Editor
Aida Bulucea

Recent Advances in Energy and Environmental and Biological Sciences

- **Proceedings of the 5th International Conference on Energy Systems, Environment, Entrepreneurship and Innovation (ICESEEI '16)**
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Plenary Lecture 1

Enhancing Knowledge on Energy Saving and Green Gasses Emission by Analysing the Performance of a Realistic Small Scale House

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Abstract: Since Rio de Janeiro conference (1992), Kyoto protocol and agenda 21 definitions, the necessity of a reasonable development is currently admitted by scientific and political personalities. Recent COP21 conference in Paris confirmed the necessity of concrete actions for power saving and green gasses emission reduction. Building trade is one of the important contributors to green gasses emission and energy consumption. Thus, our academic project of “small scale greenhouse" was born in 2012 to show and to quantify this impact. After a short presentation of the small scale green house, an holistic approach of thermal performances and Carbon assessment is developed to demonstrate interest and ability of the small scale model. Experimental data are collected and a thermal modelling is proposed to study energy losses. Carbon assessment method is applied to our small scale house to quantify its contribution and to identify which actions can contribute to its improvement. The transdisciplinary aspects of this work are finally highlighted and some future evolutions are suggested.

Brief Biography of the Speaker: Ph. Dondon was born in Paris in 1960. He is a graduate from the High School of Electronic Engineers ENSEIRB Bordeaux, France. After his electronic engineer diploma in 1983, he worked 5 years as product manager and computer aided manufacturing (C.A.M) in the French radio-communication systems company T.R.T. Back to the IMS microelectronic laboratory of Bordeaux, he received his Ph D in microelectronic analogue design in 1992. Member of the power electronic assembly design team, he worked on power circuits test and characterisation for a few years. He has more than 80 scientific papers in journal and conferences, one book, and took three patents. He is now teaching analogue electronic at ENSEIRB- MATMECA. Dr Ph. Dondon became active reviewer in World Scientific and Engineering Academy and Society (WSEAS) in 2006, then, editor within “WSEAS transaction journal in 2010. He is organizer and chair of many international conferences.

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Plenary Lecture 2

Development of the Metal Granulation Methods Based on Parametric Control in Continua for the Unique Materials' Production

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&
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Abstract: The general and specific peculiarities of parametrically excited oscillations and the new parametric effects revealed are presented and discussed for the important engineering and technological applications. First the general statement and substantiation of the problems studied is considered, and then the various parametric oscillations in continua are analyzed from common methodological base. Also the assessment of a current state of the problems, analysis of their features, prospects of further development and the main difficulties of the methodological, mathematical and applied character are presented.The results by development of physical, mathematical and numerical models for parametric excitation and suppression of oscillations on the interfaces separating continuous media, for carrying out computing, physical and natural experiments by revealing the new phenomena and parametric effects, and for their use in improvement the existing and creation the perspective highly efficient technological processes are presented. Scientific novelty of this work consists in development of the theory and applications of parametric excitation and suppression of oscillations on the boundaries of continua on the samples of three tasks' classes: flat and radial spreading film flows of viscous incompressible liquids; surfaces of phase transition from a liquid state into a solid one, etc. The external actions considered are: alternating electromagnetic, vibration, acoustic and thermal fields. Along with linear the non-linear parametric oscillations are investigated (including strongly non-linear) and the results of theoretical studies are confirmed and supplemented with the corresponding experimental data. The theoretical results allowed constructing the new granulation machines for producing metal granules with cooling rate up to 104 K/s. The unique granules are used to produce the new specific materials with strong properties.

Brief Biography of the Speaker: Ivan V. Kazachkov is Mechanical Engineer who had earned his PhD (Candidate of Physical and Mathematical Sciences, 1981) and MSc (1976) from the Kyiv National T. Shevchenko University. He got Full Doctorship (1991) in Engineering Sciences from the Institute of Physics of the Latvian Academy of Sciences in Riga. He became Full Professor at the Institute of Electrodynamics of the National Ukrainian Academy of Sciences since 1989, after 1995 he has been Head of Dept and Principal Investigator at the State scienfifc and Technical Center on Nuclear and Radiation Safety of Ukraine. During 1998-2004 Ivan Kazachkov has worked at the KTH, Energy Technology Dept as Guest Professor, then during 5 years was teaching and doing research at the National Technical Univeristy of Ukraine "KPI" continuing his work part-time as Visiting Professor at KTH, teaching numerical methods and doing research in modeling of multiphase systems. Since 2008 till present time he is Affiliated Professor at the KTH. Since 2009 Prof. Kazachkov is Head of Department of Applied Mathematics and Informatics at the Nizhyn State University named after M. Gogol, during 2010-2012 was also part-time Head of Dept on Energy Saving and Heat Power at the Ukrainian Academy of Civil-Communal Economy in Kyiv. The research activities of Prof. Kazachkov include Parametric Control in Continua, Multiphase Flows, Controlled Film Flow Decay, and Granulation of Metals for Special Metallurgy, Modeling and Simulation. He has over 200 publications in scientific journals and conferences, 5 patents, 10 monographs and lecture notes. He participates in the European research programs and committees. Five PhDs have defeded their dissertation under his supervision and a number of PhD students is doing research presently under his supervision.

