CALL FOR PAPERS

Astract Deadline • October 15, 2015

Perugia - Italy • June 5-9/2016

CIMTEC 2016

5th International Conference
Smart and Multifunctional Materials Structures & Systems

11th International Conference
Medical Applications of Novel Biomaterials & Nanotechnology

www.cimtec-congress.org

Invitation to Attend!

CIMTEC 2016 - 7th Forum on New Materials, to be held in Perugia, Italy, June 5 to 9, 2016 will include the 5th International Conference *"Smart and Multifunctional Materials, Structures and Systems"* and the 11th International Conference *"Medical Applications of Novel Biomaterials and Nanotechnology"*.

The 5th International Conference *"Smart and Multifunctional Materials, Structures and Systems"* (sixteen Symposia) will cover most promising selected areas of smart and multifunctional materials R&D, from the molecular nanoscales to large complex integrated systems. Updated progress in materials science and in the widespread use of nanotechnologies will be covered that coupled with the exponential growth of computing capability and the availability of reliable multiscale modeling, promote a deeper understanding and better exploitation of the convergences among materials, electronics and biological systems.

The 11th International Conference *"Medical Applications of Novel Biomaterials and Nanotechnology"* particularly aims to report recent advances on creatively modified stimuli-responsive, active and multifunctional material systems and their implementation in selected challenging areas of nanomedicine such as soft and hard tissue engineering and regeneration, intelligent drug delivery and release, as well as medical imaging/therapy including multi-modal theranostics. Two Focused Sessions on materials for implantable neural interfaces and on the possible application of functionalized carbon nanotubes and graphene in medicine will complement the conference contents.

CIMTEC 2016 organizers are pleased to invite materials scientists, chemists, physicists, biologists, physicians and experts of application fields to contribute to discussion within the frames of what promises to be an exciting meeting, and to enjoy the immense, unique, artistic heritage and wonderful landscape of Umbria region.

Pietro Vincenzini
General Chair CIMTEC Conferences
National Research Council, Italy

Benedetto Bonfigli, Porta Marzia in Perugia, XV sec.

CIMTEC 2016

7th Forum on New Materials

Perugia, June 5-9, 2016

5th International Conference
"Smart and Multifunctional Materials, Structures and Systems"

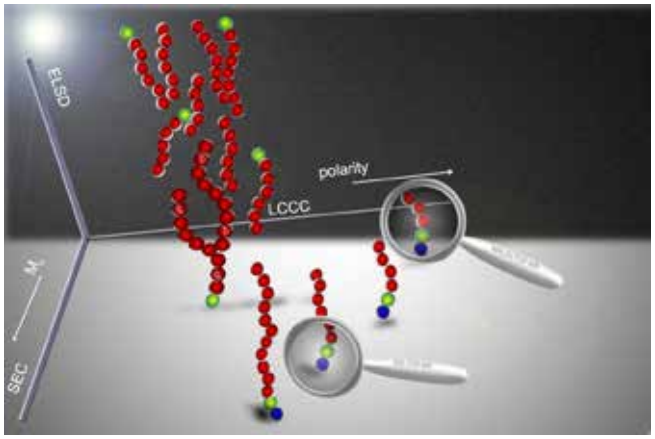
11th International Conference
"Medical Applications of Novel Biomaterials and Nanotechnology"

Perugia - view

Symposium A

Stimuli Responsive and Multifunctional Polymers: Progress in Materials and Applications

Modern applications for polymeric materials such as batteries, flexible electronics, medical devices and implants, controlled drug delivery systems as well as smart textiles have complex requirements towards material properties and functions. Functions comprise electrical conductivity, stimuli-sensitivity, degradability, specific structural functions, transport of heat energy and substances, magnetic functions as well as biofunctionality. Often combinations of functions are demanded, which are not automatically linked by each other, but need to be implemented almost independently in a material system. Different strategies are pursued for gaining multifunctionality: molecular integration by incorporating (different) functional groups, establishing of functions on different length scales and creation of multimaterial systems, in which each component contributes a function or new functions are resulting from their combination. Sustainability aspects are playing a role in the context of the raw materials used, which should preferentially be from bio-based sources, recyclability of the material system as well as energy saving processing, e.g. by use of integrated processes combining synthesis and shaping. This symposium covers all areas of research in this field including design and synthesis of stimuli-responsive and multifunctional polymers, their processing and application development based on these materials.



