

THE NOBEL LAUREATE IN CHEMISTRY, 2011

DAN SHECHTMAN

The Nobel Prize in Chemistry 2011.

Born: 24 January 1941, Tel Aviv, British Mandate of Palestine (now Israel)

Affiliation at the time of the award: Technion — Israel Institute of Technology, Haifa, Israel

Prize motivation: "for the discovery of quasicrystals"

Prize share: 1/1

Life

Dan Shechtman was born in Tel Aviv, in what was then the British Mandate for Palestine. He earned his PhD in materials science from the Technion Israel Institute of Technology in Haifa in 1972. Shechtman has been associated with Technion since that time, but has also spent time abroad. He made his Nobel Prize-awarded discovery at Johns Hopkins University in Baltimore, Maryland in the early 1980s. Shechtman has also been connected with Iowa State University in Ames in the United States since 2004. He is married with four children.



Work

In the majority of solid matter are crystals: atoms are organised in an ordered pattern. Physicists long believed that the structures of all crystals consisted of patterns that repeated over and over again. In 1982, when Dan Shechtman was studying what are known as diffraction patterns, which occur when x-rays are passed through the crystals, he discovered a regular diffraction pattern that did not match any periodically repeated structure. This showed that there are crystal structures that are mathematically regular, but that do not repeat themselves. These are called quasicrystals.

To cite this section

MLA style: Dan Shechtman — Facts.NobelPrize.org. Nobel Prize Outreach AB 2022. Wed. 19 Oct 2022. <https://www.nobelprize.org/prizes/chemistry/2011/shechtman/facts/>

SRIJEDA, 2. NOVEMBAR / WEDNESDAY, NOVEMBER 2

**UVODNIČARI I PREDSJEDAVAJUĆI SESIJAMA
SPEAKERS AT THE OPENING
& CHAIRS OF THE SESSIONS**

Academician Dragan K. Vukčević, President
of the Montenegrin Academy of Sciences and Arts

Professor Vladimir Božović, Rector of the University
of Montenegro

Professor Biljana Šćepanović, Minister of Science
and Technological Development, Government
of Montenegro

Prof. Vaso Antunović, Assoc. Member, CANU

Academician Gordan Karaman, CANU

Academician Vukić Pulević, CANU

Academician Milojica Jaćimović, CANU

Academician Ranislav Bulatović, CANU

Academician Svjetlana Terzić, CANU

Academician Slobodan Backović, CANU

Academician Petar Vukoslavčević, CANU

Academician Predrag Miranović, CANU

Academician Perko Vukotić, CANU

Academician Vlado Lubarda, CANU

Academician Ljubiša Stanković, CANU

Academician Igor Đurović, CANU

Academician Goran Nikolić, CANU

MEDICINSKE NAUKE / MEDICAL SCIENCES (7)

DUŠICA BABOVIĆ-VUKSANOVIC

Dusica Babovic-Vuksanovic was born in Sarajevo, Yugoslavia, where she completed her undergraduate and medical education. After her training in Pediatrics and Pediatric Endocrinology at the Children's Hospital in Sarajevo she worked there as a staff physician and Assistant Professor until 1992. Thanks to the Fulbright fellowship, she transitioned with her family to the US, where she completed additional training at Mayo Clinic and became certified in Pediatrics, Clinical Genetics and Molecular Genetics. She has been a staff of Mayo Clinic in Rochester, MN since 1999. She carried on multiple leadership positions including a role of Chair of the Department of Medical Genetics Mayo Clinic and a Chair of the Enterprise Department of Clinical Genomics-Rochester, MN, Jacksonville, FL and Scottsdale, AZ, member of the IRB Board, Departmental Chair of Research and member of the Executive Committee of the Center for Individualized Medicine, leading the development of Individualized Medicine Clinic at Mayo. She was Director of Clinical Genetics Residency and Laboratory Genetics Fellowships in Clinical Molecular Genetics, Clinical Biochemical Genetics and Clinical Cytogenetics. Currently, she is serving as a Director of the

Mayo Clinic Center of Excellence for Rare Disease (NORD). In addition to Mayo leadership roles, Dr. Babovic-Vuksanovic has been active at the national organizations such as the ACGME Review Committee for Medical Genetics and Genomics (including a role of vice-chair), and a member of the USMLE Pathology and Genetics Test Material Development. She is an active participant in international organizations, including member of Royal Board of Princess Katherine of Serbia, and Bosnian-Herzegovinian-American Academy of Arts and Science, where she served as a President and a Vice-president.

Dr Babovic-Vuksanovic has 23 years of experience in Clinical Genetics and Genomics, and most of her work is related to rare disease. Her special clinical and research interest is in neurofibromatosis type 1, neurofibromatosis type 2, schwannomatosis and other RAS-pathway disorders. Dr. Babovic-Vuksanovic has been a director of Neurofibromatosis Program at Mayo Clinic since 1999, I has a clinical experience in diagnosis and management of children and adults with neurofibromatoses. As a PI and Co-PI on several intramural and federally funded studies, she carried out preclinical studies and



conducted 4 clinical trials for patients with neurofibromatosis type 1. She described a new syndrome characterized by bilateral orbital neurofibromas, Marfanoid body built and hypertrophic neuropathy, and published a first case series showing that paraspinal neurofibromas and peripheral neuropathy are features of Noonan syndrome. She led multiple collaborative studies which resulted in description of new phenotypes, and I participated in the discovery of new genes.

Dr Babovic-Vuksanovic has more than 150 peer reviewed manuscripts and book chapters, many national and international presentations and visiting professorship.

GENOMICS: MODERN FORTUNE TELLER

Abstract

Genetic science has evolved over the last century and has become integral part of everyday medical practice. Instead of its initial use as a diagnostic tool to explain condition or confirm clinical suspicion, we see genomics more and more providing information to be used in predictive and preventive purposes. Genetic testing is now widely available, as the price of testing has become more affordable. Determining genetic predisposition for disease often result in preventive measures that can avoid development of disease or in screening programs that can detect disease in early stage when treatment is more effective. In addition, genetic information may guide treatment by selecting appropriate medication and dose for the individual patient. Genetics may be seen as a modern fortune teller!

Biografije i apstrakti

ANTONIJA KRSTAČIĆ

Doc. prim. dr. sc. Antonija Krstačić dr. med.

Specijalistica neurologije, uže specijalizacije iz neuromuskularnih bolesti

KBC „Sestre Milosrdnice“, Klinika za traumatologiju, Draškovićeva 19, Zagreb

Docentica, Fakultet za dentalnu medicinu i zdravstvo Osijek, Medicinski fakultet Osijek, Sveučilišta Josipa Jurja Strossmayera u Osijeku

Viši znanstveni suradnik, Medicinski fakultet Osijek

Rođena sam 1974. g. u Kotoru. Po svršetku studija Medicinskog fakulteta položila sam državni ispit 2000. godine u Zagrebu. Od rujna 2002. radim na Klinici za traumatologiju, KBC „Sestre milosrdnice“ u Zagrebu.

Završila sam specijalizaciju iz neurologije na Klinici za neurologiju KBC „Rebro“ Zagreb i položila specijalistički ispit u veljači 2008. Od ožujka 2008. radim kao specijalist neurolog u Laboratoriju za elektromioneurografsku dijagnostiku i liječenje Klinike za traumatologiju, KBC „Sestre Milosrdnice“. Od 2018. g. radim kao subspecijalist neuromuskularnih bolesti. Prijnat mi je naziv primarijus u travnju 2018. godine od strane Ministarstva zdravstva.

Od 2020. radim kao voditeljica Odjela neurologije, Klinike za

traumatologiju, KBC „Sestre milosrdnice“. 2007. obranila sam magistrski rad: „Povezanost čimbenika rizika i ishemijskog cerebrovaskularnog inzulta“ na Prirodoslovno-matematičkom fakultetu Sveučilišta u Zagrebu.

2011. obranila sam doktorski rad: „Varijabilnost srčanog ritma i prediktivni modeli autonomne disfunkcije nakon ozljede vratne kralješnice“ na Prirodoslovno-matematičkom fakultetu Sveučilišta u Zagrebu.

Izabrana sam u naslovno znanstveno-nastavno zvanje docenta u znanstvenom području Biomedicina i zdravstvo, znanstvenom polju kliničke medicinske znanosti, znanstvenoj grani neurologija u Katedri za neurologiju Medicinskog fakulteta Osijek 2016 godine, dok sam 2019. godine izabrana u znanstveno-nastavnom zvanju docenta iz znanstvenog područja Biomedicine i zdravstva, znanstvenog polja kliničke medicinske znanosti, znanstvene grane neurologija, na Katedri za neurologiju i neurokirurgiju, Fakulteta za dentalnu medicinu i zdravstvo Osijek, Sveučilišta J. J. Strossmayera u Osijeku.

Izabrana sam u znanstveno zvanje višeg znanstvenog suradnika na Medicinskom fakultetu Osijek, Sveučilišta J. J. Strossmayera u Osijeku, 11. srpnja 2017.



Izabrana sam u naslovno nastavno zvanje predavač na Katedri za neurologiju, neurokirurgiju i neuropatologiju Zdravstvenog veleučilišta u Zagrebu 01. veljače 2014. Član sam fokus grupe „Contemporary and new treatment of musculoskeletal conditions in Bio-thermal Centres“ Association, Croatian American Professionals, „ACAP Medical Tourism Task Force Retreat“, svibanj 2018., Washington, DC.

Aktivno se služim engleskim jezikom. Kao autor i koautor objavila sam pedesetak znanstvenih i stručnih publikacija, do sada sam citirana 83 puta, h-index je 6.

Bila sam aktivni sudionik sa oralnim ili poster prezentacijama na europskim i domaćim kongresima i simpozijima.

AMYOTROPHIC LATERAL SCLEROSIS — LOU GEHRIG'S DISEASE

Abstract

Amyotrophic lateral sclerosis or Charcot's disease according to the French neurologist who was among the first described the disease in more detail and distinguish ALS from other muscular atrophies, or Lou Gehrig's disease was named according the American baseball player who suffered from this disease. At the height of his fame, Lou Gehrig died in 1941. ALS is characterized by progressive degeneration and loss of motor neurons with or without similar lesions of the motor nuclei of the brain, with the replacement of lost cells by gliosis. It belongs to the group of motor neuron diseases and affects both the upper and lower motor neuron. It can occur familiarly or sporadically. The familial incidence of ALS has been described in rare publications and has received limited attention in the literature since the 1955 report by Kurland and Mulder, which suggested that ALS may be familial in nearly 10% of cases. A growing body of evidence from clinical research suggests that ALS has multiple causes with an important, albeit diverse, genetic component. Available data indicate that genetic risk for ALS likely represents the combined effects of 1 or more genes that determine a person's overall genetic susceptibility, acting in conjunction with environmental and chance effects that lead to the onset of the disease.

Key words: *amyotrophic lateral sclerosis, Lou Gehrig's disease, motor neuron disease*

MICHAL GORAN STANIĆ

Born in 1972 in Leningrad (St. Petersburg), son of Montenegrin poet and political and social activist Jole Stanić and Polish diplomat and social activist Teresa Konopielko. Due to his father's opposition to the Yugoslav government, he initially lived in the Soviet Union, and from 1991 in Poland. In 1995 he graduated with honours from the Faculty of Medicine of the Poznan University of Medical Sciences (Poland). A specialist in the field of general and vascular surgery, professor at the Poznan University of Medical Sciences, works in the Department of Vascular Surgery,

Angiology and Phlebology, directing the laboratory of endovascular techniques and technologies. He specializes in open and minimally invasive treatment of arterial and vein diseases, with particular emphasis on the treatment of diabetic foot syndrome, chronic venous disease and deep vein thrombosis. He is a member of the board of the Polish Society of Vascular Surgery and the Polish Phlebological Society. In his work, he focuses on interdisciplinarity and psychological aspects of interaction between medical staff and patients. He is a strong supporter of the integration



of Montenegro Medical Science into the EU mainstream.

INTERVENTIONAL TREATMENT OF DEEP VENOUS THROMBOSIS: ARE WE READY FOR A PARADIGM SHIFT?

Abstract

On October 13, Virchow's birthday, World Thrombosis Day is celebrated. The problem of venous thrombosis, especially in the ileo-femoral segment, is widely presented in contemporary medical and popular science literature. Every year, several scientific societies publish their guidelines for the treatment of venous thromboembolism, exacerbating the inflation of scientific evidence of medical knowledge.

The paradigm for the treatment of DVT is based on conservative treatment, which is reminiscent of the approach to the treatment of myocardial infarction, strokes and acute limb ischemia 40 years ago.

In our daily work, we are subjected to the constant pressure of evidence-based medicine data, expert opinions, lobbying by medical equipment manufacturers and pharmaceutical companies, and confronted with the growing expectations of patients.

The current paradigm of conservative treatment is based on the absolute assumption of conservative treatment as the most effective way to improve the survival of patients with acute venous thrombosis. To a lesser extent, the quality of life of patients in the period of several to several decades after the DVT incident is considered.

Technological progress makes it possible to effectively and safely treat venous thrombosis in the ilio-femoral region without the use of thrombolytics with a much lower perioperative risk than a few years ago. Despite this, the medical community is not willing to change the paradigm of treatment of proximal venous thrombosis.

The main obstacles, apart from the readiness of the medical community, affecting the possibility of changing the paradigm of treatment are: the relatively high cost of initial treatment, the lack of sufficient specialists in venous intervention and the diverse scientific evidence base influencing the decision of health care organizers.

Paradoxically, small population and area of a country such as Montenegro with a centralized health care system is an ideal place to implement a treatment system for proximal venous thrombosis based on the mechanisms adopted in the treatment of heart attack.

A paradigm shift in the treatment of venous thrombosis is necessary not only to ensure better survival, but also to reduce the distant consequences of thrombosis such as postthrombotic syndrome and in particular venous ulcers.

Biografije i apstrakti

PETAR SEFEROVIĆ

Petar M. Seferovic, MD, PhD, FESC, FACC

— Co-Editor for Eastern Europe, European Heart Journal

— Vice-president, European Society of Cardiology (2020–2022)

— President, Heart failure Association of the ESC (2018–2020)

— Academician, Serbian Academy of Sciences and Arts

— Professor, University of Belgrade Faculty of Medicine and Heart Failure Center, University Medical Center, Belgrade

— President, Heart Failure Society of Serbia

After completing his training and fellowship at Belgrade University School of Medicine and Kings College Hospital in London, UK, he spent two years as a Visiting assistant professor in Methodist Hospital and Baylor College of Medicine, Houston, USA. Starting in the mid 90's, he dedicated his clinical and research activity to chronic and acute heart failure.

Prof. Seferovic has a long standing experience in the ESC/HFA and devoted the last three decades of his professional life to promote the prevention and treatment of cardiovascular disease.

In the mandate of 2018–2020, he was a President of Heart Failure Association of the ESC, tracing new avenues for its further development. Subsequently, he committed his energy and ideas to the three ECS/HFA megaprojects: HFA Atlas (first edition completed in 2021, second edition ongoing, to be completed in 2023), ESC/HFA Quality of Care Centres (the project

started in June 2021 in 9 European countries, the pilot phase will last until 2024) and ESC Textbook on heart failure (256 authors, 6 editors, 1100 pages, Publisher Oxford University press, to be published in September 2022).

As a Vice-President of the ESC during the mandate 2020–22, he was in charge of connecting ESC and eighteen National Cardiac Societies of South-Eastern Europe and succeeded to keep a close contact and the best image of the ESC, in the harsh environment of COVID 19 pandemic. He acted as the Co-Chair of the European Heart Agency, in pursuing Agency activities and projects. In addition, he was appointed a European Heart Journal Co-editor for Eastern Europe and organized ten Joint sessions of the EHJ and relevant National Cardiac Societies. Furthermore, he was elected to the Heart Failure Hall of Fame of the Heart Failure Society of America in July 2021.

Prof. Seferović has coauthored a total of more than 600 publications, h-index 66, including multiple papers in peer-reviewed international journals. He has a total citation of 37254 (Google Scholar) /57172 (Scopus). He presented more than 300 lectures at international conferences.

Prof. Seferović believes that the strength of ESC is in close cooperation of the basic scientists, clinicians and nurses, as well as in establishing the mutual dialogue, analyzing alternative views and recognizing different opinions.



He proved to be highly motivated to put his full capacities in overcoming the future ESC scientific and organizational challenges. Moreover, he demonstrated that he is capable of successfully promoting ESC as a world leader in cardiovascular medicine, strengthening its world-wide network.

Petar M. Seferović^{1,2}, Ivan Milinković^{1,3}, Marija Polovina^{1,3}, Giuseppe Rosano⁴

¹ Faculty of Medicine, University of Belgrade, Belgrade, Serbia

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⁴ Centre for Clinical and Basic Research, Department of Medical Sciences, IRCCS San Raffaele Pisana, Rome, Italy

THE ENIGMA OF THE BEST HEART FAILURE MEDICAL TREATMENT IN 2022: STILL MORE TO COME

Abstract

Over the past three decades, pharmacological treatment of heart failure (HF) with reduced ejection fraction (HFrEF) has witnessed a significant progress with the introduction of multiple disease-modifying therapies with a proven benefit on morbidity, mortality and quality of life. Recently, several novel medications (sacubitril/valsartan, sodium-glucose cotransporter-2 [SGLT2] inhibitors, vericiguat and omecamtiv mecarbil) have shown to provide further improvement in outcomes in patients already receiving standard therapy for HFrEF. Available evidence suggests that sacubitril/valsartan and SGLT2 inhibitors (dapagliflozin and empagliflozin) are beneficial and well-tolerated in the majority in-patients and could be the mainstay treatment of HFrEF. Another

group of medications (vericiguat and omecamtiv mecarbil) has shown promising results in reducing the risk of the composite of HF hospitalisations or cardiovascular mortality in patients with the more severe or advanced HF requiring recent hospitalisations. Therefore, these medications may be considered for the treatment of select group of patients with HFrEF and persisting or worsening symptoms despite optimal treatment. In addition, advances in pharmacological management of comorbidities frequently seen in HFrEF patients (diabetes, iron deficiency/anaemia, hyperkalaemia) provide further opportunities to improve outcomes. Given the increasing complexity of evidence-based therapies for HFrEF, there is a growing need to provide a practical perspective to their use. The purpose of this review is to summarise scientific evidence on the efficacy and safety of new and emerging medical therapies in HFrEF, with a focus on the clinical perspective of their use.

Key words: *Heart failure, Treatment, Sacubitril/valsartan, Dapagliflozin, Empagliflozin, Sotagliflozin, Vericiguat, Omeamtiv mecarbil, clinical trials, Outcomes*

Biografije i apstrakti

DANILO VOJVODIĆ

Danilo Vojvodic was borne 1963 in Belgrade, Serbia, former Yugoslavia. He finished Medical School at 1988 at Belgrade University. After completing specialization in immunology at Military Medical Academy (MMA, Belgrade, Serbia) at 1993, he was posted in Department for Clinical and Experimental Immunology, Institute for Medical Research. From 2002, he started duty of the head of the Department for Clinical and Experimental Immunology, IMR MMA. From 2013 he is full time Professor of immunology at Medical School,

University of Defense. From 2019 he is a Director of the Institute for Medical Research Military Medical Academy (MMA). From 2000 until 2016, he worked as consultant of Ministry of Health Montenegro in the foundation and development of Center for Medical Genetics and Clinical Immunology in Clinical Center of Podgorica, Montenegro.

Reference list:

https://scholar.google.com/citations?hl=en&user=8zas_i4AAAAJ&view_op=list_works&sortby=pubdate



IMMUNOLOGY BETWEEN CURRENT ACHIEVEMENTS AND PERSPECTIVES

Abstract

First acknowledgement and first estimation of immune system significance came very early, in 4th century BC, from Thucydides, famous historian, politician and war general. He was the first who described an immune person as one who recovered from the disease (infection) could nurse infected without getting the disease second time. First therapeutic immunology procedure was variolization (XVI century) that gave basis for Sir Edward Jenner smallpox vaccination (XVIII century), as a first ever manipulation of immune response with aim to induce protection. Essentially, the XX century brought immunology bloom, with significant transformation from fundamental science to applicative medical procedure. Identification of antiserum, phagocytes, anaphylaxis, antibodies, complement components, blood groups, different lymphocyte population and later HLA system, monoclonal antibodies technology, natural killer cells and even idiotype anti-idiotype network, made unthinkable progress in modern medicine. All these achievements were recognized as crucial cornerstones. Therefore, it is not surprising that are numerous Nobel Prizes assigned for immunological advances in human biology and medicine, from Emil von Behring, Mechnikov, Ehrlich, Richet, Bordet, Landsteiner, Burnet, Medawar, Edelman, Porter, Bencerraf, Dausset, Snell and many more. Of course, the most exciting insight in immune mechanism came from the newest investigations in cancer immunology. Alison and Honjo, again Nobel Prize winners, demonstrated that crucial information exchange is between tumor cell, antigen presenting cell and tumor specific T lymphocytes. They discovered that tumor cells use physiological membrane molecules as specific brakes, capable to induce inhibition of tumor specific T lymphocytes, making themselves protected from ongoing immune response. They also demonstrate that monoclonal antibodies to this molecule, Programed Death-1 (PD-1) could completely remove inhibition of tumor specific T Ly, which enabled huge advance in immune therapy of solid tumors. Another significant discovery made future of immune oncology very bright. With the use of molecular biology technique nowadays it is possible to transfer part of antibody to the T lymphocyte in a way that T Ly use antigen recognition parts of antibody as its own activating receptor. This approach generate possibility to use any synthetic made monoclonal antibody to be a specific activating receptor and to bypass HLA restricted recognition of T Ly. This Chimeric Antigen Receptor (CAR) T lymphocytes are reachable future of cancer therapy, enabling individual therapy.