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Plenary Lecture 3

Multiphase Reactors and Multiphase Flow Systems are the Key For Processes Development and Advancement: What are the Needs?

Professor Muthanna Al-Dahhan
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Abstract: Multiphase reactors (bubble/slurry bubble columns, packed beds, fluidized and circulating beds, etc.) and multiphase flow systems (blenders/mixers, separators, conveyers, heat exchanges, flow in pipes, etc.) have found extensive applications in every industrial processes related to energy, environmental applications and variety of products including the renewable and sustainable technologies and processes. These systems in general and multiphase reactors in particular are the key for any process development and advancement. However, they are complex and opaque and they can take various configurations and types based on to the way the phases are contacted and interacted. Their design, scale-up, proper operation and performance prediction are challenging tasks due to the lack of their understanding as a result of the complex interaction among phases. In addition, the complexity increases with the presence of internals that affect the hydrodynamics, mixing, transports (mass and heat), reactions and hence, the performance of these reactors. Therefore, in order to ensure proper processes development and advancement, there are needs to be fulfilled which include advancing the engineering knowledge and understanding of these systems, developing mechanistic scale up methodologies, validating CFD by quality benchmarking data, implementing CFD simulations as enabling tools for scale–up and troubleshooting. Computational fluid dynamics have been increasingly used to simulate, design and scale up these reactors and flow systems. Due to their complexity, most (if not all) of the used models and closures in the CFD to simulate these systems have not been based on proper physics or first principles. Accordingly, CFD validation is a must before it is implemented with fidelity. These can be achieved by implementing sophisticated measurement techniques that are integrated in a novel way to measure various hydrodynamic and transport parameters and their integration with kinetics. Since these systems are opaque, high energy gamma ray photons based techniques are needed besides other sophisticated measurement techniques to visualize these systems, to provide an effective diagnostic means, to provide benchmarking data and to advance the needed fundamental understanding of these complex reactors and flow systems. These advances should provide the mechanistic frame work to properly scale up the results from lab to commercial scales and to properly model and optimize these systems for performance prediction.
In our laboratory such needed sophisticated measurement techniques, facilities and methodologies have been developed, verified and implement on various complex reactors and flow systems that are extensively used in a wide range of processes including energy, products and environmental applications. Some of these measurement techniques are: I) techniques that are based on radioisotopes – radioactive particle tracking (RPT), dual source gamma ray tomography (DSCT), gamma ray densitometry (GRD) for 3D flow field, velocity and turbulent parameters, phases distribution and flow pattern identification measurements, and II) techniques that are not based on radioisotopes: 4-point optical probe for bubble dynamics, heat transfer probe, combination of bubble dynamics and heat transfer probe, optical probes for solids dynamics that measure simultaneously solids velocity and holdups and their fluctuations, integration of hot wire anemometry and heat transfer probe, gas tracer dynamics, optical probe for local mass transfer, gas tracer technique for global mass transfer, optical probe for liquid velocity distribution in packed beds, pressure transducers, and others. These techniques are augmented with sophisticated mathematical algorithms and programs that have been developed in our laboratory for data gathering, processing and image reconstruction. The utilization of these techniques is complemented by our advanced modeling, scale-up methodologies and computations capabilities. Also statistical methods, artificial neural network and chaotic analyses have been developed and used to further analyze the obtained results for flow pattern identification and for mechanistic approaches that we have developed for scale-up methodologies of these complex multiphase flow systems. In addition, validation of CFD simulations, models and closures for various types of multiphase reactors and flow systems have been conducted both in our laboratory and in collaboration with various research labs and groups.
In this presentation, an overview of our recent advancement which we have made on multiphase reactors and multiphase flow systems to address the question of what are the needs will be outlined and discussed.

