*Editors*

Giacomo Viccione

Gennaro Cuccurullo

Claudio Guarnaccia

# Latest Trends in Applied and Theoretical Mechanics

**Proceedings of the 10th International Conference on Applied and Theoretical Mechanics (MECHANICS '14)**

**Salerno, Italy, June 3-5, 2014**

*Scientific Sponsors*

University of Salerno, Italy

Kingston University London, UK

International Black Sea University, Tbilisi, Georgia

Parco Nazionale del Cilento Vallo di Diano e Alburni-Geopark, Italy

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**Preface**

This year the 10th International Conference on Applied and Theoretical Mechanics (MECHANICS '14) was held in Salerno, Italy, June 3-5, 2014. The conference provided a platform to discuss plasticity, fracture, and damage mechanics, mechanics of nanomaterials, fluid-structure interaction, flows in porous media, manufacturing processes, advanced materials and smart structures, heat and mass transfer, compressible flows etc. with participants from all over the world, both from academia and from industry.

Its success is reflected in the papers received, with participants coming from several countries, allowing a real multinational multicultural exchange of experiences and ideas.

The accepted papers of this conference are published in this Book that will be sent to international indexes. They will be also available in the E-Library of the WSEAS. Extended versions of the best papers will be promoted to many Journals for further evaluation.

Conferences such as this can only succeed as a team effort, so the Editors want to thank the International Scientific Committee and the Reviewers for their excellent work in reviewing the papers as well as their invaluable input and advice.

The Editors

# Table of Contents


**Plenary Lecture 1: Advancement the Monte-Carlo Procedures to be Used by Calculation the Radiative Heat Transfer within Power/Industrial High-temperature Combustion Chamber** 12
*Boris Soroka*

**New Symmetry Solutions to Burgers' Equation** 13
*Jacob Manale*

**Comparison between Upper and Lower Bound Strategies to Determine the Homogenized Strength Domain of Running Bond Masonry In-plane Loaded** 23
*Gabriele Milani*

**PHE Heat Transfer Performance Using 29nm CuO-Water Nanofluid** 33
*M. Taws, C. T. Nguyen, N. Galanis, I. Gherasim*

**The Change in Impedance of a Coil above a Plate with a Flaw** 42
*Valentina Koliskina*

**Looking Inside a Microwave Oven for Continuous Flow Heating by IR Thermography** 47
*Gennaro Cuccurullo, Laura Giordano, Giacomo Viccione*

**New Method to Explain and Calculate the Gyroscopic Torque and its Possible Relation to the Spin of Electron** 55
*Bojidar Djordjev*

**Instability of Waves on an Interface of Two-Layer Poiseuille Flow** 63
*D. G. Arkhipov, D. I. Kachulin, G. A. Khabakhpashev*

**Experimental/FE Numerical Correlation of a Composite Sandwich Panel of a High-Speed Train** 68
*D. Siano, M. Viscardi, P. Napolitano, M. A. Panza*

**Mathematical Modelling to Predict Off-Axis Damage Behaviour of Composite Tubular Structures** 77
*N. Ghafari-Namini, H. Ghasemenjad*

**A Dynamic Model for Building Heating Plants** 84
*Davide Borelli, Simona Repetto, Corrado Schenone*

**Aspects Regarding the Global Performance for a Small Swept Flying Wing UAV in Aggressive Turns** 93
*Mircea Boşcoianu, Vasile Prisacariu, Ionică Cîrciu, Andrei Luchian, Calin Ciufudean*

**The Use of Ohmic Heating in Processing of Food Industry** 102
*Gianpiero Pataro, Giorgio Donsi', Giovanna Ferrari*

**The Gutenberg-Richter Law Deviations due to Random Distribution of Block Sizes** 107
*B. P. Sibiryakov, A. V. Kopeykin*

**Particles Dispersion in a Stratified Turbulent Ekman Boundary Layer** 115
*Pietro Scandura, Vincenzo Armenio*

**Cooling of a Multi-Chip Power Module** 122
*G. Cammarata, G. Petrone*

**Advancement the Monte-Carlo Procedures to be Used by Calculation the Radiative Heat Transfer within Power/Industrial High-temperature Combustion Chamber** 127
*Boris Soroka, Vladimir Zgurskyi*

**A Quantitative Infrared Thermography Method for the Assessment of Windows Thermal Transmittance** 137
*Francesco Bianchi, Giorgio Baldinelli, Francesco Asdrubali*

**Orthopaedic Biomechanics: A New Approach to Analysis Various Types of Cervical Fracture** 144
*O. Razmkhah, H. Ghasemnejad*

**Preliminary Experimental Results and Performance Analysis of Hybrid Retrofitted Photovoltaic Panels** 152
*Cecilia Rossi, Mattia De Rosa, Vincenzo Bianco, Federico Scarpa, Luca A. Tagliafico*