Beyond the most attractive tumor immunology, there are impressive advances in the field of immune diagnostics and therapy of auto inflammatory and degenerative diseases / disorders, with the focus on neuro inflammation and neuro degeneration.

Finally, basic investigations of regeneration processes in invertebrates or lower vertebrates demonstrated that immunological forces are crucial in regulation of stem cells dormancy, activity, propagation and even in dedifferentiation of cells toward younger phases and stem cells again. Demonstration that controlled dedifferentiation of phagocytes to stem cells is a crucial step in complete limb regeneration of lizards opened a new area. Therefore, actual perspective of immunology is modulation of ageing and regeneration of damaged tissues.

Biografije i apstrakti

GORDANA VUNJAK-NOVAKOVIĆ

University Professor

The Mikati Foundation Professor of Biomedical Engineering and Medical Sciences

Columbia University in the City of New York

Gordana Vunjak-Novakovic is University Professor, the first engineer to receive this highest academic rank at Columbia University. The focus of her lab is on engineering functional human tissues for use in regenerative medicine and patient-specific “organs-on-a-chip” models of diseases, including cancer. She is

well published and highly cited, has mentored over 150 trainees, and founded four biotech companies. She is a member of Academia Europaea, Serbian Academy of Arts and Sciences, US National Academy of Engineering, US National Academy of Medicine, US National Academy of Inventors, International Academy of Medical and Biological Engineering, Royal Society—Academy of Science, and the American Academy of Arts and Sciences.



ENGINEERING HUMAN TISSUES FOR MEDICAL IMPACT

Abstract

Today, we live longer and better than ever before in the history of humankind. As the population is aging, there is an increasing need to overcome the failure of an organ due to injury or disease. Tissue engineering evolved from the convergence of biology and engineering, with a vision to grow biological replacements of our damaged tissues. This vision has been pursued over the last thirty years, by “instructing” the stem cells to rebuild the original tissue, using the bioengineering tools. Living human tissues (such as bone, lung or blood vessels) are now being tailored to the patient and the condition being treated, a direction we call regenerative engineering. In recent years, another direction is emerging with the development of “organs on a chip” that have micro-sized human tissues, also grown from the stem cells, and connected by vascular flow, as in our body. This way, we can model a number of diseases (such as cancer metastasis, infection, or heart infarction). Taken together, tissue engineering is increasingly successful in benefiting medicine in many different ways, in a way optimal to the patient and the condition being treated.

MARIJA SANTINI

Marija Santini, University Hospital for Infectious Diseases, Mirogojska 8, Zagreb

Work experience:

Sep 2019 — Present: President of the Croatian Society for Infectious Diseases of the Croatian Medical Association, Zagreb

Feb 2006 — Present: Attending Physician — ID specialist, University Hospital for Infectious Diseases, Department for Intensive Medicine and Neuroinfectology, Zagreb

Feb 2022 — Present: Associate Professor, University of Zagreb School of Medicine, Zagreb, Professor in Infectious Diseases

Sep 2002 — Jul 2006: Physician — ID resident, University Hospital for Infectious Diseases, Zagreb

Feb 1999—May 2002: Scientific Fellow, University of Zagreb School of Medicine, Zagreb

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INFECTIOUS DISEASES — A CHALLENGE FOR MODERN MEDICINE

Abstracts

World health organization published a list of ten threats to global health in 2018. Six of these issues were infections: possible new influenza pandemic, HIV, antimicrobial resistance, vaccine hesitancy, possible spread of dengue fever, Ebola, and other new highly contagious pathogens. Two problems are closely associated with infectious diseases; health in areas affected by conflicts and natural catastrophes and primary healthcare weakening. The remaining two issues are non-infectious: air pollution with climate change and noncontagious diseases.

Soon after this publication, we faced the greatest threat to humanity since World War II. The COVID-19 pandemic demanded a rapid response considering epidemiological measures, caring for patients, and research and development of virus-specific agents and vaccines. Today we have three antiviral agents proven to lower the risk of severe forms and death. This pandemic faced us with the problem of vaccine hesitancy, for which we still do not have a solution. Vaccine hesitancy could cause reemerging of infections we considered overcome long ago. Besides this, during the last decade, we have faced the emergence of new viral infections caused by West Nile, Usutuvirus, and Dengue in South-Eastern Europe. Nonetheless, our health systems are burdened with high antimicrobial resistance making numerous hospital infections difficult or impossible to treat. Infectious diseases specialists are calling for the urgent introduction of systemic antimicrobial stewardship programs, which would make antimicrobial therapy more rational and limit the rise of antimicrobial resistance. The pharmacological possibilities to stop the spread and treat HIV/AIDS are highly efficient today but should be more available.

We have numerous exciting challenges, most of which are preventable and human-associated.

MATEMATIČKE NAUKE / MATHEMATICAL SCIENCES (7)

ANGELIA NEDICH

Angelia Nedich has a Ph. D. from Moscow State University, Moscow, Russia, in Computational Mathematics and Mathematical Physics (1994), and a Ph. D. from Massachusetts Institute of Technology, Cambridge, USA in Electrical and Computer Science Engineering (2002). She has worked as a senior engineer in BAE Systems North America, Advanced Information Technology Division at Burlington, MA. Currently, she is a faculty member of the school of Electrical, Computer and Energy Engineering at Arizona State

University at Tempe. Prior to joining Arizona State University, she has been a Willard Scholar faculty member at the University of Illinois at Urbana-Champaign. She is a recipient (jointly with her co-authors) of the Best Paper Award at the Winter Simulation Conference 2013 and the Best Paper Award at the International Symposium on Modeling and Optimization in Mobile, Ad Hoc and Wireless Networks (WiOpt) 2015. Her general research interest is in optimization, large scale complex systems dynamics, variational inequalities and games.



ADVANCES IN DISTRIBUTED GRADIENT METHODS FOR MULTI-AGENT OPTIMIZATION IN NETWORKS

Abstract

We will overview the distributed optimization algorithms starting with the basic underlying idea illustrated on a prototype problem in machine learning. In particular, we will focus on convex minimization problem where the objective function is given as the sum of convex functions, each of which is known by an agent in a network. The agents communicate over the network with a task to jointly determine a minimum of the sum of their objective functions. The communication network can vary over time, which is modeled through a sequence of graphs over a static set of nodes (representing the agents in a system). In this setting, the distributed first-order methods will be discussed that make use of an agreement protocol, which is a mechanism replacing the role of a coordinator. We will discuss some refinements of the basic method and conclude with more recent developments of fast methods that can match the performance of centralized methods.

Biografije i apstrakti

VLADIMIR DRAGOVIĆ

Dr Vladimir Dragović has main research interests in Integrable Dynamical Systems and Algebraic Geometry. He received his PhD from the University of Belgrade in 1992. His PhD advisor was Professor Boris Dubrovin from the Moscow State University, following Dragović's graduate education at the same university. He has published about 100 papers mostly in leading international journals and two research monographs. He is the recipient of the Award of the Union of the Mathematical Societies of Serbia and Montenegro for the best achievement of a mathematician younger than 40 in the period 2001–2004 and of the City of Belgrade Annual Award for Natural and Technical Sciences for 2010.

He was the PhD advisor for eight defended PhD dissertations. Dr Dragović is a Professor of Mathematics and the Head of the Department of Mathematical Sciences at the University of Texas at Dallas. He has been a Research Professor of the Mathematical Institute of the Serbian Academy of Sciences and Arts. He served as the Director of Mathematical High School in Belgrade from 2004 till 2008. He was a visiting Professor at the University of Montenegro (2003–2008). He is a leading co-author of three current official text-books for Mathematics in Montenegro, for the 2nd, 4th, and 5th grade of the elementary school. He delivered more than 200 invited talks all over the world including two at



the Montenegrin Academy of Sciences and Arts.

Vladimir Dragovic and Borislav Gajic

BRIDGING STATISTICS, GEOMETRY, AND MECHANICS

Abstract

We emphasize the importance of bridges between statistics, mechanics, and geometry. In particular, we developed and employed links between pencils of quadrics, moments of inertia, and linear and orthogonal regressions. For a given system of points in R^k representing a sample of a full rank, we recently constructed a pencil of confocal quadrics which provided a useful geometric tool to study the data.

SAŠA V. RAKOVIĆ

Saša V. Raković, Ph. D. DIC received the Ph. D. degree in Control Theory from Imperial College London. His Ph. D. thesis, entitled "Robust Control of Constrained Discrete Time Systems: Characterization and Implementation", was awarded the Eryl Cadwaladr Davies Prize as the best Ph. D. thesis in the Department of Electrical and Electronic Engineering at Imperial College London in 2005.

Saša V. Raković was affiliated with a number of the worldwide well-known universities, including, inter alia, Imperial College London, ETH Zürich, Oxford University, the

University of Maryland at College Park and the University of Texas at Austin. He is currently a Full Professor with the School of Automation of Beijing Institute of Technology, Beijing, China.

Saša V. Raković's main research interests and contributions lie within the areas of synthesis of control systems, analysis of dynamical systems and decision making under constraints and uncertainty. He has authored 115 publications, most of which are published in leading international journals and are highly cited (i. e., more than 7100 citations



according to Google Scholar on September 22, 2022).

MINKOWSKI, LYAPUNOV & BELLMAN: FUNDAMENTAL ALTERNATIVES TO TRADITIONAL MEMES

Abstract

The classical Lyapunov and Bellman equations, and inequalities, are cornerstone objects in linear systems theory. These equations, and inequalities, are concerned with convex quadratic functions verifying stability in cases of the Lyapunov equation and inequalities as well as optimality and stability in cases of the Bellman equation and inequalities. Rather peculiarly, prior to my work in the area, very little had been known about the related Lyapunov and Bellman equations, and inequalities, within the space of the Minkowski functions of nonempty convex compact subsets containing the origin in their interior. My recent research has provided complete characterizations of the solutions to the Lyapunov and Bellman equations, and inequalities, within the space of the Minkowski functions, referred to as the Minkowski-Lyapunov and Minkowski-Bellman equations, and inequalities, respectively. The talk reports key results underpinning the study of these fundamental equations and inequalities and their generalizations. The talk also renders strong evidence of topological flexibility and theoretical correctness of the developed frameworks and consequent advantages over the traditional Lyapunov and Bellman equations and inequalities.

Biografije i apstrakti

GRADIMIR MILOVANOVIĆ

Gradimir V. Milovanović is a Professor of Numerical Analysis and Approximation Theory and Full Member of the Serbian Academy of Sciences and Arts. He studied at University of Niš, obtaining a B. Sc. (1971) in electrical engineering and computer sciences, as well as an M. Sc. (1974) and a Ph. D. (1976) in mathematics.

He was with the Faculty of Electronic Engineering and the Department of Mathematics at the same place as, promoted to professor (1986) and acting as Dean of the Faculty of Electronic Engineering (2002–2004) and Rector of the University of Niš (2004–06), as well as Dean of the Faculty of Computer Sciences at the Megatrend University, Belgrade (2008–2011), until he joined the Mathematical Institute of the Serbian Academy of Sciences and Arts in Belgrade (2011). He was President of the National Council for Scientific and Technological Development of the Republic of Serbia (2006–2010).

His research interests are Orthogonal Polynomials, Orthogonal

Systems and Special Functions; Interpolation, Quadrature Processes and Integral Equations; Approximation by Polynomials and Splines and Linear Operators; Extremal Problems, Numerical and Optimization Methods; Polynomials (Extremal Problems, Inequalities, Zeros); Iterative Processes and Inequalities. He published 9 monographs, about 315 scientific papers in refereed journals, about 40 book chapters, 50 papers in conference proceedings, as well as 23 textbooks. Most significant monograph works of Milovanović are *Topics in Polynomials: Extremal Problems, Inequalities, Zeros* (coauthors: D. S. Mitrinović and Th. M. Rassias), published at over 800 pages by World Scientific (Singapore, 1994) and known in the world as „Bible of Polynomials“, as well as the monographs *Interpolation Processes — Basic Theory and Applications* (coauthor: G. Mastroianni) by Springer, 2008, and *Extremal Problems and Inequalities of Markov-Bernstein Type for Algebraic Polynomials* (coauthors: R. B. Gardner and N. K. Govil) by



Elsevier/Academic Press, London, 2022 (Home page: <http://www.mi.sanu.ac.rs/~gvm/>). He was or is currently serving as an Editor-in-Chief and an Associate Editor for several journals (*Journal of Inequalities and Applications*, Springer; *Optimization Letters*, Springer; *Applied Mathematics and Computation*, Elsevier; *Publications de l'Institut Mathématique*, Mathematical Institute, Belgrade, etc.).

QUADRATURE PROCESSES AND THEIR APPLICATIONS

Abstract

C. F. Gauss developed in 1814 his famous method of numerical integration which dramatically improves the earlier method of Newton and Cotes. This discovery was the most significant event of the 19th century in the field of numerical integration and perhaps in all of numerical analysis. This method was closely related to orthogonal polynomials and continued fractions in subsequent works by C. G. J. Jacobi, E. B. Christoffel, F.-G. Mehler, R. Radau, E. Heine, etc. The error term and convergence analysis of these Gauss-Christoffel quadrature formulas were proved by A. A. Markov, T. J. Stieltjes, J. V. Uspensky, etc. In 1969 Golub and Welsch gave an efficient procedure for constructing the Gaussian quadrature rules (quadrature nodes and weights), using a three-diagonal symmetric Jacobi matrix with recurrence coefficients α_k and β_k for the corresponding monic orthogonal polynomials. According to this procedure, the quadrature nodes are eigenvalues of this matrix, and the weights can be computed only by the first components of the corresponding eigenvectors. Unfortunately, the recursion coefficients are known explicitly only for some narrow classes of orthogonal polynomials, including the so-called very classical orthogonal polynomials (Jacobi, the generalized Laguerre, and Hermite polynomials). However, for a large class of the so-called strongly non-classical polynomials these coefficients must be constructed numerically. Basic procedures for generating these coefficients are the method of (modified) moments, the discretized Stieltjes-Gautschi procedure, and the Lanczos algorithm and they play a central role in the so-called constructive theory of orthogonal polynomials, which was developed by W. Gautschi in the eighties on the last century for arbitrary measures on the real line, including strong stability analysis of such procedures, as well as general algorithms for modifications of the measures by linear and quadratic factors and divisors.

This constructive theory of orthogonal polynomials opened the door for extensive computational work on orthogonal polynomials and their applications: (a) construction of many new classes of strongly non-classical polynomials (very often with certain exotic weights); (b) development of other types of orthogonality (e. g.. s and σ -orthogonality, orthogonality on radial rays, Sobolev type of orthogonality, multiple orthogonality, etc.); (d) applications in diverse areas of applied and numerical analysis (numerical integration, interpolation, integral equations, ...); (e) approximation theory (moment-preserving spline approximation, ...); (f) integration of fast oscillating functions; (g) summation of slowly convergent series; etc.

By the recent progress in symbolic computation and variable-precision arithmetic, it is possible today to generate the recurrence coefficients α_k and β_k directly by using the original Chebyshev method of moments, but in sufficiently high precision. The corresponding software for such a purpose, as well as many other calculations with orthogonal polynomials and different quadrature rules, is now available: Gautschi's package SOPQ in Matlab, and our Mathematica package OrthogonalPolynomials. Finally, we mention new numerical algorithms for the efficient evaluation of quantities associated with generalized matrix functions based on Gaussian quadratures and Golub–Kahan bidiagonalization, including block variants. Such generalized matrix functions appear in the analysis of graphs and networks. Otherwise, network science is an important interdisciplinary field essential for the analysis of various phenomena in many real-world networks that arise in information sciences, engineering, biology, sociology, economics, and many other fields.

Biografije i apstrakti

MIODRAG MATELJEVIĆ

Dean at Department of Mathematics (Faculty of Mathematics) 2007–2014.

Corresponding member of Serbian Academy of Sciences & Arts from 2012–2018.

Academician of Serbian Academy of Sciences & Arts from 2018 (Nov 8).

Winter semester 1988 as associate professor at University of Pittsburgh.

Associate Professorship during 1988/89. at Wayne State University, Detroit.

The winner of the City of Belgrade Science Award for 2006.

His research is related to harmonic maps, quasiconformal map-

pings, geometric inequalities and elliptic partial differential equation. He published about 130 scientific papers in well internationally known journals, which are quoted about 1670 times, and notable books Topics in Conformal, Quasiconformal and Harmonic maps 2012, and Kompleksne funkcije 1 & 2, 2006. He delivered about 50 invited lectures and about 20 plenary lectures: IWWA USA, Nevanlinna Colloquium Switzerland, 4 lectures at Finish -Rumanian seminar, Oberwolfach, Grotzsch conference, Computational Methods and Function Theory (CMFT 2017), invited by Polish and Bulgarian academy of science,...



SOME ASPECTS OF POTENTIAL THEORY, VISUALIZATION, CALCULUS OF VARIATIONS AND APPLICATIONS

Abstract

The author tried to adapt the introductory speech [M] (as well as this paper) to readers (for those who do not have mathematics as their main activity) and to show that the problems he deals with have motivation in the real world.

The work is divided into several parts:

1. First, a brief historical overview of ideas and concepts with motivations from the real world is given. The statements of well-known personalities about mathematics are listed and the concepts considered:

limit value, derivative, extreme values, stationary points, contribution to development of functional thinking in relation to convexity and one-dimensional motion and inertial systems (one task from the PISA test related to the concept of convexity), application of visualization methods to some mathematical problems ... Archimedes' approach for calculating the area bounded by a parabola has been modified.

2. In Section 2, the proof of the well-known inequality of Mihail Petrović on convex functions is given using visualization methods.

3. The third part lists some motivations for mathematical theories in the real world, especially in physics. The connections between the mathematical theory of potential and the potential in electrostatics are discussed: the state of equilibrium, the tendency of the system to occupy the position of minimum energy, isoperimetric inequalities regarding capacity, geometric inequalities that include Gehring's problem and their connection with the logo of the International Mathematical Union, etc.

4. In the fourth part, Dirichlet's principle and calculus of variations are discussed in connection with minimal surfaces, harmonic mappings that are stationary points of functional energy and geometric inequalities.

[M] M. Mateljević, Neki aspekti teorije potencijala, vizualizacija, varijacioni račun i primene, Akademske besede knj. 2, 2019, redovnih članova SANU koji su izabrani 8. novembra 2018 god. U izdanju Srpske akademije nauka i umetnosti, 73–110, ISSN 2466–5134

VLADIMIR FILIPOVIĆ

Full Professor at Department for computer science, Faculty of Mathematics, University of Belgrade. Member of the Modelling and optimization group within Department for computer science.

I was born on June 17th 1968, in Podgorica, Montenegro where I completed my primary and secondary education with excellent grades, GPA: 5.00/5.00. I was awarded the "Best student of the class '86" award in my High school "Slobodan Škerović", Podgorica.

In October 1987 I started the Computer science studies at Faculty of Mathematics, University of Belgrade. In 1988 I was awarded the Scholarship of the University of Belgrade, as one of the 40 best students of the University. From 1989 to 1993 I was on a Scholarship of the Fund for Science Promotion of the Government of Serbia, given to the 100 best students of all Serbian universities.

I obtained BSc in Computer Science (May 1993), at the Faculty of Mathematics, University of Belgrade, Serbia, GPA: 9.71/10.00. Dissertation: "Iterative Algorithms for Solving Linear Equation System on Transputer Computers".

In January 1998, I got my MSc degree in Computer Science, at the Faculty of Mathematics, University

of Belgrade, Serbia. Dissertation: "Proposition for Improvement Tournament Selection Operator in Genetic Algorithms".

I got my PhD in Computer Science in June 2006, at the same institution—Faculty of Mathematics, University of Belgrade, Serbia. Title of the thesis: "Selection and Migration Operators and Web Services in Evolutionary Applications".