Brief Biography of the Speaker: Dr. Muthanna Al-Dahhan is Professor and Chairman of the Chemical & Biochemical Engineering Department, Professor of Nuclear Engineering at Missouri University of Science and Technology (Missouri S&T), Rolla, Missouri since January 2009. He is AIChE Fellow. Prior to that he was a Professor

at Washington University in St. Louis (1994-2008), Project Manager at Xytel Corporation, USA (1993/1994), Head of process, process engineer and project engineer in pilot plants – Iraq (1979-1985). He holds three degrees in chemical engineering (BSc in 1979, University of Baghdad-Iraq; Master degree in 1988, Oregon State University and Doctoral degree in 1993, Washington University). He directed from 1999-2008 industry-academia consortium on gas conversion to alternative clean fuels/chemicals using slurry bubble columns. He obtained over $10 million in external funding as PI and Co-PI. He has graduated over 50 PhD students and supervised a large number of post-doc fellows, research associates and undergraduate students on a wide range of topics. All of his students and co-workers are holding leading positions in industry and academia in the United States and around the world. His research activities include more than 150 publications in peer reviewed journals and over 350 of national and international conference presentations. In addition, he gave a large number of invited talks in industry, academia and national labs, plenary and keynote lectures. Dr. Al-Dahhan has received many awards and recognitions and also his graduate and undergraduate students received many awards and recognitions for the work done under his supervision. He formed and chaired a number of international conferences. He has been expert and consultant to IAEA, UNESCO, many companies and research organizations in USA and from around the world. Dr. Al-Dahhan has established extensive collaboration in USA and around the world with academia, industry and research centers. He has developed research laboratories which are unique in USA and in the world and can be considered a unique global resource..

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Plenary Lecture 4

Inspection, Evaluation and Monitoring of Photovoltaic Systems: From Small Samples to Big Data

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Abstract: In this talk I give an overview of recent approaches to inspect, evaluate and monitor photovoltaic systems based on field data, mainly as developed at the Photovoltaic Statistical Laboratory at RWTH Aachen University. The inspection problem addresses the issue to determine a (minimal) sample size, in order to assess whether or not a lot of solar panels satisfies the nominal specification with respect to the power output. Recent research has focussed on inspection plans at two time points, i.e. allowing for a later inspection. Since laboratory measurements are expensive, the question arises how to analyze field data taken a site. We discuss, firstly, how one may design such studies taking into account heterogeneity due to, e.g., different manufacturers or different types of pre-damages. Secondly, we propose a framework how to analyze statistically such data. Electroluminescence (EL) imaging has become a standard tool to evaluate the quality of solar panels leading to big data samples when characterizing large PV systems by field imaging. We discuss highly efficient automatic procedures for distortion correction, standardization and testing for the presence of suspicious areas. This talk is based on own work and joint work with co-authors.

Brief Biography of the Speaker: Ansgar Steland received the M.Sc. and Ph.D. degrees in mathematics from the University of Go?ttingen, Germany, in 1993 and 1996, respectively. He held positions as an assistant at the Technical University of Berlin, Berlin, Germany, as a consultant in industry, as a postdoc at the European University Viadrina of Frankfurt/Oder, Germany, and as a lecturer at the Faculty of Mathematics at the Ruhr-University Bochum, where he also led the statistical consulting services. Since 2006, he has been a Professor at RWTH Aachen University, Germany, where he holds the Chair of Stochastics at the Institute of Statistics. Dr. Steland has been member of several societies, headed the Department of Mathematics from 2010 to 2012, acts as the chair of the Society for Reliability, Quality and Safety, and also chairs the Working Group of Change-Point Analysis of the German Statistical Society. His current research interests are in nonparametric regression, signal and change-point detection, sequential analysis and quality control, applications to photovoltaics, empirical stochastic processes, econometrics, and time series analysis.

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Plenary Lecture 5

Study Regarding the Use of Wind Energy in the Area of Water Supply

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Abstract: In the paper is presented a solution to solve the problem of water supply for an isolated small community where the area posses an outstanding wind potential. It is a place with a few buildings which are located near a river and is needed water for daily requirements. The water must be taken from the river and send it to a tank from where it is sending anytime where is needed. It was taken into consideration two types of wind turbine, one with horizontal axis and other with vertical axis. After studying the advantages of each one it was taken a decision to produce and install a wind turbine with horizontal axis.

