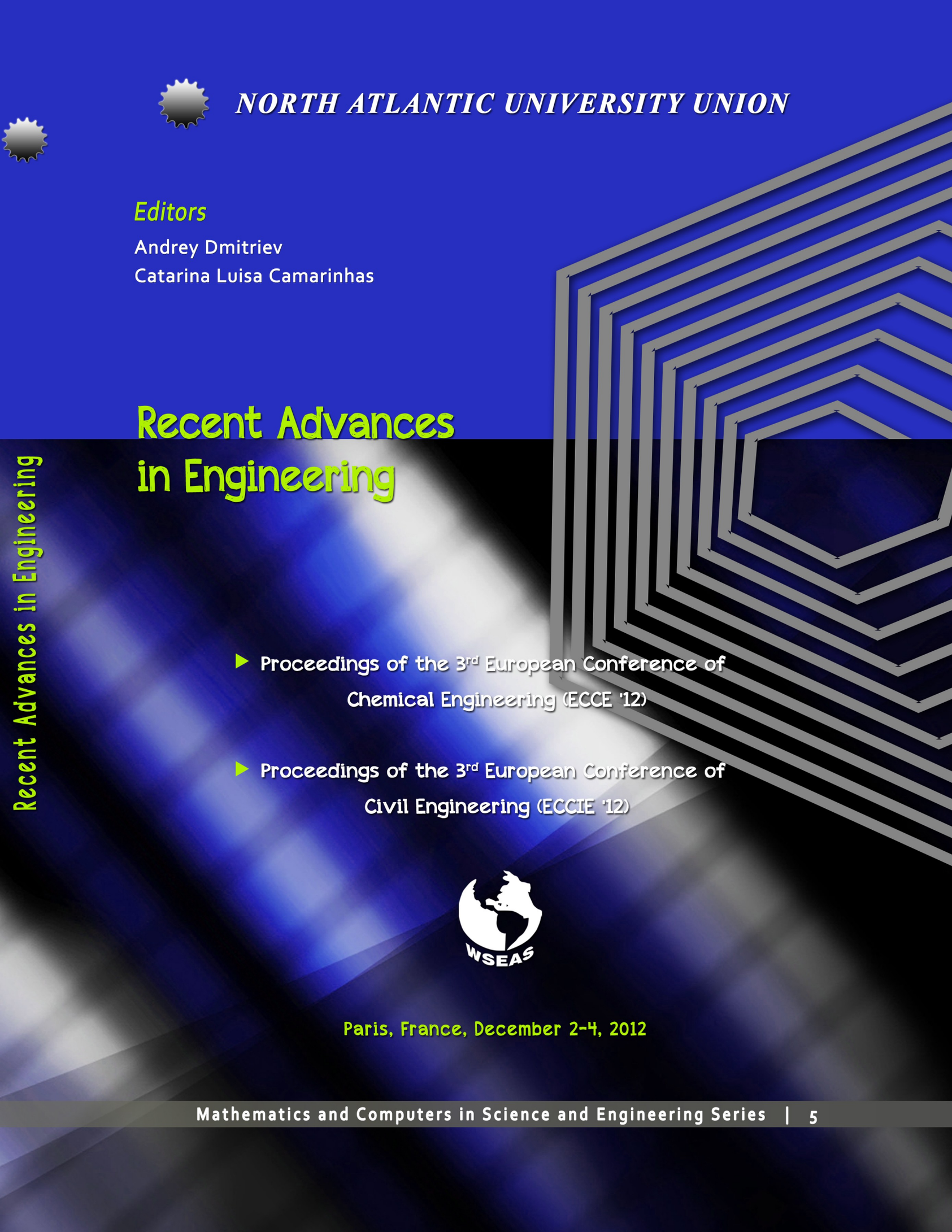
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Plenary Lecture 1

Inverted Colloidal Crystal Scaffolds for Tissue Regeneration, Stem Cell Differentiation and Spinal Cord Injury Treatment