**Study on the Relationship between Tax Structure and R&D Investment in China -Based on the Empirical Analysis in M-VAR Model** 162
*Jiang Yan Feng*

**Local Thermal Non-Equilibrium in Mixed Convection in Channels Partially Heated at Uniform Heat Flux Filled with a Porous Medium** 171
*Bernardo Buonomo, Oronzio Manca, Paolo Mesolella, Claudio Montaniero, Sergio Nardini*

**Determination of Shells Conveyer Parameters** 181
*Jiri Balla, Zbynek Krist*

**Thermal Modelling of a Skin Tissue for Medical Screening Applications** 188
*Maria Strakowska, Boguslaw Wiecek*

**Experimental Investigation on the Effect of Aluminum Foam on Natural Convection in Horizontal Channel Heated Below** 192
*Oronzio Manca, Sergio Nardini, Bernardo Buonomo, Lorenzo Marinelli, Claudio Montaniero*

**Review of Grischuk and Sachin Gravitational Wave Generator via Tokamak Physics** 200
*Andrew Walcott Beckwith*

**'Classical' Thermal NDT of Hidden Defects: Passing from Defect Detection to Defect Characterization** 206
*V. P. Vavilov, A. O. Chulkov, D. A. Derusova*

**Heat transfer Enhancement for Cooling Electronic Boards using Ultrasonic Waves: Preliminary Remarks** 213
*C. Bartoli, M. Macucci*

**Study on the Competitiveness of Modern Food Manufacturing** 218
*Luiza Daschievici, Daniela Ghelase*

**Temporal Instability of Particle-Laden Curved Shallow Mixing Layers with Non-Constant Friction Coefficient** 223
*Andrei Kolyshkin, Inta Volodko*

**Authors Index** 227

## Plenary Lecture 1

# Advancement the Monte-Carlo Procedures to be Used by Calculation the Radiative Heat Transfer within Power/Industrial High-temperature Combustion Chamber

**Professor Boris Soroka**
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**Abstract:** The advanced stochastic Monte – Carlo (MC) technique has been developed to predict resulting heat fluxes and / or unknown detailed local temperature profiles within the combustion or furnace chambers for arbitrary initial conditions (design and process parameters). Theoretical background is based upon original combination of following constituents: Hottel's zone method accompanied by his radiation model of weighted sum of grey gases on emissivity / absorptivity for combustion products while executive procedure being performed by means of application the MC counter operating with dozen thousands of random beams related to each of surface or volume zones. Direct thermal and indirect combustion kinetics characteristics have been used as the checked parameters by verification the MC procedures. Validation of the proposed MC procedures have been carried out by means of comparison of our prediction results by physical and chemical characteristics with respective experimental (measured) and literature data for some types of the industrial furnaces and boilers. Because of strong influence of temperature factors on NOx formation by combustion we have succeeded to calculate the temperature profiles and NOx issue by recirculation the combustion products under operation the boilers of different types. These data confirm an opportunity to predict the pollutants formation values being fairly coincided with measured data.

**Brief Biography of the Speaker:** Prof. Boris Soroka, Ph.D. (in Industrial Heat Engineering, Institute of Engineering Thermal Physics of National Academy of Sciences, Ukraine (NASU), Kiev, 1968), Doctor of Techn. Sciences (in Metallurgical Heat Engineering, Moscow Technical University of Steel and Alloys, 1987), Professor in Industrial Heat Engineering (1993). After graduating the Nat. Techn. University "Kiev Polytechnical Institute" he joined the Gas Institute, NASU and is working up-to-date, last time his position is Principal Institute's Scientist. Main areas of his scientific activity are as follows: development of applied combustion theory from the standpoint of chemical thermodynamics and kinetics aspects, along with transportation constituents including radiative and combined heat transfer, the CFD approach to combustion modeling and on numerical simulation, computation of high-temperature processes, environmental aspects and pollutants formation. Applied areas: designs and operation of furnaces, combustion systems, heat exchangers, and various burner facilities, being under protection of 50 his national and international patents. During 20 last years Prof. B. Soroka cooperates constantly with Gas Technology Institute (GTI, Chicago, USA) on low-emission combustion modeling. He participates in fulfillment the international scientific projects with universities and research institutes in EU as well. Prof. B. Soroka is author of more than 350 printed works (Germany, USA, France, Russia, Portugal, Great Britain, Hungary, etc) including more than 20 books and monographs, about 150 papers and presentation have been published in many countries. Main scientific awards: 2006 – awarding with G.F. Proskura's premium by NASU for individual cycle of the works in combustion ecology and energy efficiency areas, 2007 – awarding as a member of international team with Academician A.V. Lyikov's Premium, Byelorussian Academy of Sciences, for the cycle of works in area of heat-and –mass transfer in conditions of chemical reactions.