Since 1993 I have been working at the Department for Computer Science, Faculty of Mathematics, University of Belgrade, Serbia, firstly as teaching assistant, since 2006 as assistant professor and since 2013 as associate professor. I was promoted to full professor in December 2019.

From January 2007 until June 2016 I served as the Head of the Software Examination and Certification Laboratory at Faculty of Mathematics, Belgrade University.

From January 2008 until December 2011 I served as Vice Dean for Academic Affairs at the Faculty of Mathematics, University of Belgrade, Serbia.

From February 2017 until October 2017 I served as the Head of the Department for Computer Science at the Faculty of Mathematics, University of Belgrade, Serbia.



I spent period between October 2017 and October 2018 on sabbatical leave. During that period I worked as a Visiting Fellow at Department for Computer Science, Systems and Communications, on University Milano-Bicocca, Milano, Italy. In joint work with colleagues from AlgoLab research group, we developed novel metaheuristics for some important problems in Bioinformatics, such as cancer evolution interference, alternative splicing prediction and haplotype assembly.

From October 2007 until January 2020 I was visiting professor at the University of Banja Luka, Faculty of Natural Sciences and Mathematics.

METAHEURISTIC OPTIMIZATIONS IN BIOINFORMATICS AND MACHINE LEARNING

Abstract

This paper deals with the usage of metaheuristic optimization methods aimed at solving problems in bioinformatics and machine learning. Two metaheuristic optimization methods have been selected and explained in detail: Electromagnetism-like Metaheuristics and Variable Neighborhood Search. Results obtained by applying those two metaheuristic optimization methods on various problems in bioinformatics and machine learning are described. More precisely, the following problems have been solved: dimensionality reduction, support vector machine parameter selection, maximum betweenness problem and k-plex partitioning problem. At the end, algebraic topology concepts aimed at enhancing Electromagnetism-like Metaheuristics and Variable Neighborhood Search are proposed and their design is described.

Key words: *Metaheuristics, Optimization, Electromagnetism-like Metaheuristics, Variable Neighborhood Search, Algebraic topology*

Biografije i apstrakti

MILJAN KNEŽEVIĆ

Assistant Professor, Faculty of Mathematics, University in Belgrade, Serbia

Vice Dean of the Faculty of Mathematics, University in Belgrade, Serbia

Occupation: Complex Analysis, Partial Differential Equations, Differential Geometry,

Quantitative Financial Analysis, Hedge Fund Seeding and Incubation Theory, Cyber Security.

Education: PHD in Complex analysis (Quasiconformal and harmonic mappings, quasiisometries and curvature — Faculty of Mathematics, University in Belgrade, 2014).

Professional experience and activities:

— Vice Dean of the Faculty of Mathematics, University in Belgrade, Serbia.

— Senior project Researcher of Serbian Ministry of Science and Technology (Project number: 174032, Title: Analysis and Algebra with applications, URL: www.mnpn.gov.rs).

— Part time professor at the Mathematical High School in Belgrade, Serbia, specialized school for young talented students. Courses: Mathematical Analysis with Algebra (see www.mg.edu.rs).

— Member of Serbian High School Commission for Mathematical competitions.

— Member of Serbian Mathematical Society (DMS, URL: <https://dms.rs>).

Papers and invited lectures:

— M., Knežević, M., Mateljević, „On the quasi-isometries of harmonic quasiconformal mappings”, J.

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— M., Knežević, “A Note on the Harmonic Quasiconformal Diffeomorphisms of the Unit Disc”, Filomat, Vol. 29, No. 2 (2015), pp. 335–341.

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— M., Knežević, M., Mateljević, M., Svetlik, “Distance in the Absolute Plane and Cauchy Functional Equations”, Filomat 31:11 (2017), 3585–3592 <https://doi.org/10.2298/FIL1711585M>.

— M., Knežević, “Some models of economic growth and capital accumulation”, Proceedings of XXXIX Symposium in Operations Research, (SYMOPIS 2012).

— M., Knežević, Dj., Krtinić, “A note on infinite descent principle”, Teaching of Mathematics, Vol. 16, br. 2, str. 67–78, (2013), ISSN: 1451–4966.

— B., Radivojević, M., Knežević, “Pricing options using the binomial model. Practical application”, Zbornik radova, IV Symposium

— Mathematics and Applications, University of Belgrade, Vol



IV(1), 40–47, (2014): Print ISBN 978-86-7589-089-8, Online ISBN 978-86-7589-090-4.

— I., Anić, M., Stamenković, M., Knežević, “Insurance Company Valuation Based on Electre Multicriteria Decision Making”, Proceedings of XXXVIII Symposium in Operations Research, (SYMOPIS 2011), ISBN: 978-86-403-1168-7.

— Invited lecture at Moscow State University — MGU, Department of Mechanics and Mathematics, “Alexandroff Readings”, 21.-30. May 2016.

— Invited lecture at Novosibirsk State University, Sobolev Institute of Mathematics, “Geometry days in Novosibirsk”, 25–29. August 2015.

Honors and awards: 2006 FREN award for the project “Asymmetric Information in Financial Markets and the Market for Information”, Belgrade 2006.

Other skills: Excellent knowledge in MathLab, Visual Basic, C++ and SQL. Excellent knowledge in English and Turkish languages.

MONTENEGRO AND SERBIA: CHALLENGES IN SCIENCE AND MATHEMATICS

Abstract

The lecture will mostly devoted to the development of some branches of science, and especially certain mathematical disciplines, in Montenegro and Serbia, with an emphasis on the development of the Seminar for Complex Analysis in Belgrade and the emergence of the Belgrade School of Mathematics. The Seminar for complex analysis of the Faculty of Mathematics, University of Belgrade, that was founded and managed by prof. dr. Miodrag Mateljević, Academician of SANU, gained extraordinary international credibility and grew into a well-known Belgrade School of Mathematics. Many researchers from Serbia and Montenegro, working diligently and

with great dedication, made their immeasurable contribution to the development and influence of that school. Some of the members of the Seminar are today some of the most respected researchers in scattering. The achieved results of the members of the Belgrade School of Mathematics can serve the young generations from Montenegro and Serbia as an incentive for further advancement in science. Scientific field: Mathematics Scientific subfield: Mathematical analysis, Complex analysis, Geometry

Biografije i apstrakti

PRIRODNE NAUKE / NATURAL SCIENCES (7)

IVAN BOŽOVIĆ

Ivan Božović received his Ph. D. in Solid State Physics from Belgrade University, Yugoslavia, where he was later elected a professor and the Physics Department Head. After moving to the USA in 1985, he worked at Stanford University, the Varian Research Center in Palo Alto, California, and Oxxel, Bremen, Germany. Since 2003, he has been the MBE Group Leader at Brookhaven National Laboratory, and since 2014 also been an Adjunct Professor at Yale University.

He is a Member of the European Academy of Sciences, a Foreign Member of the Serbian Academy of Science and Arts, a Fellow of the American Physical Society (APS), and a Fellow of the International

Society for Optics and Photonics (SPIE).

He received APS McGroddy Prize for Materials Physics, Bernd Matthias Prize for Superconducting Materials, SPIE Technology Award, M. Jaric Prize, and BNL Science and Technology Prize. He was elected as Max Planck Lecturer, Van der Waals Lecturer, and (twice) Gordon and Betty Moore Foundation Principal Investigator.

Ivan's research interests include fundamental physics of condensed states of matter, novel electronic phenomena including unconventional superconductivity, innovative methods of thin film synthesis and characterization, and nano-scale physics. He published



11 research monographs and over 300 research papers, including 30 in *Science* and *Nature* journals.

ALCHEMY OF THE XXI CENTURY: DIGITAL SYNTHESIS OF QUANTUM MATERIALS

Abstract

Atomic-layer-by-layer molecular beam epitaxy (ALL-MBE) is a new technique developed in the last few decades to synthesize functional quantum materials, including high-temperature superconductors, other complex oxides, and two-dimensional materials such as graphene and borophene. It even enables one to synthesize novel metastable materials that cannot be produced by standard methods. Several examples are presented of ALL-MBE alchemy — the creation of artificial materials with novel and unique electronic properties. The ability to engineer the materials at a single-atomic monolayer level enabled important discoveries, further illustrating the power of ALL-MBE.

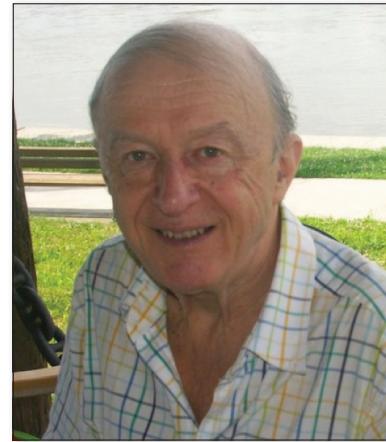
Key words: *Atomic layer-by-layer Molecular beam epitaxy Digital synthesis. Artificial metastable materials*

FEDOR MESINGER

Fedor Mesinger was born in Sremska Mitrovica in 1933, but comes from Šid, then Yugoslavia, now Serbia. He received his Sc. D. degree in meteorology from the University of Belgrade in 1960. He spent about half of his career at the University of Belgrade, where he established a numerical modeling group that compared well with the best in the world. He has spent extended periods as a visiting scientist at many of the world's leading modeling centers, including UCLA, NCAR, Boulder, CO, and GFDL, Princeton, NJ. He worked at the then National Meteorological Center, NMC, subsequently NCEP/EMC, in Washington, DC, area, for many years under the UCAR Visiting Scientist Program, and as a visitor at the University of Maryland, College Park, MD. He held shorter

visiting appointments, in this order, in Germany, France, Italy, and Brazil. Mesinger is a past president of the World Meteorological Organization's Commission for Atmospheric Sciences. He is a member of the Serbian Academy of Sciences and Arts, a member of the Academia Europaea, and a member of the International Eurasian Academy of Sciences, with headquarters in Helsinki, Moscow, and Beijing.

Mesinger is the author of numerous scientific papers and has given many invited presentations at prominent international meetings and institutions. He is the primary author of the Eta model, named after his eta vertical coordinate, for more than a decade regional U. S. operational model, now used for near-real time North American Regional Reanalysis, with



more than 3700 Google Scholar citations. He is the recipient of the 2001 Vilhelm Bjerknes medal of the European Geophysical Society, <https://www.egu.eu/awards-medals/vilhelm-bjerknes/2001/fedor-mesinger/>

THE ETA MODEL IN WEATHER AND CLIMATE: BACKGROUND, AND LESSONS LEARNED

Abstract

Incentive for writing a limited area weather prediction model stemmed from the author's several years stay at the University of California in Los Angeles, at the end of the sixties.

Exposed to what he refers to as the Akio Arakawa approach, having had an idea for a scheme that was an improvement to what Arakawa was using, and being aware of the importance of topography for weather of the country he was to continue his career in, led in 1973 to his first limited area 3D code, forerunner of what was to become the Eta model.

Refinements and enhancements introduced by the author in subsequent years, and of the collaborator he acquired, Zaviša Janjić, resulted in the code that when installed at the then U. S. National Meteorological Center, attracted attention. Hallmarks of the model were Mesinger's eta vertical coordinate, and Janjić's transformation of the Arakawa horizontal advection scheme to the model's semi-staggered B/E grid. In 1993 the Eta became the primary regional forecasting model of the U. S. Weather Bureau, and in 1998 its precipitation accuracy of 24–48 h forecasts became higher across all intensity thresholds than that of its predecessor, the Nested Grid Model (NGM) for its 00–24 h forecasts. Lately, the Eta is extensively used also as a regional climate model (RCM), mostly over the South American domain, and in near-real time as a tool for the

North American Regional Reanalysis (NARR), run by the U. S. National Centers for Environmental Prediction/Climate Prediction Center. Several later unique numerical refinements of the Eta addressing problems noticed are summarized in a "before and after" fashion, and results are mentioned of its ensemble skill compared to that of its highly acclaimed driver European Centre for Medium Range Forecasts (ECMWF) model.

Key words: *Eta model, cut-cell schemes, finite-volume schemes, topography representation*

Biografije i apstrakti

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Tehnološko-metalurški fakultet, Univerzitet u Beogradu, Centar za nanotehnologije i funkcionalne materijale, Carnegieva 4, Beograd

Profesor Radmilović je završio redovne studije, magistrirao i doktorirao na Tehnološko-metalurškom fakultetu (TMF) u Beogradu, na Katedri za fizičku metalurgiju. Na postdoktorskim studijama bio je na Fakultetu za nauku o materijalima Kalifornija univerzitetu u Berkliju 1986.g., a na istom univerzitetu bio je gostujući profesor 1987.g. Kao gostujući profesor boravio je 1992.g. na Fakultetu za materijale Picburg univerziteta u Pensilvaniji, SAD. Na TMF-u je biran u sva nastavnička zvanja, za docenta 1986.g., vanrednog profesora 1991.g., a za redovnog profesora 1995.g. Godine 1999. na poziv Nacionalnog centra za elektronsku mikroskopiju Lorens Berkli nacionalne laboratorije, Kalifornija univerziteta u Berkliju, izabran je za istraživača, a 2004.g. za vodećeg istraživača. Krajem 2010.g., na poziv TMF-a, vraća se u Beograd i pridružuje, kao naučni savjetnik, Centru za nanotehnologije i funkcionalne materijale, čije osnivanje je finansirala Evropska Unija kroz FP7 projekt. Istraživački interes profesora Radmilovića fokusiran je na fazne prelaze u čvrstom stanju i granične površine, međuzavisnost strukture i osobina materijala, primjenu visokorezolucione transmisione mikroskopije i spektroskopije u studijama

nanomaterijala, kao što su: nanožice, nanocijevi, tanki filmovi, katalizatori, termoelektrični materijali, solarne ćelije, detektori elektromagnetskog zračenja, itd. Bibliografija profesora Radmilovića sadrži 825 jedinica. Do sada je objavio 249 radova u međunarodnim časopisima sa recenzijom, od čega 197 sa SCI liste, 19 radova u domaćim časopisima, 331 rad saopšten i/ili štampan u zbornicima međunarodnih konferencija, od kojih 84 kao plenarni ili predavač po pozivu, 63 na domaćim konferencijama, održao 131 predavanje, seminar i kolokvijum po pozivu na najuglednijim univerzitetima i istraživačkim centrima u svijetu, ima 2 međunarodna patenta i 5 patentnih prijava, 21 projekat saradnje sa privredom, 2 skripte o Faznim transformacijama i Kristalografskom, 5 radova po pozivu u međunarodnim monografijama. Prema SCOPUS bazi podataka njegovi radovi su citirani preko 10000 puta sa H indeksom 47, a prema Google Scholar listi preko 12000 puta sa H indeksom 53. Član je uređivačkih odbora nekoliko časopisa iz oblasti metalurgije i materijala, i recenzira radove za brojne ugledne časopise za materijale i metalurgiju u svijetu. Na Univerzitetu Crne Gore, Beogradskom univerzitetu i brojnim univerzitetima u svijetu, držao je nastavu na redovnim i postdiplomskim studijama iz: Fizičke metalurgije, Fizike čvrstoće i plastičnosti, Termičke obrade, Faznih transformacija, Kristalografije, Grešaka u kristalima, Rentgenske analize,



Elektronske difrakcije, Elektronske mikroskopije, Mehaničke metalurgije, Fizičke metalurgije zavarivanja, itd. Dobitnik je brojnih profesionalnih priznanja: Nagrade grada Beograda za prirodne i tehničke nauke, Predavač godine po izboru Evropskog društva za mikroskopiju, Godišnja nagrada za najbolji rad Evropskog društva za mikroskopiju, Nagrada Lorens Berkli nacionalne laboratorije Kalifornija univerziteta u Berkliju za izuzetne doprinosе nauci, Nagrada Ministarstva za nauku i prosvjetu Vlade Srbije za najuspješnije istraživače, dobitnik je Povelje Srpskog hemijskog društva, Nagrada Društva za istraživanje materijala Srbije za izvanredan i trajan doprinost nauci o materijalima, član je Evropske akademije nauka i umjetnosti, počasni je član Akademije inženjerskih nauka Srbije. Redovni je član Srpske akademije nauka i umetnosti.

ATOMISTIC PHENOMENA IN ZNO-IN₂O₃ NANOWIRES

Abstract

To reach a proper balance between energy production and environmental protection, it is necessary to have a full transition to renewable energy sources and eliminating the use of fossil fuels which negatively affect the ecosystem of our planet. In order to solve this very difficult task, research has been taking variety of different avenues. One of such avenues is the field of thermoelectric nanomaterials, which demonstrate the conversion of the temperature gradient into electric current, with potential applications in sensors, consumer electronics, medical devices, etc. Thermoelectric M₂O₃(ZnO)_n nanowires, where M could be In, Ga, Fe, synthesized using solid-state diffusion, enabled us to control their defect structure at atomic level and to create an aperiodic superlattice structure, in which complex oxide interfaces are formed between ZnO wurtzite crystal structure and monoatomic indium (In) containing defect layers. Two kinds of defects: planar, parallel to basal wurtzite planes and zigzag, parallel to pyramidal planes, facilitate decoupling of

electrical and thermal properties. Both of these factors facilitate achieving a high figure of merit, zT , used to rank thermoelectric materials and devices. Atomic resolution scanning transmission electron microscopy of these nanowires confirmed the presence of In containing planar defects perpendicular to the [0001] direction. These defects separate wurtzite $\text{GaZn}_n\text{O}_{(n+1)}^+$ slabs of various thicknesses at nanoscale enabling quantum confinement effect to take place and act as obstacles for phonon propagation. Incomplete In monoatomic layers are associated with edge dislocations, providing fast diffusion paths for large indium atoms. It is apparent that these two quantum and wave mechanics tools, quantum confinement and phonon scattering, can be used for better control of thermoelectric properties, which could be the key in developing next-generation nanostructured materials.

Biografije i apstrakti

BRANISLAV JELENKOVIĆ

Prof. Branislav Jelenkovic is the research fellow at the Institute of physics, University of Belgrade (IPB).

Prior to retirement he was the head of the Photonics Center, Serbian Center of excellence, at IPB. The main research fields of the Center are nonlinear and quantum optics and biophotonics. He is the author of over 140 papers published in peer review scientific journals, with citation index over 3700.

In 2010, he was recipient of the Institute of physics award. Since 2012, Jelenkovic is the member of the Serbian Academy of Science and Art.

His main professional activities are:

Visiting scientist at MIT, Cambridge MA (2012–2021);

Visiting scientists at the University College London (2009–2011);

Visiting research fellow at Jet Propulsion Laboratory, Pasadena, California (2003–2006); Visiting scientist, National Institute of Standards and Technology, Ion Storage group of Dave Wineland (Nobel laureate 2012.) Boulder, Colorado (1995–2003);

Visiting professor, Laboratory for gas discharges, CNRS laboratory at Ecole Supérieure d'Electricité, Paris, France (1992–1993);

Visiting Fellow, JILA, University of Colorado (1991–1992);

Postdoctoral Research Associate, JILA, University of Colorado.



QUANTUM BIOPHOTONICS — HORIZON EUROPE COLLABORATIVE PROJECT (TWINNING FOR EXCELLENCE OF THE SERBIAN RESEARCH CENTER FOR QUANTUM BIOPHOTONICS)

Abstract

In my talk I will describe one of the popular mechanisms for increasing knowledge and visibility of research institutions in lesser developed European countries, like Western Balkan countries.

In the cooperative projects of Horizon Europe, known as Twinning projects, several European well established research groups are helping research group in a third country to bring its research and management skills to the higher level. In the project titled *Twinning for excellence of the Serbian research Center for quantum biophotonics*, Institute of physics Belgrade (IPB), will be helped by leading European institutions in biophotonics, Friedrich-Schiller University Jena in Germany, and Consiglio Nazionale delle Ricerche and LENS in Florence, Italy to develop novel research field, quantum biophotonics. The partner on the project, that will help in many biological aspects, is the Faculty of Biology University of Belgrade, the group headed by Prof. Pavle Andjus.

In quantum biophotonics, the methods of quantum optics are applied for better quantum state characterization and manipulation, in order to make more sensitive, reliable and traceable measurements when exploring biological systems. Emerging applications of quantum biophotonics are for sensing and imaging, for probing molecular dynamics, in systems when classical methods are either not applicable, or are too noisy. These advances are made possible by the recent progress in quantum technologies.

I will describe quantum enhanced imaging schemes for harnessing properties of time and space correlated photons, quantum illumination, ghost imaging, and quantum holographic imaging. Since the subject of the Twining project is the development of quantum holography at IPB, I will explain in more details principles and advantages of quantum vs classical computer generated holography.