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Department of Chemical Engineering
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Republic of China
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Abstract: The development of innovated scaffolds with pores of inverted colloidal crystal (ICC) geometry is presented in this speech. Sedimentation and floatation of monodispersed polystyrene microspheres leads to particulate self-assembly. The self-assembled colloids are dried, annealed and infiltrated with gels into the interstices of the particle array. The effect of solvent on the regularity of colloidal crystal arrays is in the order of ethanol > ethylene glycol > acetone. The viability of knee chondrocytes in ICC constructs is higher than 92%. The biodegradation percentage of ICC constructs over 4-week cultivation is about 34%. The order in the chondrogenesis is freeform constructs > ICC constructs with pure ethanol > ICC constructs with 95% acetone. However, ICC constructs yield uniform spatial distribution of knee chondrocytes and extracellular matrix. Moreover, the distribution of cultured bone marrow stromal cells (BMSCs) in ICC scaffolds is more uniform than that in freeform scaffolds. ICC and freeform scaffolds can preserve about 63% and 56% phenotypic BMSCs, respectively. The grafted laminin-derived peptides (LDPs) enhance the adhesion efficiency of BMSCs in ICC scaffolds and induce neuron-like cells. An induction with neuron growth factor guides the differentiation of BMSCs toward mature neurons in ICC scaffolds with surface LDPs. In a rat model of injured thoracic spine, the order in the neuronal survival at T10 is BMSCs in peptide-modified ICC construct > BMSCs in peptide-free ICC construct > direct injection of BMSCs. The above therapeutic method in the production of neuronal precursor cells (nestin staining) and axonal growth (neurofilament-H staining) at T10 is in the same order as the neuronal survival. The expression of glial fibrillary acidic protein and tumor necrosis factor-α in peptide-modified ICC construct appreciably decreases, suggesting inhibitions of the formation of glial scar tissue and inflammatory cytokine. The controlled topography of ICC structure with surface LDPs can be promising in guiding the differentiation of BMSCs toward neurons and can enhance nerve regeneration for treating spinal cord injury.

Brief Biography of the Speaker:
Dr. Yung-Chih Kuo is a professor at the Department of Chemical Engineering, National Chung Cheng University. His research interests are focused on biomaterials, drug delivery system, tissue engineering, blood-brain barrier, stem cell differentiation, nerve regeneration, cancer therapy, Alzheimer's disease treatment, biophysics, and colloid and interface science. In these fields, he has authored or coauthored over 100 SCI journal papers. He is an honor member of Phi Tau Phi Society, a life member in various academic Societies including American Nano Society, European Atherosclerosis Society, Asia-Pacific Chemical, Biological and Environmental Engineering Society, Asian Federation of Biotechnology, Asian Biotechnology Directory, Taiwanese Society of Biomedical Engineering, Chinese Institute of Engineers, Taiwan Institute of Chemical Engineers, Biochemical Engineering Society of Taiwan, and Taiwan Biomaterials and Controlled Release Society. He won Young Scholar Award in 2003 and Excellent Research Award in 2010. He is also an editorial board member in 6 journals and has been invited as a manuscript reviewer for over 50 journals (top reviewer of the Journal of Physical Chemistry (American Chemical Society)), an external reviewer for academic awards, research grants, faculty recruitments and promotions, and financial support of hosting international symposiums, and an advisory board committeeman of international conferences and symposiums.

Plenary Lecture 2

Fluoresence Supermolecules and a Spin Cascade System as Materials for Chemical and Bioengineering Devices

Professor Gertz I. Likhtenshtein
Department of Chemistry
Ben-Gurion University of the Negev
Israel
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Abstract: Over last decades scientists working in biomedicine and related areas have being faced growing requirements in novel effective analytical methods. Fluorescence, as the fast, sensitive and commonly employed technique, appears to be one of the most promising physical approaches to above mentioned problem. We proposed and developed a series of fluorescent methods for analysis and investigation of biological systems with a view of future their biotechnological and biomedical applications. Three new types of fluorescence supermolecules have been proposed and employed for such studies: 1) dual fluorophore-nitroxide compounds, 2) fluorescent-photochrome molecules and 3) super molecules containing both fluorescent and fluorescent quenching segments. The developed cascade approach, utilizing fluorescent, photochrome, triplet and spin probes, combines the advantages of each separate method, and adds a unique advantage in the study of encounters and lateral diffusion in biological membranes, over a wide range of distances and times using very sensitive regular fluorescence techniques. Unique properties of the supermolecules and the cascade system were intensively exploited as the basis of several methodologies, which include probing for investigation of biomembranes microstructure and molecular dynamics, real-time analysis antioxidants, nitric monoxide and superoxide, immunoassay in solution, quantifying the orientation and surface density of solid phase antibodies using a total internal reflection technique (TIRF). Corresponding engineering fluorescence devices have been described. Outlook for the application of supermolecules and cascade systems as materials for appropriate bioengineering devices such as fibrooptics, TIRF optical setup fluorescence imaging, fluorescence focal spectroscopy will be discussed.