Session Topics

A-1 Shape-memory polymers and shape-changing polymers

A-2 Degradable, stimuli-sensitive polymers

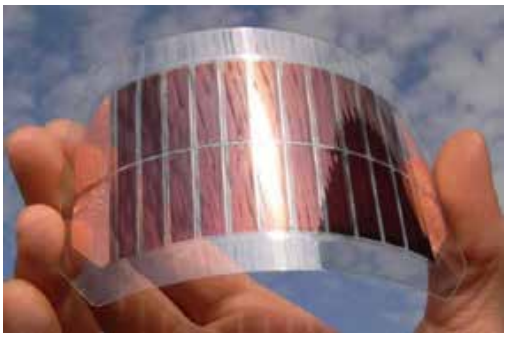
A-3 Stimuli-sensitive gels

A-4 Multifunctional (nano)composites and multi-material systems

A-5 Multifunctional surfaces

A-6 Multifunctional polymer systems for energy storage and flexible electronics

A-7 Pharmaceutical and medical applications of smart polymers



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Symposium B

State-of-the-art Research and Applications of Shape Memory Alloys

Shape memory alloys are bound to respond to the increasing demand of smart and stimuli responsive systems. Shape memory, pseudoelasticity, damping capacity and adaptive properties can find application in important sectors such as biomedicine, aerospace, building technologies, and advanced electromechanics. Although the majority of applications is based on NiTi alloys, an increasing effort has been devoted to the research of new materials: e.g. Ni-free, high temperature, composite, magnetic materials. Magnetic shape memory alloys are mechanically and magnetically responsive. They show a variety of multifunctional effects that open new exciting fields of research and applications. These include ferroic cooling, energy harvesting and magnetic actuation.

Moreover, the control of the materials at different lengthscales together with the development of micro and nano-fabrication techniques enables wide perspectives of application and integration in microsystems.

This Symposium, which follows the ones on the same topic held in previous CIMTEC Conferences, will highlight recent developments in the realization and property optimization of shape memory alloys, covering both fundamental aspects and applications.

The Symposium will welcome contributed papers related to the design, simulation, theory, processing, characterization and optimization of materials and devices.

Session Topics

B-1 Materials and materials design
Shape memory alloys (SMAs), magnetic SMAs; high temperature SMAs, Ni-free SMAs, nanocrystalline SMAs, foams, composites.

B-2 Basic phenomena and theory
Transformation behaviour, crystal structure and microstructure, magnetism, characterization techniques, theory and simulation.

B-3 Functional properties
Thermomechanical, magnetomechanical, elastocaloric, barocaloric, magnetocaloric properties.

B-4 Thin films and micro nano-systems
Thin and thick films, micro and nano.scale processing, interconnection technologies.

B-5 Engineering
Micromechanical models, macromodels, FEM simulations, constitutive behaviour, fatigue, failure mechanisms, corrosion, effects of thermomechanical processing.

B-6 Applications
Micro and nanodevices, sensors, actuators, harvesters, textiles. Aerospace, automotive, energy, biomedical, electromechanical, civil-seismic applications.

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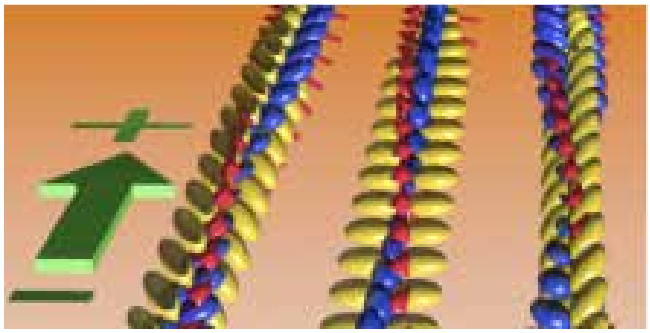
Symposium C

Recent Advances in Multiferroic and Magnetoelectric Materials and Applications

Single phase or composite materials that exhibit more than one type of ferroic ordering have attracted considerable interests in recent years for studies on the nature of cross-coupling between the ferroic orders and for useful applications in sensors, information storage and signal processing. In addition to traditional single phase multiferroics such as bismuth ferrite, significant advances have been reported on molecular, organic-inorganic, non-oxide, and 5d- multiferroics. Other topics of importance in single phase multiferroics are domain walls, magnetoelectric interactions in topological insulators, and multiferroic nanostructures. Investigations on composite multiferroics have focused on electric field control of magnetism and magnetic field control of ferroelectric order parameters, complex oxides and interfaces, ferromagnetic alloy-ferroelectric composites and self-assembled composite multiferroics.