SLOBODAN MARKOVIĆ

Work address: Department of Geography, tourism and hotel management, Trg Dositeja Obradovića 3, Faculty of Science and Mathematics, University of Novi Sad

Current occupation: Full professor since 01. 01. 2009

Education: 1990–1993: B. Sc. (Geography, General), Graduated at University of Novi Sad, Faculty of Science, Department of Geography; Average mark: 9.31, exams marks from 5 to 10);

*1993–1996: Pre-master program: University of Novi Sad, Faculty of Science, Department of Geography; Average mark: 9.50);

*1996: M. Sc. University of Novi Sad, Faculty of Science and Mathematics, Department of Geography; Thesis Title: *Water regime and directions of groundwater runoffs of the phreatic aquifer in the Yugoslav part of the Banat region;*

*2000: Ph. D University of Novi Sad, Faculty of Science and Mathematics, Department of Geography; Thesis Title: *Paleogeography of the Vojvodina region during the Quaternary.*

Fellowships: *2003–2005: Humboldt Fellowship, title proposal: *Luminescence dating of Yugoslav loess-paleosol sequences.* University of Bayreuth, Chair of Geomorphology, Germany.

* 2005–2006 Return Humboldt and Junior-Senior Humboldt fellowship, University of Bayreuth, Chair of Geomorphology, Germany.

* 2016, 2018 Chinese Academy of Sciences Fellowships

Work History: 1994–2000. Assistant, Department of Geography, Faculty of Science and

Mathematics, University of Novi Sad

2000–2004 Assistant Professor, Department of Geography, Faculty of Science and Mathematics, University of Novi Sad

2005–2009 Associate Professor, Department of Geography, Faculty of Science and Mathematics, University of Novi Sad

2009– Full Professor, Department of Geography, Faculty of Science and Mathematics, University of Novi Sad

2009–2012 & 2015 – Head of Chair of Physical Geography

2010–2012 — Vice Director of Department of Geography, Faculty of Science and Mathematics, University of Novi Sad

2015 Visiting professor University of Wroclaw

2015 — Corresponding member of Serbian Academy of Sciences and Arts

Research Interests: Investigation of loess-paleosol sequences, Quaternary stratigraphy, Reconstruction of Quaternary climatic and environmental dynamics, Paleopedology, Geomorphology, Climatology and Hydrology.

Memberships: INQUA (International Union for Quaternary Research), President of INQUA Loess Focus Group (2011–2019), Full member of SEQS (European Quaternary Stratigraphy sub-commision), National representative in INQUA International Council and Past Global Changes a core project of the International Geosphere-Biosphere Programm, EGU (European geosciences union) and Serbian National committee for geo-heritage.



Editorial board member: Quaternary International (2013–2016), Acta Geographica Slovenica, Open Geosciences, Geoscience, Quaternary, Environment, Journal of Environmental Geography, Вісник Львівського університету. Серія географічна, Зборник радова Географічного інститута САНУ "Јован Цвијић" and Geographica Pannonica (Editor in Chief 2005–2007)

Reviewer: Nature Scientific Reports, Earth Science Reviews, Geology, Quaternary Science Reviews, Geophysical Research Letters, International Geology Review, Geology, Quaternary Research, Journal of Quaternary Science, Aeolian Research, Catena, Geoderma, Quaternary International, Journal of Asian Earth Sciences, European Journal of Soil Science, The Netherlands Journal of Geosciences, Central European Journal of Geosciences, Acta Geographica Slovenica, Geologica Croatica и Neues Jahrbuch für Geologie und Paläontologie.

He has 24 most important publications.

CLIMATE CHANGE: PALEOCLIMATIC EVOLUTION, RECENT AND FUTURE CLIMATE DYNAMICS

Abstract

We are witnessing a developing, worldwide interest in the phenomenon of climate change, within both a notable portion of the scientific community and the public at large. This widespread interest in climate change implies the existence of a wide range of circulating perspectives on this problematic phenomenon, from underestimating its potential consequences, to interpretations excessively catastrophic in nature. Such an unprecedented global interest in understanding the

Biografije i apstrakti

mechanisms of climate dynamics is an understandable reaction, given modern civilization being undeniably dependent on the climate's stability and predictability.

Viewed from the perspective of long-term Cenozoic climate change, we are living in the last warm phase (interglacial) of the Quaternary Ice Age, which is still far cooler than the Paleocene-Eocene climate maximum. Many contemporary scientists have argued that an increase in greenhouse gas emissions released into the Earth's atmosphere will cause significant global warming. This study analyzes the variability of the Earth's climate over the last 65.5 million years, with a focus on greenhouse gases. It offers a possible basis for a more comprehensive critical assessment of contemporary attempts to foresee future climate change variability. The Quaternary Ice period started around 2.5 million ago has been characterized by extreme climatic variations related to cold glacial and warm interglacial phases. Widely known Serbian scientist Milutin Milanković crucially influenced modern paleo-climatic research with his theory that Quaternary ice age climatic fluctuations are caused by variations in the Earth's orbit around the Sun. The overriding belief among the scientific and broader community is that humans are starting to have the dominant effect on climate, and that there is a danger of a "super-interglacial" period that would last much longer than Milanković's cycles predicted. It is symptomatic that the fear of anthropogenically caused global warming is widely used in politics and other social undertakings that are only loosely connected to scientific climate research. Unfortunately, mankind still lacks an adequate replacement for the economically justified usage of fossil fuels, which brings to the fore the inevitable civilizational search for new, efficient and financially favorable energy sources.

OGNJEN MILJANIĆ

Ognjen Š. Miljanić je rođen 1978. godine u Beogradu, gde je i završio studije na Hemijskom fakultetu. Doktorsku disertaciju iz organske hemije je odbranio na Kalifornijskom univerzitetu u Berkliju (SAD) 2005. godine. Između 2005. i 2008. godine je boravio na Kalifornijskom univerzitetu u Los Anđelesu (UCLA) kao postdoktorski saradnik prof. Frejzera Stodarta, dobitnika Nobelove nagrade za hemiju 2016. godine. Od 2008. je profesor na Univerzitetu u Hjustonu, gde se trenutno bavi istraživanjem poroznih materijala i kompleksnih smeša, kao i problemima

kontaminacije životne sredine. Dobitnik je većeh broja priznanja i nagrada, među kojima se izdvajaju stipendija Aleksandar fon Humboldt fondacije, počasno članstvo u izraelskom hemijskom društvu, i CAREER nagrada američke fondacije za nauku (NSF). Održao je preko 110 predavanja o svom istraživačkom radu na univerzitetima i konferencijama u 28 zemalja, i objavio 90 radova u međunarodnim časopisima. Njegova prva knjiga pod naslovom *Introduction to Energy and Sustainability* je objavljena prošle godine na engleskom jeziku. Živi u Hjustonu sa svoje troje dece.



FROM THE GLOBAL WARMING TO MOLECULAR CRYSTALS

Abstract

Climate change is the biggest and the most daunting problem faced by our civilization today. Changes in our climate are being caused by the changes in our atmosphere, which has become enriched with various greenhouse gases (GHGs) mostly on account of human activity, and mostly during the past three decades. Avoiding the worst effects of climate change is both a practical and a moral obligation of today's society. Further emissions of GHGs need to be dramatically lowered, while additional attempts to remove some of the already-emitted amounts from the atmosphere must complement the decarbonization process. My research team has been developing molecular hosts which have high affinity for GHGs and can sequester them from the various gas mixtures in which they are present. Organized into porous molecular crystals—solid-state materials with sponge-like structures—these molecular hosts have been shown to capture carbon dioxide, fluorinated hydrocarbons, and fluorinated inhalation anesthetics.

Biografije i apstrakti

PAVLE R. ANDJUS

Prof. Andjus is the founder and current Head of the Centre for laser microscopy, University of Belgrade Faculty of Biology and long-time president of the Biophysical Society of Serbia. He is also the director of the foundation „Academician Radoslav K. Andjus“ and president of the Serbian Brain Council as well as representative of European councils in Brussels (Europena Brain Council).

In 1981 he graduated in Molecular Biology and Physiology at the University of Belgrade and obtained his MSc and PhD in Biophysics at the same University. He was trained in the Institute for Biological Physics — Pushchino (USSR), MBL — Woods Hole (USA) and obtained a postdoc fellowship in SISSA, Neurobiophysics, Trieste (Italy).

He started his research carrier in the Institute for General & Physical Chemistry, Belgrade as a young head of Biophysics lab where he developed studies on the biophysics of water and ion transport through cell membranes (1981–1999). His academic carrier started in 1989 at the University of Belgrade Faculty of Biology, where he is still employed and where he has been head of Chair in General Physiology and Biophysics, head of Department (Physiology & Biochemistry), vice dean for research and

where he holds full professorship in Physiology and Biophysics since 2003 and chairs the PhD program in Neurophysiology. He also founded the master programme of Biophysics at his School and the PhD programme in Biophysics and Biophotonics at the University of Belgrade. He was a visiting scientist at SISSA, Trieste (1994–1996) and the Department for Neuroscience, University of Turin (1999–2002). He is also founder of the international biannual School on Biophysics “Academician Radoslav K. Andjus” in the Institute for Marine Biology of Kotor, Montenegro (dedicated to his father the founder of Serbian biophysics). Prof. Andjus is also a long-term president of the Society “Drobnji Pijesak” devoted to the preservation of culture and history of the Paštrovići tribe from the coast of Montenegro. Outside his home institution he has been member of the committee of the Network of European Neuroscience Schools (NENS), delegate to the EC ESF/COST Domain Committee for Biomedicine and Molecular Biosciences, member of the University Council for Natural Sciences, and member of the Interdisciplinary Science Board for Biomedicine at the Ministry of Science. His current research within the Centre for



laser microscopy is mainly devoted to the cellular mechanism of pathophysiology in models of neurodegenerative diseases and conditions by means of confocal microscopy, time-resolved video microscopy and electrophysiology. Since the establishment of the Center he has run several projects including two integrative national (2007–2010 and 2011–2015) and two EC Framework grants (2006–2009 “NEUROIMAGE” — the first biomedical EU grant in Serbia and 2008–2023 H2020 “AUTOIGG”). In recent years he is devoted to the use of this knowledge to the creation of a disruptive diagnostic device for neurodegenerative diseases. He and his team were also granted a national innovative award and have been invited to the finals of several international innovation competitions (UK, China, Belgium).

INFORMATION FROM *IN VITRO* BIOMEDICAL DIAGNOSTICS — A ROAD TO PERSONALIZED MEDICINE

Abstract

In a number of neurodegenerative diseases (NDs) the production of the anti-neuronal immunoglobulin G (IgG) is a significant feature of the inflammatory process. It was shown that human IgGs may induce diverse physiological effects on neurons and glial cells of animal origin. In an ongoing project we propose to use IgGs for *in vitro* diagnostics of NDs. Based on already known cellular signaling responses recorded by fluorescent markers robust multipurpose processing of a single patient’s IgG sample effect on seeded normal cells can give a complex physiological information. This is achieved with microfluidics and automated microscopy towards experimental/clinical personalized diagnostics. Such a medical device is based on 1) the development of procedures based on a lab-on-a-chip microfluidic system with intracellular light sensors; 2) defining the standardized *in vitro* personalized diagnostic protocols; 3) design of a small-scale pilot platform based on automated/miniatirized fluorescence microscopy. Most of these principles have already been partly tested though a EC-H2020 project and a national Innovation Fund project. The interdisciplinarity of our research comprises of the following approaches: Cellular neurophysiology, Biophysics of intracellular fluorescent indicators, Video microscopy of intracellular molecular signaling, Microfluidics and biochip design, Advanced custom-made optics for automated microscopy and Machine learning for signal analysis. The designed personalized diagnostics technology will be applicable for a variety of NDs for a sustained healthcare system.

ČETVRTAK, 3. NOVEMBAR / THURSDAY, NOVEMBER 3

INŽENJERSKE NAUKE I / ENGINEERING SCIENCES I (7)

MARIJA ILIĆ

Marija Ilić, is a Professor Emerita at Carnegie Mellon University (CMU). She currently has a joint appointment of an Adjunct Professor in EECS Department and Senior Research Scientist at the MIT Laboratory for Information and Decision Systems (LIDS) at the Massachusetts Institute of Technology (MIT). She is an IEEE Life Fellow and an elected member of the US National Academy of Engineering, and the Academia Europaea. She was the first recipient of the NSF Presidential Young Investigator Award for Power Systems in the US. She has co-authored several books on the subject of large-scale electric power

systems, and has co-organized an annual multidisciplinary Electricity Industry conference series at Carnegie Mellon (<http://www.ece.cmu.edu/~electricconf>) with participants from academia, government, and industry. She was the founder and co-director of the Electric Energy Systems Group (EESG) at Carnegie Mellon University (<http://www.eesg.ece.cmu.edu>). Currently she is building EESG@MIT, in the same spirit as EESG@CMU. Most recently she has offered an open EdX course at MIT entitled "Principles of Modeling, Simulations and Control in Electric Energy Systems". She is founder and chief scientist



at New Electricity Transmission Solutions (NETSS), Inc.

DIGITIZATION: A PATH TO SUSTAINABLE DECARBONIZATION

Abstract

In this talk we explore how today's operations of electric power grids can be enhanced by evolving a hierarchically-designed and operated physical system into an interactive Cyber-Physical System (CPS). Today, the operation is fundamentally coordinated by the Energy Management Systems (EMS) sending commands to controllable power plants in their area to produce energy in a feed-forward manner. This is done at the Balancing Authority (BA) level where EMS uses its SCADA-enabled state estimator to predict power imbalances. The hard-to-predict imbalances are managed by the BAs, most often implemented using dedicated communication and control schemes.

Important for new opportunities for digitization is to understand the assumptions implied in today's operation and to design hardware and software needed to relax them. The emerging poly-centric approach to electricity services is described as a possible way forward [1]. The next generation SCADA becomes a Dynamic Monitoring and Decision System (DyMonDS) which relaxes major assumptions through interactive information exchange [2, 3]. This brings about inter-temporal and inter-spatial flexibility as a means of implementing cooperative gains and the ability to increase efficiency without sacrificing QoS. This CPS design is non-unique for any given social-ecological energy system (SEES) since it depends on the performance objectives and its resources, end users, governance system and their interactions. System governance and policy making determine the overall organization of the physical system into sub-systems with their own sub-objectives, and rules for information sharing in operations and planning. As such, they must be accounted for when building physical man-made portions of the system and the supporting CPS architecture. Design of a man-made physical grid and its cyber are done to enhance the performance of an existing man-made system. At the same time, digitization is needed to improve dynamic interactions of the SEES components and to align their sub-objectives to the best degree possible. Several real-world power grid examples are shown to illustrate its key role and potential benefits.

Key words: *Dynamic Monitoring and Decision Systems (DyMonDS); social-ecological energy systems (SEES); cyber physical systems (CPS); digitization; decarbonization*

Biografije i apstrakti

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- [3] — Ilić, M. D. (2010). Dynamic monitoring and decision systems for enabling sustainable energy services. *Proceedings of the IEEE*, 99(1), 58–79.

AYHAN İRFANOĞLU

Ayhan Irfanoglu is a professor and the associate head of civil engineering in the Lyles School of Civil Engineering at Purdue University, West Lafayette, Indiana, USA. He holds a BSCE from the Middle East Technical University in Ankara, Turkey, and MSCE and PhD from the California Institute of Technology. Prior to joining Purdue University in 2005, he worked as a consulting engineer at Wiss, Janney, Elstner Associates in Emeryville, California. His main teaching and research interests are related to structural engineering with focus on structural dynamics, earthquake engineering, engineering seismology, and classical as well as simulation-based structural analysis. Starting with the 1994 Northridge

(California) earthquake, he participated in several reconnaissance following earthquakes, namely, 1999 İzmit and Düzce/Turkey, 2003 Bingöl/Turkey, 2010 Haiti, 2011 Erciş/Turkey, 2016 Meinong/Taiwan, and 2017 Puebla/Mexico earthquakes. He is a member of the American Concrete Institute (ACI), Disaster Reconnaissance Committee (Cmte 133), and a member and the secretary of the Simplified Design of Concrete Buildings Committee (Cmte 314). He is a member of the Earthquake Engineering Association of Turkey, Earthquake Engineering Research Institute (USA), Seismological Society of America, and the American Society of Civil Engineers (ASCE). Dr. Irfanoglu is an associate editor for the ASCE



Journal of Performance of Constructed Facilities and the Frontiers in Built Environment—Earthquake Engineering.

FACING UNCERTAINTY: THE PRACTICE OF EARTHQUAKE ENGINEERING

Abstract

The realm of earthquake engineering practice is rife with uncertainties. The constraints imposed by regulations on this creative profession are often for good reason as they, sometimes, help tame the forces from finance with realities known from Nature. However, there are assumptions built into the current practice of earthquake engineering, whether stemming from or feeding into some of the regulations, which go against the maxim "know what you know and what you do not know" which defines engineering. While many examples may be given from earthquake engineering practice around the World, the dominating attitude in two contrasting cases could be used to illustrate how uncertainty is taken into consideration. One is the case of identifying low to mid-rise buildings with seismic vulnerabilities in large urban areas. This is a case where vast inventories of buildings, and as such, at least an order of magnitude more people, are impacted by the decisions of the earthquake engineers involved. The other case is the practice of designing high-rise buildings in earthquake country where the subject matter is often a single, monumental structure. Both cases are defined by how uncertainties are perceived, quantified, and taken into consideration by various parties involved (owners, local jurisdiction/government, and engineers) and by the actions taken, or not taken, in the face of these uncertainties. Typical outcomes in these cases may be surprising to the untrained in the current practice of earthquake engineering.

Key words: *earthquake engineering, uncertainty, risk, decision making*

Biografije i apstrakti

ŽELJKO TORBICA

Z. (Željko) Torbica is a Professor in the School of Construction Management Technology at Purdue University. Dr. Torbica's international experience of over 35 years includes faculty and leadership positions at several leading U. S. universities: he was Director of Construction Management program at Drexel University (2009–2012), Dean of Leonard C. Nelson College of Engineering & Sciences at West Virginia University Institute of Technology (2012–2019), and Head of the School of Construction Management Technology (2019–2022) at Purdue University. He has also an extensive and industry-recognized record in engineering, construction, real estate development, leadership and strategic planning.

During the course of his career, Dr. Torbica has received a number of distinguished awards; served as the conference keynote speaker at international conferences; published articles in the most selective professional journals; directed projects ranging from \$50 million to \$550 million; served on prestigious Baldrige National Quality Award Board of Examiners; and completed leadership programs at Columbia University and Harvard University.

Dr. Torbica received a Ph. D. degree from the University of Florida (Construction Management). Dr. Torbica is a Fellow of the American Society for Quality, Certified General Contractor in the state of Florida, and holds Project



Management Professional (PMP) and Certified Quality Engineer (CQE) certifications.

PURDUE UNIVERSITY'S UNIQUE MODEL OF CONSTRUCTION MANAGEMENT EDUCATION — LESSONS LEARNED

Abstract

Construction Management program at Purdue University has introduced a unique educational model for its undergraduate degree. The curriculum transformation process has been an extremely complex endeavor with a set of unique challenges for which there was no reference in the existing literature. The article briefly describes Purdue's educational approach and provides a summary of some of the major challenges that have been encountered. The main goal is to encourage the discussion and exchange of ideas aimed at advancing the quality of undergraduate education regardless of the field of study. Although it is recognized that the complexity of the Purdue model may be too complicated to be adopted in its entirety (as a "whole"), it is believed that there are many aspects of the model that other institutions can study and potentially benefit from.

Key words: *construction management, undergraduate education, integrated curriculum*

SINIŠA DJUROVIĆ

Dr Siniša Djurović is an Associate Professor in Electrical Machines and Drives Systems in the Department of Electrical and Electronic Engineering at The University of Manchester, UK. He obtained his Dipl. Ing. degree in Electrical and Electronic Engineering from University of Montenegro in 2002 and his PhD degree from the University of Manchester Institute of Science and technology (UMIST), Manchester, 2007. His research interests are in the area of design, operation, modelling and condition monitoring of electric machines and drives, including the application of this technology in modern transportation and renewable power generation systems.

Dr Djurović was an investigator on a number of UK Engineering and Physical Sciences Research Council (EPSRC) and industry funded projects in the power sector, where most recently he lead

the Sensing and Condition Monitoring Theme within the multi million pound EPSRC HOME-Offshore consortium, the Offshore Renewable Catapult Energy Infrastructure funded project on monitoring power electronic switches for offshore applications, and is an investigator on a UK National Grid funded project on monitoring of High Voltage overhead line insulators. His work also includes a range of industrially engaged research, such as that on novel sensing techniques for rotating machinery performance and integrity monitoring (QPS Photonics, Canada), condition monitoring of electric drives (Airbus, UK) and fibre optic monitoring systems application (Dyson, UK).

Dr Djurović is an Associate Editor of IEEE Transactions on Energy Conversion, IEEE Access and the IET Electric Power Applications, and a Fellow of the UK Higher



Education Academy. He lead the Energy Systems and the Electric Machines themes on the organising committee of the IET Power Electronics, Machines and Drives Conference, the flagship IET event in the UK power community. He has published more than 100 articles in leading peer reviewed international journals and conferences.