Brief Biography of the Speaker:
Gertz I. Likhtenshtein received his PhD and his doctor of science from the Semenov Institute of Chemical Physics at the Russian Academy of Science in Moscow, where he was appointed to the position of Head of Laboratory of Chemical Physics of Enzyme Catalysis in 1965, becoming a professor in 1976. In 1992 he moved to the Department of Chemistry at the Ben-Gurion University of Negev, Israel, as a full professor in charge of the Laboratory of Chemical Biophysics and has been an emeritus since 2003. He has authored ten scientific books and around 380 papers, and his many awards include the Medal of the Exhibition of Economic Achievement, the Diploma of Discovery, the USSR State Prize, the V.V. Voevodsky International Price for Chemical Physics and the Diploma of the Israel Chemical Society. Professor Likhtenshtein is a member of the International ESR Society, the American Biophysical Society, the Israel Chemical Society and the Israel ESR Society. His recent main scientific interests focus on analysis of biologically important molecules.

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Plenary Lecture 3

Ni-Doped Carbon Nanofilaments: Preparation and Use as Steam Reforming Catalyst

Professor Nicolas Abatzoglou
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Sherbrooke (Quebec) J1K-2R1,CANADA
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Abstract: The use of Single (SWNT) and multi-wall (MWNT) carbon nanotubes (CNT) as heterogeneous catalyst supportsis being studied at significant extent since the late '90s. The main advantage offered by these nanostructures is the possibility to have well dispersed and thermally stable catalysts. Although the results are encouraging, the relatively high cost of the CNT compared to conventional ceramic supports constitutes a major hurdle towards commercialization.
Previous work of our research group (a) has driven to a patented process for the production of much less expensive carbon nanofilaments (CNF) and (b) has proven that these CNF have by themselves, without any subsequent preparation, catalytic properties in ethanol dry reforming due to their low content in iron carbides.
The main objective of this work is the use of the so-produced CNF as support of diesel steam reforming catalysts.
The methodology include (1) functionalization of the CNF through an optimized acid pretreatment; (2) use of the functionalized CNF as support of a Ni-based nanocatalyst by means of a wet impregnation technique; (3) prove the catalytic activity of these new nanostructures and (4) optimize the steam reforming conditions and (5) compare with known catalysts.
An isothermal fixed-bed reactor, equipped with a proprietary water-diesel emulsion formula injection train, on-line sampling + GC analysis and a data acquisition and control interface, has been operated under steam reforming conditions.
The CNF -during all experimental steps- as well as the therefrom produced fresh and used reforming catalysts are analyzed by many instrumental techniques: Scanning and Transmission Electron microscopy (SEM and TEM) to visualize the morphology and map the elemental composition;Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES) to evaluate the metals (Ni) load;X-Ray Diffraction (XRD) to evaluate the presence and changes of the crystalline (and amorphous) phases.
The preliminary results are very promising and the details will be available in the full paper and the invited lecture.

Brief Biography of the Speaker:
Dr. Nicolas Abatzoglou is full professor and Chairman of the Department of Chemical & Biotechnological Engineering of the Université de Sherbrooke. He is also Adjunct Professor at the University of Saskatchewan, Department of Chemical Engineering. He is a specialist in Process Engineering involving particulate systems in reactive and non-reactive environments. Since May 2008, he is the holder of the Pfizer Industrial Research Chair in Process Analytical Technologies (PAT) in Pharmaceutical Engineering. He is Director of the Research Center on Energy, Environment and Green technologies & Processes (GREEN-TPV).
He is co-founder of the company Enerkem Technologies Inc., a spin-off of the Université de Sherbrooke. Enerkem commercializes technologies in the field of energy from renewable resources (i.e. biomass and waste streams gasification; cellulosic ethanol).
He has a career of many years at both the academic and industrial levels. He represented Canada at the International Energy Agency (Gasification Task) from 1997-2001 and was the secretary of the Board of Directors and the Executive Committee of the AQME from 1996-2000. His research activities during the six last years are:
Steam and dry reforming of methane, ethanol, diesel and biofuels.
New Fischer-Tropsch Synthesis nanocatalytic formulations for the production of Biofuels (Green Diesel and Higher Alcohols) from biosyngas and biogas.
Process Analytical Technologies (PAT) in Pharmaceutical Engineering
Carbon sequestration through CO2 (dry) reforming.
Biogas purification using granular adsorbents.