Brief Biography of the Speaker: Badea Lepadatescu is currently an Associate Professor at the Faculty of Technological Engineering and Industrial Management of Transylvania University of Brasov, Romania. He obtained his doctoral degree in 1998 in the area of machining through superfinishing process. After he graduated he worked five years as design engineer at Roman truck factory in the field of manufacturing processes where he designed many devices and special machine tools especially for superfinishing process. Started on 1982 he worked as research engineer at Transilvania University of Brasov, and after 1997 he is teaching at Department of Manufacturing Engineering. His main academic interests include Tolerance and Dimensional Control, Manufacturing Engineering Processes, Automation Processes, and Renewable Energy Sources. The research accomplishments are reflected through publications in a five books and authored or co-authored over 120 papers published at international conferences. He has extensive experience in both experimental and theoretical research work having more than 50 contracts with factories to design and produce machine tools for machining processes. Also in the field of Renewable Energy Sources together with a team he made two wind turbines, one with horizontal axis for taking water, and one with vertical axis to produce electric energy. He has been speaker to international conferences, has moderated forums, organized symposia, workshops and sessions at major international conferences.

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Plenary Lecture 6

Climate Adaptive Land Reclamation and Improvement Systems – An Integrated Approach of Food Security, Low-Carbon Energy, Sustainable Water Management and Climate Change Mitigation

Professor Rares Halbac-Cotoara-Zamfir
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Abstract: Land degradation affects large areas of Eastern Europe where social, economic and political changes generated high pressures on land resources, all of these under the global climate change. Agricultural lands and agricultural production are threatened by climate changes especially due to the severe changes in rainfall and temperatures variability requiring counteracting measures like land reclamation and improvement arrangements. Land Reclamation and Improvement arrangements are managing land, water and plants, are both energy users and providers, have a strong impact on land management and are answering to climate changes by mitigating their effects and by creating microclimates.
Policy makers need a set of measures from a wide range of fields in selecting and implementing innovative climate adaptive land reclamation systems using an innovative trans-disciplinary approach, integrating both stakeholders and scientists knowledge as well as results from case studies and covering a range of pressures and threats on agricultural water management in different bio-physical and socio-economic environments across Europe.
The presentation will debate an integrated approach of food security, low-carbon energy, sustainable water management and climate change mitigation using innovative climate adaptive Land Reclamation and Improvement systems.

Brief Biography of the Speaker: Rares Halbac-Cotoara-Zamfir is Assistant Professor Engineer at the “Politehnica” University of Timisoara, Romania, he has a MSc in Environment Protection and a PhD in Civil Engineering. He spent eleven years in academia as PhD candidate and Assistant Professor with teaching and transnational project research responsibilities in civil engineering (land reclamation and improvement, sustainable land management, water resources management), sustainable development, human resources, environment protection. Since 2004, Dr. Halbac-Cotoara-Zamfir published more than 90 scientific papers, almost half of them being indexed in ISI Web of Science, SCOPUS and other well known international databases.
He is reviewer and member of editorial board for several international journals. Member of IACSIT, EWRA, ECRR, he was invited to be reviewer and chairman for several international conferences. He published more than 10 books about water management, environment protection and human resources in Romania and abroad.

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Plenary Lecture 7

3D Framework Design Optimization of All-Ceramic Crowns

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Abstract: Yttria-stabilized zirconia cores veneered with dental ceramics are highly aesthetic alternatives to conventional metal-ceramic crowns. By applying veneering materials aesthetically superior results can be achieved, but these materials have mechanical properties inferior to those of the frameworks. Failure of all-ceramic dental restorations is predominately caused by cohesive fractures of the ceramic veneering material. An important factor influencing the chipping behavior of veneered zirconia restorations is the framework design. Zirconia ceramics can be processed only with CAD/CAM (computer aided design/computer aided manufacturing) technologies and in current practice, the framework is obtained by milling an even thickness copies, rather than using a scientific-based design. The aim of the studies was to suggest the optimal design for the framework of zirconia-ceramic crowns and to evaluate the effect of core design on stress distribution in all ceramic crowns. Finite element analyses were used to provide a biomechanical explanation of the behaviour of different all ceramic bilayer crowns.The recent possibility of the softwares to scan the bite-registration allows achieving a digital improved design of the framework, regarding the control of the veneer thickness in case of the cutback design and also of the occlusal contacts in case of a vestibular veneering. Optimization of the zirconia substructure 3D design has been proven as a considerable factor in reducing chipping failures, and coping modifications are still a topic of current investigations.