POWER AND ENERGY CHALLENGES — TECHNOLOGICAL OUTLOOK

Abstract

The talk will use the UK as an example to present an overview of the key challenges and possible solutions for the growing needs of the power and energy sectors. The UK has one the most ambitious global targets in this area and seeks to decarbonise the electricity sector by 2035, along with addressing the multitude of the underlying technological ques

Biografije i apstrakti

BRATISLAV E. STIPANIĆ

Bratislav Stipanić, Faculty of Civil Engineering, University of Belgrade; PBU Novi Sad, Serbia

Born in 1949 in Kotor (Montenegro). On Belgrade University—Faculty of Civil Engineering got 1974 Bachelor degree (structures), 1981 Master of science degree and 2005 PhD degree. From 1974 till 2014 was employed on the Faculty of Civil Engineering in Belgrade, giving lectures on the subjects Metal Structures and Bridges, afterwards was employed on State University in Novi Pazar (Serbia) as professor for Metal Structures and Metal Bridges (2014/15 — 2017/18). He gave lectures on Metal Bridges on Civil Engineering Faculty in Priština (Serbia, Kosovo) (1992/93 — 1998/99). From 2019 has been employed in Project Biro UTIBER Novi Sad.

He is co-author of manuals Metal Bridges and Metal Structures in Civil Engineering, published in several editions. Scientific research and professional works have been dedicated to the analysis of steel structures and bridges. He took part in the realization of several scientific-research projects. He published in English (60) and in Serbian (70) scientific and professional papers in the international and domestic engineering journals and proceedings

from international and domestic conferences.

His professional work has been related to the fields of design of bridge structures; as well in making studies, expertise, consulting in projects; particularly professional supervisions of large bridge constructions: Bridge Solidarity across Vistula River in Plock PL (2002–2005), Bridge on Ada in Belgrade including approaches (2007–2013), Bridge Ostružnica across Sava River at Belgrade (2017-), Bridge across Sava River at Sremska Rača (2020-), bridges for speed railway line Belgrade-Subotica — sections Staro Pazova-Novi Sad-Vrbas (2020-) and others.

As co-author & co-designer B. Stipanić was awarded by first prize on open international competition for design of bridge across Vistula river in Poland (1998). The bridge has the longest span in Poland and as well in its category (375m). It was finalized in 2005, by B. Stipanić managing in all stages of design and during the design supervision of works. As the co-author he was awarded by third prize on open international competition for the choice of location and pass across the Bay of Kotor (1999). As the co-author he was awarded by first/second prize on open international



competition for the widened general design of bridge across the Danube at Beška on the left downstream E-75 highway lane Novi Sad — Belgrade (2002). As the author he was awarded by third prize on the open international competition for concept design of footway-cycle bridge across Ibar River in Kraljevo (2006).

B. Stipanić is the chairman of IABSE National Group Serbia and member of Permanent Committee of IABSE (International Association for Bridge & Structural Engineering). He is member of Scientific Committee of the Conferences Bridges on the Danube.

ADVANCES IN BRIDGE ENGINEERING

Abstract

The paper treats overall aspects of advances in bridge engineering, affected by rapid development of natural sciences and technical innovations in design & structural analysis (static and dynamic due to wind & earthquake), building materials (high-strength & high-performed concrete, high-strength steel) and construction technology (building procedures, prefabrication, robustness). Consequently, advancements have not been only made in improved realizations of classical structural types (beam, frame, truss, arch & suspension bridges), but furthermore in application of innovative structural types as: integral bridges, cable-stayed and extradosed bridges. Nowadays the Building Information Modeling (BIM) is referred to as a process that connects engineers (involved in bridge design, construction, supervision & management) very efficiently in the various stages of construction.

The prestressed concrete bridges, steel bridges (with orthotropic deck) and steel-concrete composite bridges are dominantly applied nowadays. The number of bridges with super-long (over 500m) and ultra-long spans (over 1000m) has been largely increased in this century. The tables of longest spans for arch, cable-stayed and suspension bridges are given in the paper.

As the particular new bridge achievements, built in ex-YU region, are noted in the paper: Roadway Cable-Stayed Bridge Ada in Belgrade (2011), Roadway-Railway Arch Bridge in Novi Sad

(2018), Highway Beam-Frame Bridge Moračica at Podgorica (2022) and Roadway Multy-Span Cable-Stayed Bridge Pelješac (2022).

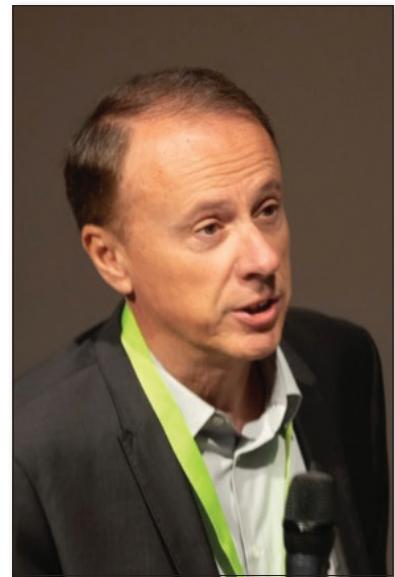
The Cable-Stayed Bridge Solidarity in Plock (2007), with 375m span (the longest one where pylons are fixed to girder and the longest bridge span in Poland), was designed by the paper author, as the co-author. The paper author's scientific works are the contributions to analysis of cable-stayed and box beam bridges.

Biografije i apstrakti

VLADAN ĐOKIĆ

Vladan Djokić studied at the University of Belgrade, Faculty of Architecture, finished his master's at the University of Southern California, School of Architecture in Los Angeles, and PhD at the University of Belgrade, Faculty of Architecture. He was visiting Professor at the Faculty of Architecture and Civil Engineering in Banja Luka, Faculty of Architecture in Podgorica and Faculty of Architecture in Skopje. He exhibited at 10th International Architecture Exhibition, Venice Biennial, 2006. Recent international Publication: Peter Eisenman in Dialogue with Architects and Philosophers, 2018. Recent expert activity: Lead Researcher Advisor for UNDP project Creative Montenegro — Economic Valorization and

Creative Industries, 2020. Editor-In-Chief of the international scientific journal of architecture and urbanism Serbian Architectural Journal since 2009. President of the Serbian Network of Urban Morphology, since 2017. Member of the Executive Committee of the European Council of Spatial Planners since 2017. Dean at the University of Belgrade, Faculty of Architecture until 2021. Rector of the University of Belgrade from 2021. In the teaching activity, he lectures a number of courses at AFUB which relate to the field of urban planning and design, and urban morphology. In scientific and research activity he works in the field related to urban planning and design and urban morphology.



ADVANCES IN URBANISM

Abstract

This paper aims to provide an experience-based overview of current advances in urbanism, with a specific focus on the higher education sphere impacted by numerous challenges. On the one side, international projects provide the framework for fostering a connection between research and education, and on the other hand, demonstrate the importance of acquiring sources of funding for the realization of research activities that are very relevant and interesting in the context of "small countries"). In this sense, the following four projects would be presented: 1. HERsus — an example of a strategic partnership, focused on intellectual results and activities, 2. ECObuilt — an example of a project that correlates research in the early phase of the conception of new study programs, 3. RMB — an example of a joint master's program project and its influence on the reformulation of the national accreditation framework, and 4. Circle U. — project focused on building a European University by co-creating knowledge and solutions across disciplines. In addition, in the thematic sense, all four projects illustrate current topics in the field of advances in urbanism: from the relationship between sustainability and heritage (HERsus), to ecological and environmentally sensitive approaches (ECOBUILT), reuse of existing building stock and re-use, rehabilitation, reconstruction, (RMB), and public health, wellbeing (CIRCLE U.).

BRANISLAV MITROVIĆ

He graduated from AF in Belgrade. Employed in RO Srbijaprojekt 1977–86, and then in CIP 1986–90. In addition to his exceptional creative work, he makes his contribution through his engagement at the AF in Belgrade 1990–2014. Founder of arch. Bureau MItarh (2006). He is a member of

SANU (correspondence 2006, regular 2012) and AINS. He has done over 150 competitions and won more than 100 awards. Prof. Mitrović is the author of about 40 completed objects. He has won 40 professional and social awards. He was elected the first prof. Emeritus AF in Belgrade 2015.



FROM DRY-WALL TO MODERN FORM: THE MORPHOLOGICAL ROLE OF THE WALL IN THE MONTENEGRO COASTAL AND MOUNTAIN LANDSCAPES

Abstract

This study examines the morphological conditions for contemporary architecture in the natural-historical context of the Montenegrin coastal-mountain landscape. The research includes topics that range from the analysis of the meaning of the original dry-wall structure and primary terraced construction in order to achieve arable land, as well as from authentic gathering places in inaccessible areas, to contemporary architectural solutions that contain metamorphoses of the wall as a response to the originality of the expanding landscape.

The design position is presented on the basis of three case studies: 1) Light and shadow — the artistic value of the contrast: *Royal Gardens Paradise*, Budva, 2) Transformation of the structure in the historical context: *Hotel Kamenovo* and 3) Open form of upgrade: *Helidrom / Gumno / Bi-stijerna*, Markovina near Cetinje. In addition to the responsibility according to the programmatic requirements of the new content, the presented role of the designer is aimed at preserving the inherited spatial values. The study aims to show how the articulation of these values, which gives new forms a deeper meaning and shows their true potential, can become an individual task and a challenge for an architectural investment in space that represents much more than a consistent response to utilitarian aspects.

In the case studies, the originality of buildings is highlighted, which through the interpretation of primary forms acquire a wider value as cultural, spatial and urban signifiers. Objects are interpreted as relational contents of the environment that achieve their own identity through exchange. The thematic context of the analysis, which in a broader sense represents the phenomenology of walls, is determined on the one hand by researching the metaphorical meanings of primary forms, and on the other by the technical experiences of the construction process.

Key words: *dry-wall, wall, space, light-shadow, historical context, form, superstructure*

INŽENJERSKE NAUKE II / ENGINEERING SCIENCES II (7)

ZHILBERT TAFA

Zhilbert Tafa is currently a Professor with the School of Computer Science and Engineering, University for Business and Technology in Kosovo and also collaborates with the Indiana University, Bloomington, USA. He obtained his PhD in Computer Engineering and Information Theory from Belgrade University, Serbia; and both BS and the MS degrees in Electrical and Computer Engineering from the University of Montenegro. He has published a number of papers and articles in indexed peer-reviewed

conferences and journals. As a member of renowned scientific journals and conference boards, over the past years, professor Tafa has also been contributing as a reviewer of scientific papers, including a number of IEEE magazines and conferences. He has received the most cited paper award from IEEE MECO conference, 2017. His current research interests include networking protocols, wireless sensor networks, IoT, and machine learning.



AIR POLLUTION MONITORING AND MANAGEMENT USING WIRELESS TECHNOLOGIES

Abstract

Air pollution (AP) is one of the main causes of lung cancer and stroke. It has also been correlated with cardiac, ophthalmologic, psychiatric, and many other diseases. In order to minimize the negative health impacts, AP should be properly monitored and managed. Conventional systems are expensive and sparsely deployed, hence cannot provide the required spatiotemporal resolution. This paper reviews the emerging (wireless) technologies for real-time AP monitoring. The implementation of machine learning (ML) in AP monitoring and management is also considered.

ILIR ÇAPUNI

Ilir Çapuni obtained his PhD in computer science from Boston University in 2012.

His research interests include reliable computation and algorithmic aspects of computer networks. He constructed a Turing machine that can compute reliably even in the presence of noise with moderate slow down and increase in space. He also devised a method to synchronize computer clocks by analyzing

time information embedded in HLS video packets.

He is one of the founders and a Steering Committee member of the Balkan Communications conference.

He is chairing the Department of Computer Science at Barleti University in Tirana and is consulting for an international technological company.



A RELIABLE TURING MACHINE — A DIGEST

Abstract

Reliability of computation concerns itself with the computation using a computing machine that is subjected to some noise. In this paper we survey the key elements of the construction of a reliable Turing machine which, with some moderate overhead, can perform arbitrarily large computations even when its operation is subjected to noise.

Since the construction is surprisingly complex, the outline presented here is suitable as an introduction for those who want to go to the depths of the construction and a substitute for those who want to get a low resolution picture of the construction with enough details to understand the core principles of it.

Biografije i apstrakti

NIKOLA MIŠKOVIĆ

Nikola Mišković is a Full Professor at University of Zagreb, Faculty of Electrical Engineering and Computing where he teaches control engineering related courses.

He is the Head of Laboratory for Underwater Systems and Technologies (LABUST, <https://labust.fer.hr/>). He is currently a coordinator of one Horizon Europe project. He participated in 15 European projects (Horizon Europe, H2020, FP7, DG-ECHO, INTERREG) out of which he coordinated FP7 CADDY, focusing on the development of the first underwater robot for interaction with divers; H2020 aPad, devoted to commercialization of an autonomous surface vehicles developed in LABUST, and H2020 EXCELLABUST devoted to increasing

LABUST excellence in marine robotics. He also participated in 4 Office of Naval Research Global (ONR-G) projects (coordinated 3), 2 NATO projects, and 7 national projects (coordinated 3). He published more than 70 papers in journals and conference proceedings in the area of navigation, guidance, and control, as well as cooperative control in marine robotics.

In 2020 Prof. Nikola Mišković was awarded IEEE Croatia Section Award for Outstanding Engineering Contribution for exceptional engineering contribution in the field of marine robotics, particularly innovative underwater robotic systems and autonomous surface vehicles. He received the annual State science award for 2015, awarded



by the Croatian Parliament and in 2013 he received the young scientist award "Vera Johanides" of the Croatian Academy of Engineering (HATZ) for scientific achievements.

MARINE ROBOTICS FOR THE BLUE ECONOMY

Abstracts

About 70% of the Earth is covered with water, making it difficult to access for exploration. As a result, we know more about the surface of the Moon and Mars than we do about our own planet. Even the Adriatic Sea, with a maximum depth of about 1200 meters, is still completely unexplored. The underwater environment is harsh and under the constant influence of disturbances such as sea currents, winds and waves. Nevertheless, the oceans and seas are home to a multitude of species, many of which have yet to be discovered, and a great source of resources that humanity desperately needs.

The EU Blue Economy Report is an annual publication that analyzes the scope and size of the Blue Economy in the European Union. According to the document, the traditional sectors of the Blue Economy (such as marine living and non-living resources, marine renewable energy, port activities, shipbuilding, maritime transport and coastal tourism) contribute to about 1.5% of the EU-27 GDP and provide about 4.5 million direct jobs, i. e. 2.3% of EU-27 total employment, which underlines their importance. The countries around the Adriatic Sea are highly dependent on the marine environment and maritime transport. For example, the Croatian coastal zone takes up almost 20% of the country's surface area, blue economy contributes by 8.2% to the gross value added and 9.8% to the jobs in the national economy.

However, the marine environment is becoming increasingly vulnerable to the impacts of economic activities, which are becoming more intense and leaving a larger and larger environmental footprint through blue sector industries. Innovative maritime technologies have the potential to reduce the environmental footprint while promoting sustainable economic growth in blue economy sectors.

The Laboratory for Underwater Systems and Technologies (LABUST) at the University of Zagreb Faculty of Electrical Engineering and Computing is a regional leader in the field of marine robotics. It successfully combines researchers, technologies, infrastructure and experience with field trials, contributing to the development of the EU Blue Economy. LABUST has been a partner in 15 international and 23 national projects.

This talk will focus on some of the ongoing research projects in different application areas. The focus will be on human-robot interaction, aiming to improve the teaming capabilities between human divers and their robotic diving counterparts to create a synergy as a potential solution for many challenging diving tasks. In addition, a systematic solution for the coordination

and cooperation of smart heterogeneous robots in the air, on land, and at sea capable of autonomously collaborating and distributing tasks in open, unstructured space/waters, with emphasis on aquaculture, will be described. A system for Underwater Internet of Things consisting of static buoys, dynamic surface marine vehicles, and underwater sensor nodes performing environmental monitoring and providing real-time access, enabling pollution detection and water quality monitoring will be described. Finally, an innovative artificial intelligence method applied to autonomous navigation and situational awareness for an unmanned ship will be described.

Biografije i apstrakti

KAROLJ SKALA

Institut Ruđer Bošković, Zagreb, HR, Centre for informatics and computing

Member of Hungarian Academy of Science

Member of Croatian Academy of Technical Sciences

Academician Karolj Skala (born 1951 in Subotica) is a scientific advisor and full professor in a permanent position. He is the founder of the Centre for Informatics and Computing at the Ruđer Bošković Institute. Since 1989 he has been teaching at the University of Zagreb, at the postgraduate programmes of the Faculty of Electrical Engineering and Computer Science and at the Faculty of Graphics in Zagreb. His research interests are optoelectronics, laser technology, scientific visualisation, distributed computing, eScience (ICST) and Data Science applications. He developed a large number of complex optoelectronic and laser devices for military

use according to military standards. He gained great influence in the market through research and development of specialised equipment. He was include and lead in the development of the scientific infrastructure: IRB Campus Network, initiator and co-leader of the CRO GID project, SEE GRID national node, establishment of the EGEE node, EU EGI grid infrastructure, eScience EOSC Hub Services, Euro Centre of Competence, RBI DIH, EBSI node at IRB and establishment of the national blockchain service infrastructure. He coordinates the work of the Centre of Scientific Excellence — Data Science. He is the head of the IEEE DewCom STC. He is developing the Dew Computing paradigm within the Dew-Fog-Cloud distributed service hierarchy. Chair of the MIPRO programme committee. National coordinator of 4 COST projects. Collaborator in five EU FP6, six EU



FP7 and ten EU Horizon 2020 projects. He is a member of the Hungarian Academy of Sciences and the Croatian Academy of Technical Sciences. He was the winner of the Annual Science Award of the Hungarian Academy of Sciences in 2015. In 2016, he was awarded the Croatian State Prize for Science. In 2022, he was awarded the Power of Knowledge Lifetime Achievement Award.

A GLOBAL DISTRIBUTED SERVICE SYSTEM FOR NEW INDUSTRIAL REVOLUTION AND SOCIAL DEVELOPMENT

Abstract

Most of the information processing around us takes place at the lowest possible computer level, which is directly connected to the physical environment and mostly directly controls our immediate human environment. We find these “invisible” information processing devices in home entertainment systems, in traffic control systems, in industry and industrial products. These devices, which are neither in the cloud nor at the mobile edge, but at the physical edge of computing, form the basis of the *Dew Computing* paradigm. The benefits of seamlessly integrating devices into the Cloud — Fog — Dew Computing hierarchy are enormous, for individuals, the public and industrial sectors, the scientific community and the commercial sector, by enhancing the physical and communicative, as well as the intellectual, immediate human environment. It is therefore imperative to explore the possibilities of Dew Computing through research, innovation and development, to solve the fundamental problems of integrating the Dew Fog Cloud hierarchy, with particular attention to the need for information processing (and not just data) and communication, and to demonstrate the feasibility and high effectiveness of the developed architecture in various areas of human endeavour through real-world implementations.

Dew computing differs from classical cloud and edge computing in that it brings devices closer to the end user and enables autonomous processing independent of the Internet, but is still able to interact with other devices to exchange information over the Internet. The difference is also expressed in terms of scalability, as edge and cloud providers can provision (almost endless) resources, whereas scalability in dew computing has to be realised at the device level rather than at the server level. Such devices can be ubiquitous and pervasive devices in our environment, embedded processors, cyber-physical systems or other IoT devices.

The rapid development of IoT and mobile devices without and with internet connectivity is the most common application area. The trend is for the most important information processing

around us to be at the lowest possible level, directly connected to the physical environment and mostly directly controlling our immediate human environment. These devices, which are not at the cloud or fog edge, nor at the mobile edge, are the basis of the dew computing paradigm.

In the distributed cloud dew service architecture, a cloud server and many dew servers work together as a distributed application to provide controls or services.

Multiple clouds in symbiosis result in a cloud federation that connects the cloud service environments. Federated cloud services provide global *Rainbow services* based on the Dew server connecting directly to a user.