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His production as a researcher includes a hundred of publications in scientific reviews, international conferences, plenary and invited lectures, patents and a book chapter. He currently supervises or co-supervises 10 graduate students and 3 undergraduate students in specialty projects or training sessions. His professional experience as engineer spreads over a dozen of years. He is member of the BioFuelNet (national coordinator of the thermal conversion Theme) and SOFC Canadian Networks. He has received many distinctions and awards both for his teaching and research achievements.
Prof. Abatzoglou is trilingual (French-English-Greek).

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Plenary Lecture 4

Risk Considerations of Cave Stability in Soft Carbonate Rocks Using 3D Geophysical Methods

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Italy
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Abstract: According to the Protection Civil Department database, Apulia is the fourth region in Italy affected by sinkholes, due to collapse of natural or mane-made cavities. The southern part of the region (the Salento peninsula) had hosted in the last twenty years at least fifteen events of sinkholes, the greatest part of which occurred inside "soft" carbonate rocks (calcarenites).
The man – made and/or natural cavities are sometime assets of historical and archaeological significance. Sometime monuments of historical and archaeological significance are located in areas with high risk of sinkholes. In spite of the importance on the civil protection, the prediction of the sinkhole events is currently an hard issue. This paper provide a new methodological approach on the evaluation of sinkhole hazard in such "soft" carbonate rocks combing geophysical and mine engineering complementary methods.
A case study is exposed which concern natural cavity named "Grotta delle Veneri". In this case the approach was: i) 3D Ground-penetrating Radar (GPR) and Electrical Resistivity Tomography (ERT) in order to evidence the shape and dimension of karstic cave; ii) seismic refraction tomography in order to study the physical-mechanical characteristic of rock mass that constitute the roof of the cave; iii) the scaled span empirical analysis to instability evaluation of the crown pillar's caves.
The research allows to define the geometrical cave shape (span, length and thickness of the cave's roof) which related to the geological features and physics properties of the rocks, determine the instability of the roof's cave and, as a consequence, the sinkhole hazard.

Brief Biography of the Speaker:
After the Degree in Physics he has achieved the title of PhD in Geophysics for Environment and Territory.
He was assistant professor in the following Archaeological Geophysics, Applied Geophysics, Laboratory of Geophysics, Physics of the Earth, Geophysical data processing, Environmental Geophysics, Seismology at the Faculties of Sciences and Faculties of Cultural Heritage at the University of the Salento.
He collaborates to the summer school of "Geophysical Techniques for the Cultural Heritage", developing lessons on the acquisitions and processing of ground penetrating radar data.
He was Professor at the International Master in Urban and Territorial Diagnostic at the University of Salento Cagliari (Italy), Messina (Italy), Palermo (Italy), Pisa (Italy), Trieste (Italy), Atene (Greece), Barcellona (Spain), Buenos Aires (Argentina).
From 2003 He is in the list of the experts in Environmental Physics of the Italian Geophysical Association.
From 2003 He is referee of numerous international journals.
From 2006 He is inserted in the international scientific committee to arrange regulations for Geophysical Surveys.
From 2007 He is inserted in the scientific committee of the International Union of Geological Sciences of the UNESCO for the evaluation of the sites of historical and environmental interest.
From the a.a. 2007/08 He is Professor of Cartography and Topography at the Faculties of Science at the University of the Salento.
Currently it is researcher at the Institute for Archaeological and Monumental Heritage – National Council of Research (CNR-IBAM).
Experience in all aspects of exploration geophysics including: field operations; data reduction, processing, display, and interpretation; research and development.

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Extensive knowledge and experience in all major surface, airborne, and borehole geophysical methods including: ground penetrating radar; refraction, reflection, and tomography seismics; electromagnetics; resistivity (Electrical Resistivity tomography) and induced polarization; gravity and magnetics.
Active participation to geophysical projects for groundwater, engineering, environmental remediation, hazardous waste, archaeology, and cultural heritage remediation.
Presentation of project results at technical international and national conferences, within peer-reviewed articles.

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Plenary Lecture 5

Interaction Dynamics of a Maglev Vehicle Moving on Guideways Considering Support Settlement

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Abstract: As a maglev transport route is planned to cross a region with soft soil, the interaction dynamics of vehicle/guideway is of great concern in riding quality and running safety of the maglev system. This study presents a computational framework to investigate the dynamic response of a maglev vehicle moving on guideway girders considering support settlement. Due to motion-dependent nature of magnetic forces in a maglev suspension system, an on-board hybrid PI controller in conjunction with Ziegler-Nicholas (Z-N) method is designed to regulate the magnetic force and control the vibration of the running maglev vehicle. To include the influence of support movements on vehicle/guideay dynamic analysis, the total response of the guideway girders is decomposed into the static response due to support settlement and the dynamic component caused by inertial effect of beam vibration. In this study, an analytical solution of the static displacement of the beam is presented and the dynamic analysis of the maglev vehicle/guideway coupling system is performed using iterative approach. Numerical studies indicate that decreasing levitation gap of a maglev vehicle may mitigate vehicle's response; but once guideway support settlement is taken into account, the response of the maglev vehicle with smaller air gaps would be amplified significantly at higher speeds.