This Symposium, which follows the ones organized in previous CIMTEC conferences, will highlight developments in the understanding of the physics multiferroic materials, theory, advances in materials synthesis and applications.

Of specific interests are: Theory and modeling of single phase and composite multiferroics, Advances in materials, synthesis and processing; New single phase multiferroic materials; Layered and multiferroic heterostructures and Nanocomposites; Physics of interfaces; Magnetic field sensors; Memory application; Tunable, multiferroic microwave and mm-wave devices; Miniature antennas.



Session Topics

C-1 Theory and modeling of single phase and composite multiferroics

C-2 Non-oxide, organic-inorganic and 5-d oxide multiferroics

C-3 Advances in materials synthesis and processing

C-4 Magnetoelectric characterization and electric field control of magnetization

C-5 Domain walls and dynamics of multiferroics

C-6 New effects

C-7 Devices and applications

Perugia - "Palazzo dei Priori" and "Fontana Maggiore"

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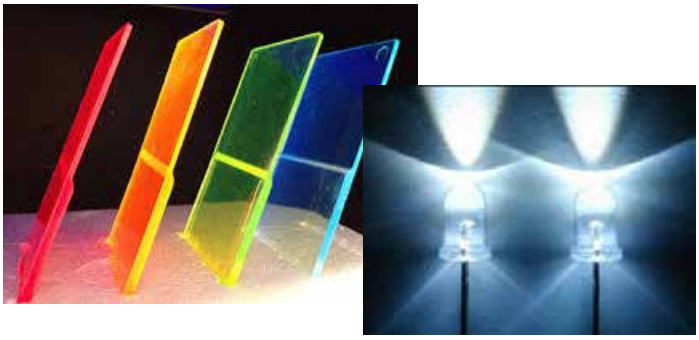
Symposium D

Advances in Inorganic Luminescent Materials and Applications



Luminescence in inorganic materials arises from excitation from an external energy source, biochemical and chemical changes or reactions. This symposium covers theoretical and experimental aspects of the luminescence phenomena in insulators, semiconductors, disordered and amorphous materials and in structures such as micro-cavity, photonic and plasmonic ones. Luminescent materials have wide applications: solid-state lighting, detectors, imaging analysis, display devices such as field emission, plasma and electroluminescent, biomarkers, medical diagnostics and photodynamic therapy, amplifiers, lasers, security labelling and energy conversion. Luminescent centers, energy transfer and migration, excited state dynamics, collective phenomena and spectroscopic methods and analyses are topic areas. The challenge to develop new compounds along with novel synthesis methods to form nano- to single-crystal compositions and methods to characterize the luminescence phenomena are included. Progress on scintillators, upconversion materials, sensor and imaging materials are covered. The goals of this symposium are to highlight recent progress, promote discussions among the participants and further develop concepts for the application of luminescent materials.

Session topics

D-1 Physics and modelling of luminescent materials

D-2 Photonic and biophotonic structures; plasmonic metamaterials; photovoltaics; non-linear optical materials and processes

D-3 Phosphors, quantum dots and low dimensional materials for lighting and displays

D-4 Advances in scintillator development

D-5 Upconversion materials

D-6 Optical fibers; sensing and imaging

D-7 New synthesis and processing methods

D-8 Advances in characterization techniques; light management for active applications

D-9 Methods to integrate luminescent materials in a device

D-10 Medical applications and bioimaging

Assisi - view

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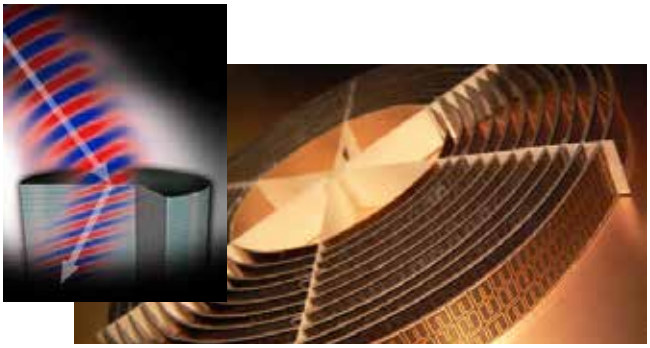
Symposium E