Biografije i apstrakti

VELJKO MILUTINOVIC

Prof. Veljko Milutinovic (1951) received his PhD from the University of Belgrade in Serbia, spent about a decade on various faculty positions in the USA (mostly at Purdue University and more recently at the University of Indiana in Bloomington), and was a co-designer of the DARPA's pioneering GaAs RISC microprocessor on 200MHz (about a decade before the first commercial effort on that same speed) and was a co-designer also of the related DARPA GaAs Systolic Array (with 4096 GaAs microprocessors). Later, for almost three decades, he taught and conducted research at the University of Belgrade in Serbia, for departments of EE, MATH, BA, and PHYS/CHEM. His research is mostly in datamining algorithms and dataflow computing, with the emphasis on mapping of data analytics algorithms onto fast energy

efficient architectures. Most of his research was done in cooperation with industry (Intel, Fairchild, Honeywell, Maxeler, HP, IBM, NCR, RCA, etc...). For 10 of his books, forewords were written by 10 different Nobel Laureates with whom he cooperated on his past industry sponsored projects. He published 40 books (mostly in the USA), he has over 100 papers in SCI journals (mostly in IEEE and ACM journals), and he presented invited talks at over 400 destinations worldwide. He has about 2000 Thomson-Reuters WoS citations, about 2000 Elsevier SCOPUS citations, and about 5000 Google Scholar citations. His Google Scholar h index is equal to 40.

He is a Life Fellow of the IEEE since 2003 and a Member of The Academy of Europe since 2011. He is a member of the Serbian National



Academy of Engineering since 1999, and a Foreign Member of the Montenegrin Academy of Sciences and Arts since 2018.

SYNERGISING FOUR DIFFERENT COMPUTING PARADIGMS FOR MACHINE LEARNING

Abstract

This article presents and analyzes four computing paradigms that are present in today's world of IT programming — Control Flow, Data Flow, Diffusion Flow and Energy Flow. It compares their main features, indicates the purpose of each of them and describes what their advantages and disadvantages are. In the third part of this article, the authors speculate about the possible architecture of a supercomputer on a chip, and in the fourth, they propose the optimal distribution of resources for a certain set of applications in civil engineering.

VESNA BENGIN

BioSens Institute, University of Novi Sad

Zorana Đindjića 1, Novi Sad, Serbia

Web: www.biosense.rs

Prof. Vesna Bengin is the co-founder of the BioSense Institute and the coordinator of H2020 project ANTARES, which, with a budget of € 30 million, aims to evolve BioSense Institute into a market-oriented European Centre of research excellence. Besides developing institutional scientific excellence, Prof. Bengin also directly focuses on fostering the economic growth of the region, through specifically designed activities involving the national and regional agrifood and IT sectors, as well as on the development of the national policies in the field of research and innovation.

Prof. Bengin is a scientific advisor at BioSense, a full professor at the Depart. of Physics, University of Novi Sad and an *Extraordinary Professor* at Stellenbosch University in South Africa. She also serves as a member of UNICEF Business Advisory Board in Serbia, a consultant for UN FAO, a consultant for UNDP, and a member of the Management Board of BioSense. She has also served as the member of the Management Board of the Innovation Fund of Serbia, an evaluator of the entire COST programme COST in H2020 and HE, as well as a member of many European and international professional bodies.

Prof. Bengin is the recipient of a number of national and international awards including the special award granted by the European Commission at 'Marie Curie



Actions for an Innovative Europe: Excellence, mobility and skills for researchers, the award for outstanding women in science and technology *She's Mercedes* awarded by the Mercedes-Benz company, and many more.

She is a mother of three.

THE MISSION OF THE BIOSENSE INSTITUTE: NEW TECHNOLOGIES IN AGRICULTURE

Abstract

Agriculture is facing enormous challenges. Not only does it have to provide enough safe food for the growing population, it also needs to leave a minimal environmental footprint and combat climate change. The available natural resources are limited and the conventional agricultural technologies do not provide sufficient means to address these challenges.

On the other hand, a number of key enabling technologies have matured in the recent decade, including nano and microelectronics, material science, remote sensing, communications, and artificial intelligence. However, although some of these technologies have already created a significant impact in various aspects of human life and wellbeing, they have not yet delivered their full impetus to the agrifood sector.

Agriculture needs to be optimized. More (higher quality) yields need to be produced with less inputs (water, fertilizers, labor, energy...) and with less risks (related to weather, pests, market conditions...). However, agriculture is a very complex biosystem, and its optimization presents a significant challenge as it requires full understanding of all underlying processes and their correlations. The first step in this process is to develop and deploy various sensors that will provide as much information as possible about the plant itself, the soil, atmospheric and meteorological conditions.

However, large amounts of sensing data *per se* do not offer necessary insights into complex processes in agriculture. To discover underlying interdependencies and to create actionable information from sensing data, multisensor data fusion, feature engineering, deep learning and big data analytics need to be deployed. As a result, sufficiently large sets of reliable data combined with AI algorithms have already proven their potential in optimizing agriculture.

Key words: *digital transformation, sensing technologies, artificial intelligence, agriculture*

Biografije i apstrakti

MIRJANA KRANJAC

Mirjana V. Kranjac je rođena u Novom Sadu, 1959. godine.

1982. godine završila je studije na Fakultetu tehničkih nauka u Novom Sadu, Elektrotehnički odsek, smer: elektronika. Magistarsku tezu odbranila je u Centru za multidisciplinarnе studije Univerziteta u Beogradu 1994. godine i time stekla zvanje: Magistar kliničkog inženjerstva. MBA studije je završila 2010. godine na Fakultetu tehničkih nauka u Novom Sadu i United Business Institutes, Brisel na smeru Prenuduzetna inteligencija i menadžment projekata, kao student generacije i time stekla zvanje: MBA Magistar poslovnog menadžmenta. Doktorsku disertaciju odbranila je na Fakultetu tehničkih nauka u Novom Sadu 2010. godine i time stekla zvanje: Doktor tehničkih nauka.

Profesionalne aktivnosti i radno iskustvo dr Mirjane Kranjac su:

Od 1982. do 1987. godine zaposlena je u "ŽTP Vojvodina", Novi Sad, a od 1987. do 2010. godine radi u JPP "Srbija" i „Telekom Srbija" zadužena za izradu strateških planova za regiju Vojvodine.

Od 2010. do 2012. godine je predavač (strategijski menadžment, upravljanje projektima, teorija sistema) na Evropskom univerzitetu u Beogradu, u zvanju docenta, od 2012. do 2017. godine predaje na Fakultetu tehničkih nauka u Novom Sadu, predmete: Multimedijalne komunikacije i Geografski informacioni sistemi u saobraćaju. Od 2017. do 2020. godine je vanredni profesor na Fakultetu za inženjerski

menadžment u Beogradu, na predmetima: Upravljanje projektima EU, Geografski informacioni sistemi i Pametni gradovi.

Od 2012. radi u Sekretarijatu za privredu Vlade Vojvodine na pozicijama pomoćnika Sekretara zadužena za preduzetništvo i zapošljavanje i načelnice za industriju i elektronske komunikacije.

Učesnik je timova koji su izradi li Regionalnu strategiju smart specijalizacije AP Vojvodine za period 2015–2020, Regionalni prostorni plan Vojvodine, Strategiju razvoja vodnog saobraćaja Srbije 2015–2020, Program razvoja Vojvodine za period 2015–2020 i 2022–2030, Strategiju razvoja širokopojasnih telekomunikacija za AP Vojvodinu, Detaljnu studiju i strategiju razvoja za logističke centre u AP Vojvodini, Analizu tokova roba AP Vojvodine.

Bila je član nacionalnog tima koji radi na izradi strategije smart specijalizacije u istraživanju i inovacijama Republike Srbije.

Savetnik je Klastera za transport i logistiku Vojvodine, Klastera za ekološku kulturu -Ecopanonia, Klastera za organsku proizvodnju Vojvodine.

Generalni sekretar je Dunavskog biznis foruma i konferencije Konkurentnost i održivi razvoj KOR.

Aktivan je član Inženjerske komore Srbije i predavač na njenim skupovima. Poseduje licence za projektovanje i izvođenje radova iz oblasti elektrotehnike.

Izabrana je za evaluatora projekata za IPA CBC i Adriatik program



Evropske unije. Učestvovala je u pravljenju aplikacija i realizaciji više desetina projekata koje je finansirala Evropska unija, iz programa: IPA, COSME, Interreg, HORIZON, Creative Europe, Europe for Citizens.

Recenzent je istaknutog međunarodnog naučnog časopisa "Ekonomika", ISSN 1392–1258, koji izdaje Vilnius univerzitet iz Litvanije. Objavila je preko 60 radova u domaćim i prestižnim međunarodnim časopisima.

Koautor je knjige The evaluation and implementation of a smart specialization strategy (2022, Cambridge Scholars).

Završila je specijalizacije u Francuskoj (Alcatel), Danskoj (Commscope), Belgiji (Cisco), Americi (Harmonic), Portugaliji (Faro) i Italiji (Aquila).

Dobitnik je nagrade Kapetan Miša Anastasijević za povezivanje nauke, privrede i državne administracije.

Pored srpskog, tečno govori engleski i nemački jezik, a služi se francuskim jezikom.

Majka je dvoje dece.

SMART SPECIALIZATION STRATEGY IN SERBIA

Abstract

Serbia created its own Smart Specialization Strategy (S4) for the period from 2020 to 2027. This document is the basis for the development of the research and innovation sector in European countries and regions. It is based on the division of these activities according to the specificities of the regions and taking into account their comparative advantages. Regional niches of research activities are being created that tend not to overlap. This optimizes the life cycle of knowledge and innovation, giving greater added value to the European space as a whole. After creating such a strategy, it is necessary to promote it to all interested parties. The implementation of the document must be continuously monitored, it should be corrected and improved and involve as many actors as possible. Is it like that in Serbia? The authors indicate that this document is not sufficiently visible, as well as many similar documents. Neither its value nor the possibility

of application when applying for financial resources of the European Union was recognized. The paper gives recommendations on how to improve the life cycle of S4 in order to have significant effects for the development of the Serbian innovation ecosystem. One of the ways of further development of S4 can be the creation of a cross-border smart specialization strategy between Montenegro and Serbia in order to see good ways of cooperation between the two countries in the field of innovation, research, and development. The authors identify areas and ways of co-operation between the two countries.

Key words: *smart specialization, cross-border smart specialization, innovation, research, development*

Biografije i apstrakti

INFORMATIČKE NAUKE / INFORMATIONAL SCIENCES (7)

ONUR MUTLU

Onur Mutlu is a Professor of Computer Science at ETH Zurich. He is also a faculty member at Carnegie Mellon University, where he previously held the Strecker Early Career Professorship. His current broader research interests are in computer architecture, systems, hardware security, and bioinformatics. A variety of techniques he, along with his group and collaborators, has invented over the years have influenced industry and have been employed in commercial microprocessors and memory/storage systems. He obtained his PhD and MS in ECE from the University of Texas at Austin and BS degrees in Computer Engineering and Psychology from the University of Michigan, Ann Arbor. He started the Computer Architecture Group at Microsoft Research (2006-2009), and held various product and research positions at

Intel Corporation, Advanced Micro Devices, VMware, and Google. He received the IEEE Computer Society Edward J. McCluskey Technical Achievement Award, the ACM SIGARCH Maurice Wilkes Award, the inaugural IEEE Computer Society Young Computer Architect Award, the inaugural Intel Early Career Faculty Award, US National Science Foundation CAREER Award, Carnegie Mellon University Ladd Research Award, faculty partnership awards from various companies, and a healthy number of best paper or "Top Pick" paper recognitions at various computer systems, architecture, and hardware security venues. He is an ACM Fellow "for contributions to computer architecture research, especially in memory systems", IEEE Fellow for "contributions to computer architecture research and practice", and an elected member



of the Academy of Europe (Academia Europaea). His computer architecture and digital logic design course lectures and materials are freely available on YouTube, and his research group makes a wide variety of software and hardware artifacts freely available online. For more information, please see his webpage at <https://people.inf.ethz.ch/omutlu/>.

MIODRAG GRBIĆ

Miodrag (Mike) Grbić is an associate professor at the University of Western Ontario (Canada) leading the Arthropod and agricultural genomic program. Dr. Grbić obtained his Undergraduate and Masters's degree in Entomology from the University of Novi Sad (Yugoslavia/Serbia). As a Fulbright fellow, he completed his Ph. D. degree at the University of Wisconsin-Madison, USA majoring in Developmental Biology and Entomology. Following a postdoctoral degree at the University of Cambridge, UK (Wellcome Trust Institute) as Human Frontier in Science postdoctoral fellow, he established his laboratory at the University of Western Ontario. Dr. Grbić led the team that sequenced the first chelicerate genome, the genome of the two-spotted spider mite *Tetranychus urticae*

(funded by DOE/JGI), a major agricultural pest and currently his group is studying plant-pest interactions and application of genomics approaches in agriculture and pest control (work funded by Genome Canada, OGI, ORF) <http://www.spidermite.org/gapm/>. Dr. Grbić is the recipient of the Premier's Research Excellence Award (Ministry of Energy, Science and Technology of Ontario, Canada), Marie Curie Incoming International Fellowship (EU), serves as section editor of the journal Arthropod Structure and Development, and is one of the founders of biotech company Nanomitech <http://www.nanomitech.com>.

Selected publications:

Miodrag Grbić et al. (2011) The genome of *Tetranychus urticae* reveals herbivorous pest adaptations. **Nature** Vol. 479: 487- 492.



Zhurov, V., Terzin, T. and Grbic, M. (2004) Early blastomere determines embryo proliferation and caste fate in a polyembryonic wasp. **Nature** 432:746–769.

Grbic, M, Ode, P., Strand, M. R. (1992) Sibling rivalry and brood sex ratio in polyembryonic wasps. **Nature**, Vol. 360, 254–256.

GENOMICS AND GENETIC DIVERSITY

Abstract

In my presentation, we will broadly address the application of genomic technologies in assessing biological diversity, including various organisms ranging from Chelicerates, viruses, humans and plants. I will focus on the development of these approaches in the development of new bio-nano materials, tools for the determination of non-mutable regions of the pathogen genome, human population origin, and grapevine evolution.

Biografije i apstrakti

NENAD FILIPOVIĆ

Nenad D. Filipovic is Rector of University of Kragujevac, Serbia, full Professor at Faculty of Engineering and Head of Center for Bioengineering at University of Kragujevac, Serbia. He was Research Associate at Harvard School of Public Health in Boston, US. His research interests are in the area of computational mechanics, biomedical engineering, cardiovascular disease, fluid-structure interaction, biomechanics, bioinformatics, biomedical image processing, machine learning, medical informatics, multi-scale modeling, software engineering, parallel computing, computational chemistry and bioprocess modeling. He is author and co-author 11 textbooks and 9 monographies, over 400 publications in peer review journals and over 10 software

for modeling with finite element method and discrete methods from fluid mechanics and multi-physics. He also leads a number of national and international projects in EU and US in area of bioengineering, artificial intelligence and software development.

He is Director of Center for Bioengineering at University of Kragujevac and leads joint research projects with Harvard University and University of Texas in area of bio-nano-medicine computer simulation. He also leads a number of national and international projects in area of bioengineering and bioinformatics. He is Editor in Chief for EAI Endorsed Transaction on Bioengineering and Bioinformatics, Managing Editor for Journal of Serbian Society for Computational Mechanics, President of Serbian



Society of Mechanics and member of European Society of Biomechanics (ESB), European Society for Artificial Organs (ESAO) and IEEE member.

Affiliation: Faculty of Engineering, University of Kragujevac, Sestre Janjica 6, 34000 Kragujevac, Serbia

DIGITALIZATION AND HEALTH

Abstract

Computer simulations and Artificial Intelligence (AI) are used to design and safely test new products in virtual patients. In silico clinical trial represents a new paradigm for development of new drug and medical device.

In number of in silico projects researchers are using multiscale modeling and AI which take into consideration comprehensive list of patient specific features (genetic, biological, pharmacologic, clinical, imaging and patient specific cellular aspects) capable of optimizing and testing medical treatment strategy with the purpose of maximizing positive therapeutic outcome, avoiding adverse effects, avoiding drug interactions, preventing sudden death, shortening time between the drug treatment commencement and the desired result.

For example in cardiovascular disease we are developing the artificial intelligence (AI)-based, Decision Support System (DSS) for assessing and predicting the risk of cardiomyopathy, its early diagnosis and progression. It integrates 1) patient-specific data i. e. demographic, clinical, genetic, lifestyle and socio-economic, 2) an AI-based digital patient library and algorithms for risk stratification, early diagnosis, and disease progression, and 3) a highly innovative multifunctional AI-based and computational modelling DSS and mobile app for informing a patient-centred, personalised, prevention and treatment strategies.

We believe that in silico projects we will connect basic experimental research with clinical study and bioinformatics, data mining and image processing tools using very advanced computer models drug, medical devices, patient database and regulative in order to reduce animal and clinical studies.

Key words: *biomechanics, bioinformatics, machine learning, biomedical image processing, medical informatics, multi-scale modeling, software engineering*

MIROSLAV BOJOVIĆ

Prof. Dr Miroslav Bojović was born on July 10, 1957, and all his formal education, including the Ph. D. (1989) are from the Faculty of Electrical Engineering, University of Belgrade, Serbia. From 1980 till 1982 he was on the "Mihailo Pupin" Institute, Belgrade. Starting with 1982 he is on the Faculty of Electrical Engineering, University of Belgrade, where he teaches courses in Database Management Systems, Software Engineering of Large Scale Databases, Software Engineering and Fault Tolerant Computing. From 1988. till the end of 1989. he was on the faculty of Computer Science Department, UCLA, Los Angeles, USA. He became teaching assistant (1982) assistant professor (1991) associate professor (1999) and full professor (2017) at the University of Belgrade. He was Head of Computer Science Department from 2006–2012, Head of Software Engineering Department from 2012–2018, Head of Computer Engineering Department from 2018 till now.

Awards and invited talks: Special award for the exceptional software product in the SCG for year 2004.; *MobilePDR*, the project he led was awarded as the best

software product in the USA in the field of medical information system software for year 2004.; City of Belgrade award for the best PhD thesis for academic year 1988 — 89.; IREX grant, USA, 1988.; University of Belgrade November Award for exceptional studies, 1979.; University of Belgrade November Award for exceptional studies, 1980.; "Mihailo Petrović-Alas" special diploma award for results on the city of Belgrade, republic of Serbia and republic of Yugoslavia competition in mathematics, 1975; "Mihailo Petrović-Alas" and "Nikola Tesla" special diploma awards for results on the city of Belgrade, republic of Serbia and republic of Yugoslavia competition in mathematics and physics, 1971.; Presented more than 50 invited talks at the major USA universities and companies: UCLA (Los Angeles), Purdue (West Lafayette), Brown (Providence), McDonnell Douglas (Long Beach) i Boeing (Seattle), Medsite (New York), Medec (New York).

He published over 70 papers in SCI journals and conferences.

He was leader in more than 20 USA industry, EU and Serbian government sponsored projects, and participant in more than 30 projects.



He was project leader for *MobilePDR* product ordered from client Thompson, USA. It was considered as "pushing limits" product in the world in the category. It was awarded as one of two the best software product in the USA in the field of medical information system software for year 2004. It was referenced in more than 100 000 publications in the world. It was awarded as the exceptional software product in the Serbia and Montenegro for year 2004. The last version was implemented in 2010. Also, he was project leader of many projects for pharmaceutical industry, such as Pfizer, Aventis-Lantus.

He has more than 30 Technical Solutions accepted.

Miroslav Bojović, Veljko Milutinović

AIHEAL: AN ARTIFICIAL INTELLIGENCE HEALTHCARE SYSTEM

Abstract

AIHeal healthcare system is a new solution creating explainable and causal artificial intelligence (AI) infrastructure by combining the benefits of the accuracy of deep-learning algorithms with visibility on the factors that are important to the algorithm's conclusion in a way that is accessible to physicians, solution in which they can trust, which open new routes to delivering better, faster, and more cost-effective medical care. The proposed AIHeal system defines a new structure of Electronic Health Record (EHR) that can connect longitudinal data providing insights across episodes of treatment and settings of care, and incorporating new types of data from wearables, sensors and genomics and other omics data. Another innovative contribution of this project is an extensible big data architecture which makes it possible to collect huge volumes and wide spectrum of data.

Key words: Artificial Intelligence in Healthcare, Electronic Health Record, AI Clinical Decision Support

Biografije i apstrakti

JAKOB SALOM

Jakob Salom finished School of Electrical Engineering, University of Belgrade

Recent work experience:

Consultant: Mathematical Institute of the Serbian Academy of Sciences,

Manager: Electronic Banking Department, Hypo-Alpe-Adria Bank, Belgrade,

Deputy CEO: Informatika Ltd. Belgrade.

IT topics:

HPC computing on Maxeler high-performance DataFlow computers,

Data warehousing, data archiving and mining.

Financial sector topics:

Evaluation of a Smart Specialization Strategy,

Mind Genomics — data-driven marketing strategy,

Establishing E-banking at Hypo Alpe-Adria Bank,

Creating software for former Yugoslavia's domestic payment system,

Implementing the first e-banking in former Yugoslavia.

Implementation:

Tutoring students in HPC programming using Maxeler computers

Preparing, writing and organizing FP7 EU projects,

Preparing, writing and organizing Bilateral projects (projects between Serbia and other countries)

Implementing MindGenomics in marketing.

