofske fakultete, 2013.

Area **Interdisciplinary research**

Achievement **The motif of warning birds in Attila's siege of Aquileia**

The motif of warning birds in Attila's siege of Aquileia and its survival and transformation in the *Origo civitatum Italiae seu Venetiarum (Chronicon Altinate et Chronicon Gradense)*, *La cronaca di Marco* and *Chronica extensa* by Andrea Dandolo.

Among the warning animals in the European tradition the storks of Aquileia have attracted most attention due to their correct prediction about the fall of Aquileia into Attila's hands in 452. The article studies the survival of the motif and its transformation in three Venetian historiographic texts: *Chronicon Altinate* (12 c.), *La Cronaca di Marco* (13 c.) and *Chronica extensa* of Andrea Dandolo (14 c.). In the chronicles the motif undergoes various degrees of modification, with Dandolo's work being the most traditional, while the other two chronicles experienced a much more radical transformation of the motif. The warning birds are regarded as a divine sign directing the inhabitants of the endangered town of Altino towards a new life in Venetian lagoons. The motif had begun to emerge in the Venetian historiography since the twelfth century, identifying Attila's devastation of Northern Italy as this historical event which triggered a mass exodus of the population from the mainland to the lagoons. The ancestors of the Venetians are regarded as devoted Christians, pioneers and visionaries who create new urban communities, the ancestors of the Venetian Republic. The original article is marked by all research characteristics typical of the author's previous scientific contributions, especially her research into Icelandic sagas and their links with late antiquity and medieval tradition.



Reference Divjak Alenka. *The motif of warning birds in Attila's siege of Aquileia and its survival and transformation in the Origo civitatum Italiae seu Venetiarum (Chronicon Altinate et Chronicon Gradense), La cronaca di Marco and Chronica extensa* by Andrea Dandolo. *Acta Histriae*, ISSN 1318-0185, 2013, letn. 21, št. 4, str. 493-512.

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