Brief Biography of the Speaker: Professor at the "Victor Babes" University of Medicine and Pharmacy Timisoara, Faculty of Dentistry, Specialization Dental Technology, Department of Dental Prostheses Technology, PhD in dentistry, Primary dentist in General Dentistry specialty, Specialist in the specialty of Orthodontics and Dental-Facial Orthopedics , Specialist in specialty Dental Prosthodontics. The areas of research are focused on: tridimenional reconstructions of dental structures and prosthetic restorations, threedimensional modeling, computer aided design in the field of dental prosthodontics, numerical simulations (finite element analysis) in fixed prosthetics, removable and combined restaurations, design optimization, modern welding procedures of dental alloys in shielding gas, structural aspects of base metal alloys, design concepts of removable partial dentures, attachments used in combined prosthetic restorations, ceramic systems used in dental technology, CAD / CAM systems used in dental technology. They were evidenced by coordination of 6 research projects in this areas of interest. The dissemination of research results was done by: 13 published books and monographs, 10 published courses and practical work handbooks, 164 scientific papers published in extenso, 160 papers published in summary, 221 papers presented at scientific meetings, 92 participation in conferences and symposia, 33 courses and training programs.

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Plenary Lecture 8

Low-Dose Computed Tomography for Lung Cancer Screening…. What Would the Next Step Be?

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Abstract: Lung cancer (LC) is a public health problem and the leading cause of cancer-related death worldwide. Is the third most common cause of mortality in high income countries. In Spain, in 2011, cancer was the first cause of mortality; and the LC mortality rate was almost as high as colonic, breast and prostate cancers combined. Most symptomatic patients (i.e. persistent cough, sputum streaked with blood, chest pain, voice change, and recurrent pneumonia or bronchitis) are diagnosed when they already have metastasis or a disseminated disease; therefore, five-year survival, among these patients, is very low (less than 20%). Major improvements in diagnostic tools, staging methods and treatment procedures and guidelines (e.g. surgery, chemotherapy and radiotherapy) have been recently reached. Cigarette smoking is by far the most important risk factor for LC. Clinical diagnosis and treatment together with prevention programs, such as smoking cessation, have decreased the LC mortality rate, nevertheless LC continues to have very poor long-term survival rates despite the improvements in diagnosis, staging, and treatment. Screening programs have been proposed as a means improving the LC survival rate by early detection. Chest X-rays, among other methods, have shown to be ineffective screening methods, with a very low sensitivity and specificity. Thus low-dose computed tomography (LDCT) scan has been proposed to be best way to reduce LC mortality by screening high risk asymptomatic patients. Since 2001, many studies (cross-sectional, cohort, randomized clinical trials, meta-analysis) have been conducted in order to assess the use of LDCT as a recommended tool for screening for LC. Although multiple randomized clinical trials had been conducted, no screening test had been shown to reduce LC–specific mortality until the June 2011 release of data from the landmark National Lung Cancer Screening Trial (NLST). This study showed a 20% lung cancer mortality rate reduction; on the other hand, the number of false-positive detections is significant, costs are considerable and harm caused by invasive diagnostic procedures and treatment of indolent, non-malignant nodules, are important factors to consider. Radiation risks must be also taken into account.
Prior to the design, development and an eventual implementation of a screening program in Soria, Spain, we have done a systematic review of the literature. In this plenary session, we will present this review. Epidemiological, clinical, pathological and other facts regarding LC will be briefly presented. We are going to discuss the clinical evidence, technical and logistical aspects, sensitivity, specificity, reliability, safety, efficiency, feasibility, applicability and rationale behind a public health screening program for lung cancer with LDCT.

Brief Biography of the Speaker: Dr. Carlos Rivas-Echeverria, MD, PhD, FACP is Medical Doctor (1992) and Specialist in Internal Medicine (1998) and in Critical Care (2000) at the University of Los Andes, Venezuela; with a PhD degree from La Universidad del Zulia, Venezuela. He has a Master degree in Sleep Medicine (Universidad Pablo de Oladive, Spain) and a Diplomate on Franchising Systems Management (Universidad Cat?lica Andr?s Bello, Venezuela). Currently, he is a Family Medicine Resident in Soria, Spain, and Master Degree in Sexology Candidate (INEFOC, Spain). He is the Head of the SLEEPCARE Sleep Clinics in Venezuela since 2002. He became Professor at the University of Los Andes on 1993 (Full Professor on 2004), and has been Head of the Department of Pharmacology. He is cofounder and active Member of the Intelligent Systems Laboratory (University of Los Andes). He has over 70 publications in high level conferences, journals, and book chapters and has been a mentor to numerous MD, MSc and PhD thesis candidates. The main areas of focus of his papers and research are: hypertensive disorders of pregnancy, sleep disorders, traffic accidents, and artificial intelligence. He became an active reviewer in several journals and societies, such as World Scientific and Engineering Academy and Society (WSEAS), and has been editor of some “WSEAS” journals. He has been organizer and chair of many international conferences and is Fellow of the American College of Physicians since 2008.

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