Author/co-author of four books.

Author/co-author of more than 20 peer-reviewed articles in journals and conference proceedings.

Published books:

— *Guide to DataFlow Supercomputing: Basic Concepts, Case Studies, and a Detailed Example*

V. Milutinovic, J. Salom, N. Trifunovic, R. Giorgi — 2015 — Springer

— *Mind Genomics: A Guide to Data-Driven Marketing Strategy*

V. Milutinovic, J. Salom — 2016 — Springer



— *DataFlow Supercomputing Essentials: Research, Development, and Education*

V. Milutinovic, J. Salom, D. Veljovic, N. Korolija, et al. — 2017 — Springer

— *The Evaluation and Implementation of a Smart Specialization Strategy*.

M. Kranjac, J. Salom — 2022 — Cambridge Scholars Publishing

DIGITALIZATION OF HERITAGE AND THE FORUM TECHNOLOGY

Abstract

Modern digital library systems face challenges related to data analytics, interoperability, access control and cooperation between institutions and users. This article presents work that has been done to add value to conventional digital library workflows in a next-generation library system. The article begins with a brief history of the Austria-Forum project and describes its creation and basic features. Then, the interactivity characteristics of large internet sites are analyzed and compared with the characteristics of the Austrian Forum. Namely, websites present information or services and they rarely allow users to provide feedback or ask questions. It is noted that the currently used approaches to user feedbacks almost exclusively belong to the category called "provider-initiated" and lack the highly desirable feedback capability called "user-driven". Finally, some examples of user-driven feedbacks are presented and the advanced features of the new NID (Net-Interactive Documents) system as part of the Austria-Forum are described.

MIODRAG MIHALJEVIĆ

Miodrag J. Mihaljević is currently a Research Professor and the Deputy Director with the Mathematical Institute, Serbian Academy of Sciences and Arts, Belgrade. His main research interests include cryptology, information security and blockchain technology. He has published more than 100 research articles in the leading international journals and conference proceedings and over 200 publications in total. He is co-inventor of eight granted patents in Japan, U. S., and China. He has participated in over ten international research projects. Since 1997, he has been holding long-term visiting positions at the universities and research institutes in Japan, including

The University of Tokyo, Sony Research Labs, the National Institute AIST, and Chuo University, Tokyo. Since 2014, he has been an Elected Member of the Academia Europaea. In 2013, he received the National Award of the Serbian Academy of Sciences and Arts for ten years achievements. In the years 2020 and 2021, Dr. Mihaljević is included in the ranked list colloquially known as "World's Top 2% Scientists by Stanford University" regarding his carrier achievements. He has been a Guest Editor of few journals. He is an Associate Editor of SN Computer Science (Springer). He is an Elected Member of the Serbian Academy of Sciences and Arts from 2021. For more



information, please visit <https://www.sanu.ac.rs/en/member/mihaljevic-miodrag/>

ILLUSTRATIVE ADVANCES IN CRYPTOLOGY AND BLOCKCHAIN TECHNOLOGY TECHNIQUES

Abstract

The aim of this talk is to provide an illustrative address on some open problems and some advanced techniques in the fields of information security and blocking technology. The domains of secrecy protection and reduction of energy consumption in permission-less blockchain systems are considered. The following is pointed out: (a) An approach to strengthening the cryptographic security of lightweight encryption employing error-correction coding, and (b) An approach that employs trade-off between necessary energy and memory resources in the Proof-of-Work (PoW) based blockchain consensus protocols.

Biografije i apstrakti

NENAD MEDVIDOVIĆ

Nenad Medvidović is a Professor and Chair in the Department of Computer Science at USC. He is currently serving as Editor-in-Chief of IEEE Transactions on Software Engineering. He has served as Chair of the ACM Special Interest Group on Software Engineering (SIGSOFT). Additionally, he has served as Chair of the Steering Committees for ICSE, the International Conference on Software Engineering, and FSE, the Symposium on the Foundations of Software Engineering. He has been the recipient of the Okawa Foundation Research

Grant (2005), the IBM Real-Time Innovation Award (2007), the USC Mellon Mentoring Award (2010), the OCEC Distinguished Engineering Merit Award (2018), and the ACM SIGSOFT Distinguished Service Award (2020). Two of his papers have been recognized as Most Influential Papers ("test of time" awards), by the ICSE 2008 and SEAMS 2020 conferences. His papers have also been recognized with several "Best Paper" and "Most Cited Paper" awards. Medvidović is an ACM Distinguished Scientist and an IEEE Fellow.



SOFTWARE ARCHIPELAGOS AS IMPEDIMENTS TO SCIENTIFIC PROGRESS

Abstracts

Islands of related software systems regularly emerge through a recurring multi-year evolution chain of the systems' underlying architectures. Such software archipelagos are especially prevalent in scientific-laboratory and academic settings, where proofs-of-concept are frequently developed to run experiments that tend not to generalize and then discarded after they fulfill their purpose (e. g., when the desired results are obtained, a paper is accepted for publication, or a doctoral dissertation is completed). However, there are cases when the resulting software grows into archipelagos of multi-purpose components, tools, frameworks, workbenches, and/or environments (e. g., when the developed capabilities are perceived by another scientist as a good foundation for their own research). These archipelagos possess unique characteristics and suffer from unique complications: due to the haphazard processes by which they emerge, they inherently accumulate technical debt. In turn, this directly hampers their transition to other research groups or to industrial usage, despite containing state-of-the-art technology. This talk will propose the archipelago model, explain how and why it tends to emerge in scientific-lab and academic-research settings, illustrate it with real-world examples, and discuss the lessons-learned in the process of both growing and trying to make use of others' archipelagos.

PRIMJERI DOBRE PRAKSE / EXAMPLES OF GOOD PRACTICE

JELENA LATINOVIĆ

Prof. dr Jelena Latinović rođena je u Podgorici, gdje je završila osnovnu školu i gimnaziju „Slobodan Škerović“. Diplomirala je na Poljoprivrednom fakultetu Univerziteta u Beogradu 1996. godine, sa prosečnom ocjenom tokom studija 9,62. Magistarsku tezu odbranila je 2001. godine, stekavši zvanje magistra biotehničkih nauka — oblast agronomskih nauka — fitopatologija, a doktorsku disertaciju odbranila je 2007. godine, takođe na Poljoprivrednom fakultetu Univerziteta u Beogradu, nakon čega je promovisana u doktora biotehničkih nauka — oblast zaštita bilja i prehrabrenih proizvoda.

Od decembra 1996. godine zaposlena je na Biotehničkom fakultetu (nekadašnjem institutu) u Podgorici, gdje i sada radi. Za redovnog profesora Univerziteta Crne Gore izabrana je 2021. godine. Usavršavanja iz zaštite bilja obavljala je u raznim naučnoistraživačkim ustanovama u inostranstvu: u septembru 2005. godine bila je na jednomjesečnom usavršavanju na Iowa State

University, USA, u martu 2006. godine na Univerzitetu Tuscia, Odsjeku za zaštitu bilja u Viterbu, Italija, u januaru 2012. godine boravila je u renomiranoj instituciji Fungal Biodiversity Centre (CBS) u Utrehtu, Hollandija radi proučavanja prouzrokača bolesti biljaka.

Otvorila je (sama ili kao koautor) u domaćim i stranim publikacijama i saopštenjima na naučnim skupovima preko 110 naučnih radova. Mnogi od njih su na SCI/SCIE listama časopisa (Plant Disease, Frontiers in Plant Science, Microorganisms, Journal of Plant Pathology, Phytopathologia Mediterranea, Crop Protection, Phytotaxa, The Plant Pathology Journal, Phytopathology, Botanica Serbica i dr.) ili prezentovani na brojnim međunarodnim i nacionalnim skupovima. Recenzirala je veći broj radova za međunarodne časopise „Plant Disease“, „Phytopathologia Mediterranea“, „Mycological Progress“, PLOS ONE, Physiological and Molecular Plant Pathology, Canadian Journal of Plant Pathology“ i dr. Član



je uredništva i recenzent časopisa "Poljoprivreda i šumarstvo" koga izdaje Biotehnički fakultet Univerziteta Crne Gore.

Učestvovala je u realizaciji raznih nacionalnih i međunarodnih projekata. Jedan je od autora patent-a čija je prijava preko Evropskog patentnog zavoda objavljena u Evropskom Glasniku broj 2022/36, kao i nacionalnog patent-a objavljenog u "Crnogorskom glasniku intelektualne svojine" 2020. godine.

BISCOGNIAUXIA DESTRUCTIVA VUJAN., NOVI UZROČNIK „KATRANSKE“ KORE BUKVE: PRIMJER MEĐUNARODNE NAUČNE SARADNJE U ZAŠTITI ŠUMSKIH EKOSISTEMA

Apstrakt

Zahvaljujući saradnji koja je uspostavljena između profesora Vladimira Vujanovića sa University of Saskatchewan u Kanadi i profesora Jelene i Nedeljka Latinovića sa Univerziteta Crne Gore, nastala su vrijedna naučna saznanja prvenstveno za Crnu Goru, ali i šire. Saradnja je otpočela 2018. godine prilikom posjete uvaženog profesora Vujanovića Crnoj Gori i Biotehničkom fakultetu (nekadašnjem Institutu) na kome je naučno sarađivao u periodu od 1982. do 1989. godine. Poznavajući od ranije fitopatološke probleme šumskih biljnih vrsta na području Crne Gore, u svojstvu rukovodioca istraživanja "Sušenja šuma" na Institutu za šumarstvo i drvnu industriju, profesor Vujanović je zajedno sa svojim crnogorskim kolegama došao na ideju da se detaljnije prouči uzročnik "katranske" kore bukve u Nacionalnom parku „Lovćen“.

Karakteristični simptomi bolesti u vidu krupnih crnih stroma u pukotinama kore uočeni su na brojnim stablima bukve (*Fagus sylvatica*) u NP Lovćen. Uzorkovanje je izvršeno tokom 2018. i 2019. godine na lokalitetu Ivanova Korita. Sakupljeni uzorci su dalje naučno obradivani sa ciljem precizne karakterizacije i taksonomske identifikacije gljive iz roda *Biscogniauxia*. Standardnim laboratorijskim postupcima proučene su mikroskopske osobine gljive odnosno organi polnog (askomata i askospore) i bespolnog (micelija i konidije) razmnožavanja gljive. Filogenetske analize rađene su na osnovu dobijenih amplifikovanih sekvenci ribozomalne DNK izolovane gljive, koje su potom upoređivane sa drugim sličnim sekvencama pohranjenim u GenBank bazu podataka.

Biografije i apstrakti

Dobijeni rezultati ukazali su na jedinstvene taksonomske karakteristike gljive izolovane sa sa-kupljenih uzoraka oboljele kore bukve, i to kako sa gledišta mikroskopskih morfoloških osobina teleomorfa i anamorfa, tako i na osnovu filogenetskih i evolutivnih analiza. Zbog evidentnih razlika u odnosu na druge vrste iz roda *Biscogniauxia* predložen je novi takson pod nazivom *Biscogniauxia destructiva* Vujan. koji ukazuje na destruktivnu, gotovo devastirajuću prirodu ove vrste fitopatogene gljive na pomenutom staništu šume bukve.

Biscogniauxia destructiva stvara askospore koje se razlikuju od onih koje stvaraju dvije srođne vrste gljiva iz roda *Biscogniauxia*: *B. nummularia* i *B. anceps*. Naime, kod vrste *B. nummularia* askospore su jednoćelijske, bezbojne ili tamne bez apendicesa, dok *B. anceps* formira dvoćelijske askospore sa većom tamnom ćelijom i manjom svijetлом ćelijom na kojoj se nalazi apendices pravog oblika ili formira jednoćelijske bezbojne askospore bez apendicesa. Nasuprot tome, *B. destructiva* se karakteriše kombinacijom tamnih jedno- ili dvoćelijskih askospora sa apendicesom zakrivenog oblika. Filogenetsko stablo, dobijeno upoređivanjem ispitivane sekvenca sa sekvencama iz baze podataka, pokazalo je zanimljivu evolutivnu topologiju ovog novog taksona koji je, po svemu sudeći, različita rDNK varijanta srođne vrste *B. nummularia* (97,23% sličnosti), ali i *B. anceps* (90,29% sličnosti). Iako je rDNK sekvenca novopredložene vrste gljive pokazala veću sličnost sa vrstom *B. nummularia* nego sa *B. anceps*, stvaranje dvoćelijskih askospora sa apendicesom dovodi novu vrstu u bliskost sa *B. anceps*. Međutim, odsustvo jednoćelijskih hijalinih askospora kod nove vrste *B. destructiva* nju jasno razdvaja od prethodno pomenute dvije vrste, ukazujući na rijetku pojavu introgresije i specijaciju ove populacije u južnoj Evropi. Na jedinstvenost novog taksona ukazuju i promjene u patogenosti i simptomatologiji: povećanje dimenzija stromatičnih tvorevina gljive (cm^2) po kori i pucanje kore stabala dovodi do češćih uginuća biljaka u starim planinskim šumama *F. sylvatica* na području južne obale basena Jadranskog mora.

Imajući u vidu visok stepen agresivnosti kod ove patogene gljive na samoj južnoj granici rasprostranjenosti bukve, potrebna su dalja istraživanja sa ciljem procjene potencijalnog uticaja nove patogene gljive na šumske sastojine u Evropi sa jedne strane i pronalaženja održivog rješenja njenog suzbijanja sa druge strane.

VESNA MARAŠ

Vesna Maras was born in 1966 in Podgorica, where she completed primary school as well as high medical school with excellent results. She graduated in July 1990 at the Faculty of Agriculture in Sarajevo. She received her master's degree in 1995 at the Faculty of Agriculture in Belgrade, department of Viticulture — Ampelology. She obtained the title Doctor of Agricultural Sciences in the field of Biotechnology — Viticulture (Ampelology) in 2000 at the Faculty of Agriculture in Belgrade. In 2017, she completed post-doctoral studies in the field of Viticulture — Genetics at the Institute of Vine and Wine — ICVV, Logroño in La Rioja (Spain).

From 1992 to 2004, she worked at the Agricultural, later Biotechnical Institute at the University of Montenegro, where she obtained all scientific titles — senior researcher in 1996, scientific associate in 2001, senior scientific associate in 2006 and scientific advisor in 2013. In 2014 she obtained the title of full University's professor in the field of Viticulture by election at the University of Donja Gorica.

During 1998, she was trained in the field of viticulture and wine-making in several centers in Bulgaria (Institute for Viticulture and Oenology — Pleven, Agricultural Institute — Plovdiv, Experimental Station for Viticulture — Septemvri). After completing her doctoral studies, as a scholarship holder of the Italian government in 2000, she completed a three-month training in Italy in the field of Ampelography and Developmental Genetics (Institute for Experimental Viticulture, Department of Ampelography and Developmental Genetics, Susegana, Conegliano). In 2003, as a scholarship holder of the Chinese government, she completed a three-month course in modern

biotechnology at the South China Agricultural Faculty in China (TCDC Modern Biotechnology Course — South China Agricultural Faculty). In 2004, she completed a one-month training in Viticulture (Integral/Organic Production in Viticulture — International Center for Advanced Mediterranean Agronomic Studies) at the Mediterranean Faculty of Agronomy in Bari (Italy). Also as a holder of a scholarship of the Italian government in 2008, she completed a three-month training in the field of clonal selection, ampelography and grapevine genetics at VCR Raushedo-Pordenone, Tuscany (Consortium Chianti Classico) and at ISVEA — Institute for the Development of Viticulture, Oenology and Agro-Industry in Italy. In 2017, as a winner of a national scholarship for excellence for post-doctoral studies, she completed a six-month scientific and professional training in the field of Vine Genetics at the University of La Rioja, Spain (Science Institute of Vine and Wine ICVV, Logrono).

She has been engaged in teaching at the University of Donja Gorica since 2010. In 2012 she was elected as dean at the Faculty of Food Technology, Food Safety and Ecology at the University of Donja Gorica. She has been a mentor and a member of several committees for the graduate theses, master's theses and doctoral dissertations.

She has published more than 100 scientific and professional papers in international and national journals. She is a participant and manager of numerous domestic and international projects. She is the author of seven selected Vranac variety clones, which were recognized as patents in 2017. She is co-author of six new grape varieties created at the Center for Viticulture and Winemaking of the



Biotechnical Institute in Podgorica. She was one of the organizers of the "First International Conference on Vranac and other Montenegrin autochthonous varieties" held in the period November 20–22, 2017 in Podgorica. From 2004 to 2022, she was the Director of Development at the company "13. jul Plantaze" a. d. in Podgorica.

For her scientific and research work and contribution to the development of the viticulture and wine sector in Montenegro, she obtained several awards: the award for the most successful woman in science in Montenegro for 2012 (Ministry of Science of Montenegro), the award for inventor — innovator for the most successful patent or innovative solution in 2014 (Ministry of Science of Montenegro), award "8. February" for 2015 of the City Municipality of Golubovci for achievements in scientific and research work and improvement of agricultural development. She was awarded the medal for inventors by the World Intellectual Property Organization WIPO in 2016 for 7 selected clones of the Vranac variety.

She is a member of the Committee for Agriculture of the Montenegrin Academy of Sciences and Arts.

Biografije i apstrakti

CENTURIES FOR THE FUTURE: MONTENEGRIN VITICULTURE AND WINEMAKING

Abstract

In the period 2014–2017, a multidisciplinary team led by Montenegrin and Spanish researchers carried out the most extensive research of grapevine genetic resources in Montenegro. The research included the genetic characterization of the existing grapevines diversity in cultivated and wild populations, encompassing their pedigree analysis.

The paper presents the richness of the grapevine genetic heritage in Montenegro, which still creates a very rich diversity of the *Vitis vinifera* species.

Out of 476 genotyped samples, using SSR and SNP markers, 101 genotypes corresponding to cultivated varieties (*Vitis vinifera* ssp. *sativa*) were identified, 43 genotypes corresponded to wild forms (*Vitis sylvestris*). In the cluster of cultivated varieties, 50 known varieties were identified, 51 unidentified genotypes are considered to be newly discovered, potentially autochthonous Montenegrin varieties. The results of the research confirmed that Montenegrin viticulture is based on a family of genetically related varieties, which is also characteristic of other famous traditional regions for the cultivation of vines and wine production. In Montenegro, this family was created around the Kratosija and Razaklija varieties. The research revealed 25 full pedigree varieties (trios) and 27 duos. The full pedigree of Vranac, who is a descendant of Kratošija and Duljenga, was found. The process of grapevine domestication, that began 8,000 years ago, in the Neolithic Age, continues in the wine-growing areas of Montenegro. All levels representatives of grapevine domestication were found.

The history of Montenegrin viticulture is preserved in its varieties that have survived through cultivation centuries in these areas and ensured the future of Montenegrin viticulture. This obliges us to preserve them and the need for Montenegrin viticulture and winemaking to preserve its authenticity.

Key words: *vine, genetic resources, diversity, variety, autochthonous varieties, Kratošija, Razaklija, Vranac*

NEDELJKO LATINOVIĆ

Prof. dr Nedeljko Latinović je diplomirao 1997. godine na Poljoprivrednom fakultetu Univerziteta u Beogradu, odsjek za voćarstvo i vinogradarstvo. Postdiplomske studije iz oblasti fitofarmacije, završio je 2001. godine na Poljoprivrednom fakultetu u Novom Sadu. Doktorsku disertaciju pod naslovom: "Model zaštite vinove loze od ekskorioze u uslovima podgoričkog vinogorja", odbranio je 2007. godine, na Poljoprivrednom fakultetu u Beogradu, nakon čega je promovisan u doktora biotehničkih nauka, oblast zaštite bilja i prehrabnenih proizvoda.

Od 1999. godine zaposlen je u Biotehničkom institutu (sada fakultetu) u Podgorici na kome je biran u zvanje redovnog profesora 2020. godine za oblast zaštite bilja.

Specijalizacije iz oblasti Integralne zaštite bilja obavio je u Italiji (2006), Sjedinjenim Američkim Državama (2006), Njemačkoj (2019), a iz oblasti registracije sredstava za zaštitu bilja (pesticida) u Sloveniji (2010, 2016) i Velikoj Britaniji (2013). Učestvovao je na brojnim

skupovima iz oblasti zaštite bilja i bezbjednosti hrane (Austrija, Italija, Grčka, Belgija, Luksemburg, Francuska, Hrvatska, Kipar, Mađarska, Litvanija, Njemačka, Češka, Srbija, Bosna i Hercegovina), gdje je prezentovao radeve putem postera i usmenih prezentacija. Objavio je preko 160 naučnih i stručnih radova u domaćim i međunarodnim časopisima i skupovima u zemlji i inostranstvu. Učestvovao je u velikom broju projekata kao što su: bilateralni (Slovenija, Srbija, Hrvatska), TEMPUS, ERASMUS +, COST programi, projekti koje je finansiralo Ministarstvo nauke preko HERIC projekta, projekat od posebnog značaja sa Italijom, inovativni projekat Ministarstva nauke i nacionalni projekti. Učestvovao je u izradi jednog nacionalnog i jednog evropskog patenta. Kao zaslužni pojedinc za ostvarene rezultate tokom 2019. godine iz oblasti naučnoistraživačkog i stručnog rada dobio je priznanje od strane Univerziteta Crne Gore.