Progress in Metamaterials Research



Metamaterials belong to the class of artificial materials that can be engineered to exhibit properties that cannot be found in nature such as the negative index of refraction. Metamaterials offer the exciting new opportunities for controlling and modifying the flow of electromagnetic radiation. In combination with conventional materials, artificially engineered electromagnetic metamaterials open new ways to a number of applications in microwave, tetrahertz and photonic devices that range from super-resolution optical instruments and microwave antennas to photonic signal processing circuits. More recent developments include the expanding studies of metasurfaces, all-dielectric metamaterials, and hybrid metamaterials and metadevices incorporating graphene and other two-dimensional materials. Research is also very active on mechanical metamaterials, especially acoustic metamaterials designed to control, direct and manipulate acoustic, infrasonic and ultrasonic waves. This Symposium, which follows the ones on the same topic held in previous CIMTEC Conferences, seeks to enlighten recent progress and stimulate an open discussion among experts of this multidisciplinary fascinating area of research with a view on the perspectives opened by exploring its potential in present and forecast applications.

Session Topics

E-1 Physics and modelling of metamaterials systems
E-2 Microwave and THz metamaterials
E-3 All-dielectric metamaterials and metasurfaces
E-4 Nonlinear, tunable and active metamaterials
E-5 Applications of metamaterials and metadevices
E-6 Antenna, nanoantenna and waveguide applications, transformation optics, superlenses
E-7 Acoustic and mechanical metamaterials
E-8 Novel concepts and applications of metasurfaces and metadevice

Perugia - "San Pietro, Chiostro Maggiore"

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Symposium F

Graphene and Other Emerging 2D-layered Nanomaterials: Synthesis, Properties and Potential Applications

The demonstration of the isolation of stable single atomic layers of carbon by mechanical exfoliation of graphite has stimulated the interest of exploring a substantial number of other layered compounds including nitrides, dichalcogenites, oxides, silicene etc. which upon reduction to single or few atomic layers complement graphene with a range of novel fascinating properties. There is also a recent surge of considerable interest both in building materials and devices based on stacking heterogeneous layers of these compounds and to design and fabricate nanocomposites with enhanced functionalities when combined/dispersed in other inorganic or organic compounds.

This symposium aims to highlight recent progress in the synthesis of graphene and novel 2D layered materials including various doping, alloy-forming, hierarchical, multifunctional, tunable and switchable architectures, heterostructures, hybrid superstructures and nanocomposites. Predictable structure-property correlations, state-of-the-art characterization and modelling of structure, chemistry and electronic, optical, electrochemical, mechanical and thermal properties and in testing of performance in devices will be also of interest.

Advances in production processes for cost-effective and scalable growth of low-defective graphene and other 2D layered nanostructures and in techniques for their integration into electronic, optical, optoelectronic and electromechanical devices will be relevant subject of discussion as well as the wide range of ongoing and potential applications in energy, environmental, mechanical and biomedical fields.

Contributed papers are solicited in the following sessions:

F-1 General physical and chemical properties, structural and electronic characterization of graphene, graphene oxide and of single and few-layered 2D compounds: such as nitrides, oxides, dichalcogenides, silicene, MXenes, 2D polymers.....

F-2 Novel properties including spin, spin-orbit, magnetic, superconducting, thermal, thermoelectric, piezoelectric, excitonic, catalysis-related etc.

F-3 Synthesis, processing and integration of graphene and other 2D layered compounds and their nanostructures such as ribbons and quantum dots by bottom-up (chemical vapour deposition, wet chemistry, etc.) and top-down (exfoliation, unzipping) processes and property characterization including novel techniques and experimental tools. Large-scale growth. Chemical modification, interlayer and intralayer heterostructures, hierarchical architectures.

F-4 Synthesis and processing of composites of graphene and other 2D layered materials with polymers, metals and ceramics including nanoparticulate dispersion in organic or inorganic matrices.

F-5 Novel characterizations such as high-resolution imaging, chemical/spectro-scopic analysis, ultrafast methods, in-situ approaches or properties under extreme conditions, new computational approaches, 2D materials by design including genomic approaches

F-6 Application of graphene and other 2D layered materials and composites.
- Electronics, optics, optoelectronics, plasmonics (transistors, field emitters, transparent electrodes, sensors, optical modulators, touch screens, light emitters, nanoantennas....)
- Energy generation, conversion and storage (fuel cells, photovoltaic cells, thermoelectric generators, batteries, supercapacitors...)
- Environmental applications (catalysis, ultrafiltration...)
- Biotechnology, bioengineering and medical applications (DNA translocation, smart drug delivery, tissue engineering, contrast agents/bioimaging, theranostics, neural interfaces...)
- Structural materials
- Other