Brief Biography of the Speaker:
Dr. J. D. Yau got his Ph.D. from National Taiwan University (NTU) in 1996. After serving as a chair-engineer at the Kuan-Tech Engineering Consultants Co. at Taichung in Taiwan (1997-1999), he joined the faculty at TamKang University (1999) where he has served as Assistant Professor (1999-2003), Associate Professor (2003-09), and Chair (2004-2007) in the Department of Architecture and Building Technology. In 2010, Dr. Yau became a Professor of Tamkang University, and an Adjunct Professor of Zhejiang University (2011-2013) and a Visiting Professor of East China Jiao Tong University (2011-2014) in China. Dr. Yau also serves as consultants on seismic analysis of storage tanks to Industrial Technology Research Institute (ITRI, government, 2011) and Shin-Yue Engineering Consultants Co. (private organization, 2010~) in Taiwan. Dr. Yau has published over 60 referred journal papers and articles. His research area of interest is centered on:
1. Maglev dynamics of vehicle/guideway interaction
2. Vibration problems of high speed rails
3. Geometrical nonlinear analysis of framed structures
4. Direct integration methods for structural dynamics
5. Structural stability of thin plates

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Plenary Lecture 6

The Performances of Concrete as Main Construction Material

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Abstract: Although concrete, in form of plain, reinforced, or prestressed concrete, is the leading construction material, it is considered non – ecologic due to the great amount of CO2 emissions arising mainly from the manufacturing of cement. On the other hand concrete has the ability to sequestrate carbon dioxide from the atmosphere due to the effect of carbonation. According to existing researches, concrete structures can recover between 7.6% and 57% of the initial emissions of CO2 during their service life and after demolition. But in the same time, reinforced concrete structures that are subjected to environmental conditions are likely, after a certain period of exposure, to exhibit signs of distress – initial period of reinforcement corrosion process – due to concrete carbonation.
Ultra high performance concretes – UHPC – developed after the year 2000, are characterized by some very spectacular results as: strength to levels exceeding 500 N/mm2; durability; dense structure; control heat absorption and thermal conductivity.

Brief Biography of the Speaker:
Prof. Corneliu BOB, graduated at the University "Politehnica" of Timisoara – Romania in 1961 and Ph.D. Civil Engineering in 1971 at the same University. In 1990 he became professor of R.C. Structures and Ph.D. – Scientific Coordinator at the Civil Engineering Faculty in Timisoara. From 1996 till 2004 he was the Head of the National Building Research Institute – Timisoara Branch. Professor Bob has also been very active in the Romanian Associations for Civil Engineering: National Association Engineering for Structural Analysis, Bucharest, Romanian Concrete Commission, Romanian Academy – Material Science. Member of IABSE since 1992, Prof. Bob became the member in Permanent Committee, Working Commission WC-8 and Structural Engineering Document Editorial Board. In the last years he has been involved, with good results, in the WSEAS activities.
Prof. Bob has had many and major contributions in the field of Structural Engineering:
(i). He participated as designer at more than 70 structures projects. In the last 15 years his attentions was paid to the design of the RC prefabricated structures: 25 structures have been projected and built up with more than 100000 m2 built surface. An important contribution of Prof. Bob in this field was in a patent concerning the "RC prefabricated structures with rigid nodes".
(ii). A very important field of work was paid to evaluation and rehabilitation of existing buildings. He participated at 75 projects of maintenance and rehabilitation of some important structures affected by seismic actions, gas explosions as well as time environmental factors. A very notable contribution is the "Model of reinforcement corrosion in RC Structures.
(iii). Prof. Bob C. has published many books and papers in Journals and Proceedings of National and International Meetings. The field of interest of works is: rehabilitation of structures, analysis and design of structures, durability of buildings, new special concrete types. Prof. Corneliu BOB played an important role in development of assessing of existing structures and in design of new buildings and he has devoted great energy in promoting the role of students and young engineers as designers and researchers.

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