Član je Etičkog komiteta Crne Gore i Odbora za strateško



planiranje razvoja nauke i umjetnosti Univerziteta Crne Gore. Predsjednik je Komisije za registraciju fungicida u Crnoj Gori. Član je pregovaračke grupe za poglavljje 12 "Bezbjednost hrane, veterinu i fitosanitarne poslove" u predstupnim pregovorima sa EU (imenovanjem od strane Ministarstva poljoprivrede i ruralnog razvoja). Bio je član Odbora za doktorske studije Univerziteta Crne Gore. Oženjen je i ima dvoje djece.

MOGUĆNOSTI BIOLOŠKOG SUZBIJANJA BOLESTI „KATRANSKA“ KORA BUKVE: PODSTICAJ ZA DALJU MEĐUNARODNU SARADNJU U OBLASTI ZAŠTITE BILJA

Apstrakt

„Katranska“ kora bukve je ozbiljno oboljenje koje na stablima bukve (*Fagus sylvatica*) izaziva gljive iz roda *Biscogniauxia*. Pored vrste *B. nummularia*, nova vrsta gljive pod nazivom *Biscogniauxia destructiva* Vujan. je identifikovana kao uzročnik pomenutog oboljenja. Ovo otkriće, nastalo zahvaljujući posjeti profesora Vladimira Vujanovića sa University of Saskatchewan (Kanada) 2018. godine Crnoj Gori i uspostavljenoj saradnji sa crnogorskim kolegama, publikованo je u prestižnom naučnom časopisu Microorganisms pod nazivom: "Natural Fungicolous Regulators of *Biscogniauxia destructiva* sp. nov. That Causes Beech Bark Tarcrust in Southern European (*Fagus sylvatica*) Forests" (2020), autora Vladimir Vujanović, Seon Hwa Kim, Jelena Latinović i Nedeljko Latinović. U radu su, pored otkrića nove fitopatogene gljive iz roda *Biscogniauxia*, opisane i mogućnosti njenog prirodnog suzbijanja pomoću mikoparazita.

Mikoparaziti su gljivični eukariotski organizmi koji su antagonisti mnogim drugim gljivama koje su uzročnici bolesti biljaka. Do nedavno, ova grupa organizama je bila dosta zapostavljena u naučnim studijama biodiverziteta. Tako, postoji nedovoljno podataka o mogućnostima biološkog suzbijanja gljiva odgovornih za bolesti kore bukve. Stoga je u ovom radu izvršeno poređenje diverziteta mikoparazitskih gljiva vezanih za *Biscogniauxia* prouzrokovaca „katranske“ kore bukve sa prethodnim literaturnim podacima o mikoparazitima gljiva iz roda Xylariales. Nakon urađenih morfoloških i molekularnih analiza mikoparazitnih gljiva izolovanih iz plodonosnih tijela (stroma) gljive *Biscogniauxia destructiva* odnosno uzoraka uzetih iz bukove šume u NP Lovćen, otkrivena su

Biografije i apstrakti

23 taksona koji uglavnom pripadaju rodovima *Exosporium*, *Pseudotrichia*, *Sistotrema* i *Lophiotrema*. Raznolikost nađenih mikoparazita predstavlja potencijal za izučavanje mogućnosti bioloških mjera suzbijanja ove bolesti bukve, a značajnost svakog od nađenih taksona ogleda se u smanjenju dimenzija stroma u pojedinim fazama razvoja bolesti. Ovi rezultati su od posebnog značaja za pronalaženje održivog rešenja u zaštiti bukve od bolesti „katranske“ kore, obzirom da ne postoje efikasne mjere za kontrolu ovog oboljenja, dok je biološki način suzbijanja u skladu sa principima zaštite životne sredine.

Od važnosti je pomenuti proučavanja akademika Milorada Mijuškovića i dr Zore Vučinić, naučnih radnika Biotehničkog instituta (današnjeg fakulteta) u Podgorici, koji su na polju proučavanja mikoparazita ostvarili značajne rezultate koje su objedinili u monografiji pod nazivom „Hyperparasitic fungi in mycopopulation of Montenegro“ (2001).

Međunarodno prepoznatljiv doprinos izučavanju mikoparazita u Crnoj Gori predstavlja podsticaj za snažnije umrežavanje domaće nauke u svjetske trendove zaštite bilja.

RADOVAN STOJANOVIĆ

Full professor at University of Montenegro. He graduated from the Faculty of Electrical Engineering, University of Montenegro, and received his PhD from the University of Patras (Πανεπιστήμιο Πατρών), Greece. He is the author/co-author of more than 350 publications in international journals and conference proceedings and managed or participated in over 30 projects. He is nominated as an expert of EACEA, EURAMET and in a large number of institutions in Europe and Mediterranean Region. He is a member of the Committee for Natural and Technical Sciences of the Montenegrin Academy of Sciences and Arts (CANU), the national HERE team, and the manager of the first international program in English „Sustainable Development“. He is the president of the Montenegrin Association for New Technologies

(MANT) and a member of the Board of Directors of the European Association for Microelectronics Euro-Micro, president and founder of the MECO conference and CPSIoT workshop, scientific events included in the most reference databases in the field of computer science. He is a member of scientific committees in more than 50 international and domestic scientific meetings, and an editor or reviewer in several SCI / SCIE journals, as well as invited lecturer. He founded the Center for Applied Electronics, the Center for Biomedical Engineering (BioEMIS), the NATO Center for Disaster Simulation (GEPSUS), the Medical Electronics Laboratory (MEDEL), Doctoral Studies in English „Sustainable Development“, several new courses, programs and teaching modules. It is actively involved in the transfer of technology and



knowledge in the Western Balkans and the Mediterranean Region.

More about Radovan Stojanović
https://en.wikipedia.org/wiki/Radovan_Stojanovi%C4%87
<https://www.ucg.ac.me/radnik/130260>

THE FIRST INTERNATIONAL DOCTORAL STUDIES AS AN EXAMPLE OF INTERNATIONAL COOPERATION

Abstract

The First Doctoral Program in Sustainable Development was established in Montenegro under the leadership of the University of Montenegro in the academic year of 2021/2022.

The Program is an outcome achieved over the period of a four-year Erasmus + "598465-EPP-1-2018-1-ME-EPPKA2-CBHE-SP" project, which was maintained by 16 partners in 6 countries. This interdisciplinary program focuses on natural, technical and biomedical sciences, which are very relevant today in the modern world, as they are important for sustainability of nature and living beings at the present stage of civilization development.

The article outlines the importance and requirements of modern doctoral education for sustainable development, as well as focuses on the vision of the Program, curriculum structure, early experiences, feedback and the lessons learned. The Program has already had a wide impact on different aspects of the sustainable development of Montenegro and the Mediterranean Region by training leaders, experts and managers to combat the contemporary challenges, shaping culture and habits, improving the visibility and international recognition of the PhD education in Montenegro and other five countries-participants of the project.

The project has also substantially boosted the cooperation of academic and non-academic sectors, created the possibility for scientific diaspora contribution and reintegration, as well as offered many other major and minor changes.

Biografije i apstrakti

ADIS BALOTA

Prof. Dr. Adis Balota was born on 29/12/1974 in Rožaje. Graduated from primary and secondary school in Rožaje.

He graduated from the Faculty of Electrical Engineering at the University of Montenegro, where he also received his master's degree. He received his PHD degree at the Faculty of Electrical Engineering, University of Sarajevo.

He was elected to the position of full professor at the Faculty of Information Technology of Mediterranean University. He is a member of numerous professional and scientific associations, as well as a reviewer in several scientific journals. He was also engaged as a lecturer at other universities and faculties.

He was elected to the position of vice dean of the Faculty of Information Technology in the period 2009–2010, and to the position of dean of the Faculty in the period 2014–2019. In the period 2017–2019 he was elected to the position of vice-rector for teaching at Mediterranean University.

During his working career, he covered a number of positions:

— System engineer in the Republic Secretariat for Development in the period 1999–2003.

— Head of Development Sector in the Health Insurance Fund in the period 2003–2009.

— Deputy Minister for Information Society and Telecommunications in the period 2009–2014.

— Head of GDPR and Digital Transformation in Lovćen Bank Podgorica, since 2019.

— Internal IT auditor

He covered the function of the President of the Information Security Council of Montenegro. He owns a number of certificates related to security and data protection. For the purpose of professional training, he was at ILEA Budapest and attended several trainings organized by NATO, related to information security and security of critical IT infrastructure.

He was hired as an IT consultant by the World Bank, World Health Organization, and OSCE Mission to Montenegro. He also worked as an IT consultant for the needs of the Securities Commission for the area of IT components. He performed the activities of internal



and/or external audit of information systems for several commercial banks in Montenegro. He was a member of the Board of Directors of the Bank, as well as of the Audit Committee of the Bank.

In his previous career, he has published 43 professional and scientific papers and participated in 29 international and national projects. In seven international research projects, he covered the positions of either project leader or a member.

He is married and a father of two children.

INFORMATION SYSTEM FOR MEASURING LIGHTNING DISCHARGE (LIGHTNING CURRENT STRIKES) ON THE MOUNTAIN LOVĆEN

Abstract

The project to establish the Lightning Activity Monitoring System (LAMS) was launched on March 31, 2015. LAMS project was supported by the Ministry of Science of Montenegro and financed through the HERIC programme (Higher Education and Research for Innovation and Competitiveness).

Leader of the project is the Faculty of Information Technology of Mediterranean University Montenegro, with the following project partners:

- Faculty of Electrical Engineering and Computing — Zagreb,
- Sadovic Consultant — France,
- Electric Power Company of Montenegro and
- Radio Diffusion Center of Montenegro (RDC).

The main idea came from Prof. Dr. Salih Sadović, full professor of ETF in Sarajevo and Prof. Dr. Adis Balot, full professor of FIT Podgorica. The leader of LAMS project is Prof. Dr. Adis Balota.

The main goal of LAMS project is to create, develop and maintain an information system to support the operation of the monitoring station for the research of lightning discharges on the mountain Lovćen (antenna pole RDC), which will become competitive at the international level.

It is known that lightning discharges (lightning strikes) cause substantial material damage to almost all significant technical systems (electric power, telecommunications, railways, oil and gas processing,...). In addition, lightning strikes can cause casualties to people and animals. Lightning strikes often cause large forest fires and fires in residential and industrial buildings. They also cause significant material damage to IT devices and systems.

In addition to direct material damage, lightning strikes also cause indirect material damage: interruptions in supply of electricity, interruptions in telecommunications traffic, interruptions in air and rail traffic,... Indirect material damages significantly exceed direct material damages caused by lightning strikes. For example, lightning strikes to high voltage overhead lines cause 50% to 70% of all power line outages. Outages of overhead lines lead to interruptions in the supply of electricity, and can lead to a complete breakdown of the system. In order to choose appropriate lightning protection systems, it is necessary to know the parameters of lightning currents.

Thanks to progress in development of measurement, information and communication technologies, it is possible today to develop a very powerful system for measuring the parameters of lightning currents. The main idea behind this project is to improve the performance of Montenegrin scientific research and economic activities through the creation of environment for technology transfer.

Internal research has shown that there is no similar concept of applied scientific research in Montenegro at the moment. It is important to point out that there are currently three stations in Europe for measuring the shape of lightning currents: Santis Tower Switzerland, Gaisberg Hill, Austria and Peissenberg Hill, Germany.

The selection and design of lightning protection system is based on data obtained more than 50 years ago at monitoring stations in South African Republic and Switzerland. All international recommendations and corresponding standards (CIGRE, IEEE,...) are based on these data. The shortcoming of these data is the small number of samples and the fact that old measurement technology was used (old analog oscilloscopes — automated data processing was not possible). The latest CIGRE brochure from August 2013, prepared by a group of world-renowned experts in the field of: research into the phenomenon of atmospheric discharge, development of technologies for examining the said phenomenon and development of technologies for protection against lightning discharges, includes all results from this field in the last 50 years or so. This brochure confirms that the data collected so far do not present a representative sample for serious statistical analyzes and establishment of relations between lightning current parameters. The authors especially recommend continuation and development of testing based on direct measurements of lightning currents, and this is only possible by installing a monitoring station like the one built on the Lovćen mountain. It should be noted that the analyzes showed an incredible fact that, for example, one year of operation of the monitoring station at Lovćen corresponds to 50 years of operation of the station at Peissenberg Tower in Germany.

As part of the project, the following measuring sensors were installed:

— Measuring sensor on a 76m high pole on the mountain Lovćen.

The sensor is connected to developed information system and operates as an integral information system. For the needs of the measuring sensor, a software platform was developed that enables the collection of electrical impulses, conversion into a digital record, data transport to the server located within the RDC facility in Lovćen and further data transmission to the Data Center of the Faculty in Podgorica. The developed applications enable data processing, analysis of lightning current parameters, storage of graphs and images and simultaneous comparison with the data of the international project LLS (LLS — Lightning Location Systems) based in Germany. Modern LLS allow precise determination of lightning strike locations, provide data on lightning characteristics and have very accurate GPS time.

— Measuring sensor for measuring the electrostatic field,

— Special IP cameras and

— Measuring sensor for measuring the quality of electricity.

The complete information system operates in real time and collects data at the point of origin. The monitoring station registered 1460 direct lightning strikes. The monitoring station has already produced significant results, and the developed information system already registers lightning discharges and enables detailed analyses.

The complete system is based on the most modern information, communication and measurement technologies, **and for now there is no similar system anywhere in the world**. Developed software and modern communication technologies have all the features of "Cloud Computing".

The results obtained from the analysis of a large number of registered lightning strikes will be the basis for better understanding of this natural phenomenon, and a new proposal of the lightning current model will be obtained through precise measurement. The obtained data will be the basis for improving the high voltage protection of all electronic devices.

The measurement results are available in real time, and can be significant for international organizations and a large number of institutions.

Biografije i apstrakti

RAMO ŠENDELJ

Prof. Dr. Ramo Šendelj was born on September 11, 1971 in Prijeopolje, Serbia. He finished his PhD studies in the field of Software Engineering at the University of Belgrade in 2003. In the period from 2006 to 2013, he was working as the Dean of the Faculty of Information Technologies at the University of the Mediterranean and Vice-Rector for Teaching and Finance at the University of the Mediterranean. Ramo Šendelj is a Full Professor and Research Chair in Cyber Security at the University of Donja Gorica. As a visiting professor, he is engaged at master's and

doctoral studies at the Faculty of Information Technology, University "Džemal Bijedić" in Mostar, and at master's studies at the Faculty of Engineering, University of Kragujevac. He has extensive experience in the management and implementation of projects financed from EU grants. He is a member of H2020 Programme Committee for "Research infrastructure" and Montenegrin Delegate in „European Strategy Forum on Research Infrastructures". Prof. Šendelj is also Bologna Expert for Higher Education Reform, and FP7 expert for Ethics reviewing, Research & Innovation.



HUMAN CENTERED COMPUTING (DEVELOPMENT OF ICT ENHANCED PERSON-CENTRED CARE SERVICES FOR STROKE OUTPATIENT REHABILITATION)

Abstract

Person-centred care (PCC) is increasingly advocated as a new approach for delivery of care which advances partnership between a provider and a patient on the way to produce a mutually agreed treatment plan. This approach improves health outcomes and increase patient satisfaction. Implementation of PCC is highly linked with the existing healthcare system (the structure, organisation, cooperation models with patients, health care delivery processes, etc.) as well as with concrete domain of care (due to specific knowledge and individualised treatment plans).

The stroke rehabilitation is mostly designed based on scientific evidence gathered in the form of clinical practice guidelines (CPGs) which proves to improve patient outcomes. Since stroke is a chronic condition, the recommendations have to embrace the whole cycle of recovery, from the early treatment in the acute care hospital through reintegration into the community till the long-term maintenance and prevention including social reintegration, health-related quality of life, maintenance of activity, and self-efficacy. Optimally, rehabilitation should be delivered by a multidisciplinary team of healthcare professionals trained in neurology, rehabilitation, occupational speech and language therapy, psychology, psychiatry, and social work.

In this paper, we present an innovative framework for creation and planning of PCC services for stroke rehabilitation built upon the well-known principle in the software engineering field, known as the model-driven approach, which allows specification of processes with included commonality and variability of the constitutive element. However, the following two directions are identified of crucial importance for validation of the whole concept from user experience side, such as: (i) validation of PCC-centeredness for stroke patients, by measuring the level of satisfaction, confidentiality and well-being of patients at after-stroke rehabilitation in real contests; (ii) validation of benefits for health treatments, by providing comprehensive evaluation of physicians and medical staff members included in the whole recovery process, and (iii) validation of predictive models, by empirical testing and validation. The framework is elaborated over evidence from neurology department of Clinical Centre in Montenegro.

KAROLJ SKALA

General Chair of MIPRO Convention
Member of Hungarian Academy of Science
Member of Croatian Academy of Technical Sciences

MIPRO AS A HUB FOR REGIONAL COOPERATION AND INTEGRATION OF THE DIASPORA



Lampadem tradere-Innovative promotion of partnership!

MIPRO is an international meeting and cooperation platform (hub) for experts from the fields of science, education, business, banking, government and local government. MIPRO is simultaneously a scientific, technological, professional and business conference. The MIPRO conference dates back to 1978 and began with tutorials for the lifelong education of engineers in the field of microprocessor architecture and applications. Over the last decades, MIPRO has become one of the largest and most important congresses in Central and Eastern Europe, based on innovation and new technologies such as ICT. The core of the congress is formed by conferences covering a large part of ICT (such as microelectronics, electronics, data science, biomedicine, telecommunications, smart and security systems, digital economy, smart cities and environment, robotics and many others). Other indispensable segments include panels, workshops, tutorials, keynote speeches, plenary sessions, project meetings and the exhibition of EU projects, technical solutions and services. The MIPRO Congresses are regularly attended by more than a thousand participants from thirty to forty countries from all over the world. In the 45 years of its existence, more than 8900 scientific and technical papers have been published (regularly indexed in IEEE Xplore Digital Library). In addition, more than 200 panels, 150 workshops and 120 tutorials were held and more than 600 exhibitors participated in the exhibition. The mission of MIPRO is Lampadem tradere, i. e. to create, share and disseminate knowledge. We follow this mission by adapting to the demands of the world market and national interests in times of digital transformation, by networking and contributing strategies that follow EU technology policies and development directions. MIPRO aims to become a hub and a major dissemination point by joining forces with other ICT associations in Europe to provide a well-developed infrastructure for the promotion of knowledge and cutting-edge technologies.

Biografije i apstrakti

PAVLE R. ANDJUS

Full professor, PhD; Center for laser microscopy, Faculty of Biology University of Belgrade, Studentski trg 3, 11000 Belgrade, Serbia

AN EXAMPLE OF A GOOD AND SUSTAINABLE INTERNATIONAL COOPERATION BIOPHYSICS SCHOOL “ACADEMICIAN RADOSLAV K. ANDJUS”

Abstract

After organizing a successful international Biophysics congress at Sveti Stefan dedicated to Radostlav K. Andjus (1926–2003), the founder of Serbian Biophysics and the leader of the Belgrade School of Physiology, in 2006 the members of the Yugoslav Biophysical Society decided to honor the academician Andjus (he was member of both Serbian and Montenegrin Academies) by establishing a biennial series of international Biophysics schools & workshops dedicated to his memory. Since then 8 Schools have been organized. The main concept was that this is an international event organized at Montenegro coast with the mutual core organization by colleagues from Serbia (Biophysical Society and Faculty of Biology University of Belgrade) and Montenegro (Institute of Marine Biology, Kotor). Co-organizers were usually distinguished scientists from abroad. Since the topics of the School were often tackling Neurobiophysics the School coined its acronym “NERKA” (NEuro Radostlav K Andjus). The School remains a lighthouse of collaboration between Serbia and Montenegro attracting international peers, experts as well as young participants.



List of the Participants

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 NAUKA I MALE ZEMLJE:
 SINERGIJA DIJASPORE, MATICE
 I PRIJATELJA CRNE GORE**
**SCIENTIFIC SYMPOSIUM
 SCIENCE AND SMALL COUNTRIES:
 SYNERGY OF THE DIASPORA, THE MOTHERLAND
 & FRIENDS OF MONTENEGRO**

2. i 3. novembar 2022 / November 2 & 3, 2022, Podgorica

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