Symposium G

Multifunctional Inorganic One-dimensional Nanostructures: Status and Potential

Pushed from the great deal of scientific and technological excitement attracted from more than a decade by the new carbon nanomaterials, a great variety of inorganic 1-D nanostructures (nanotubes, nanowires, nanofibers, nanobelts) and their composites are being extensively investigated from the fundamental physical properties to applied materials research in nanoelectronics, nanophotonics, energy production and storage, sensors, catalysis, biomedicine, structural applications, etc.
Essential to exploit the advantages deriving from the nanoscale and to achieve a deep understanding and control of relationships among synthesis, structure and properties has been the identification of refined growth techniques and the development of appropriate structural and functional characterization tools at the nanoscale. Research is now focused on further refining basic knowledge on quantum confinement effects, on scaling up reliable and reproducible production processes and in opening new perspectives for applications. The development of higher-level multifunctional nanostructures integrating novel/multiple functionalities by controlled doping and compounding strategies featuring complex hierarchical and hybrid organic-inorganic heterostructures is actively pursued as a view to approach efficient nanoscale frameworks/devices design and fabrication.
This symposium aims to bring together experts from different disciplines to discuss most recent progress in theory, synthesis, characterization, and assembly of inorganic 1-D multifunctional nanostructures as well as the perspectives opened by exploiting their potential for ongoing and future applications.

The following Sessions are planned:

G-1 Growth and functionalization of 1-D nanostructures
Advances in growth methods. Core /shell heterostructures, hybrid heterostructures, hierarchically assembled nanostructures. Doping, alloying, nanoparticle incorporation, surface functionalization. Molecular approaches for purification, modification and sorting, high yield synthesis, process scale-up.

G-2 Structure and properties of 1-D nanostructures
Morphological and structural characterization. Electrical, magnetic, optical, thermal and mechanical properties. Charge transport mechanisms. Catalytic activity. Surface chemistry. Advances in nanoscale testing methods.

G-3 Modeling and simulation of 1-D nanostructures
Theoretical modelling and simulation of growth, electronic structure, defect state, charge transfer, properties.

G-4 Processing, characterization and modeling of 1-D nanostructure-polymer/metal/ceramics composites

G-5 1-D nanostructures-based applications
Analysis of recent achievements on specific materials/device/property design and processing approaches relevant to ongoing and prospective application in:
- Nanoelectronics and nanophotonics
- Energy and environment (photovoltaics, fuel cells, batteries, supercapacitors nanosensors, catalysis, nano/molecular separation)
- Biomedical (biosensors, bioimaging, drug/gene carriers, theranostic agents, neural interfacing, multifunctional coatings)
- Structural applications

Orvieto - view

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Symposium H

Electroactive Polymers and Shape Memory Polymers: Advances in Materials and Devices

The special capability of inducing large deformation, fast response and long lifetime, light weights, lower density and higher resilience compared to other smart materials (piezoelectric ceramics and shape memory alloys), brings electroactive polymers (EAPs) and shape memory polymers (SMPs) into a broad application field. The intrinsic properties of EAPs not only as actuators targeted to augment and possibly replace biological muscles, but also in a number of different areas as sensors, displays, energy harvesters, and microelectronic, optical, bio-mimetic and MEMS devices are exploited. SMPs can deliver active properties and autonomous response. Large-scale actuated bending, extending, and folding structures would enable the deployment of antennae in space and the development of morphing wings on unmanned aerial vehicles. Other applications for new active materials include smart sensors, solar arrays, tactual displays, self-healing composite systems, smart textiles and fabrics, shape adaptive systems, biomedical devices, energy efficient locomotion and concealment. In order to improve the important progress, several challenges must be addressed if EAPs and SMPs are to be a successful and viable technology. A deeper theoretical and practical understanding on how these materials work, the ideation of new design approaches to efficient operation, and ensuring reliable and reproducible processing and characterization methods for materials and devices as well as stimuli methods are among the several issues to cope with.
This symposium, following the ones on the same topic held on the frames of previous CIMTEC Conferences, is aimed at presenting the current status of EAPs and SMPs research, showing the ongoing case applications and discussing the potential of smart materials' technology in the future.

Session Topics

H-1 Advances in EAP materials

Synthesis, processing, shaping, fabrication

- Field activated EAPs: dielectric, ferroelectric, electrostrictive and liquid crystalline polymers
- Ionic EAPs: conductive polymers, IPMCs, responsive gels, carbon nanotubes
- Bulks, fibers, thick/thin films, composites, hybrid systems
- Electrode materials and conducting EAPs

H-2 Analysis and mechanical mechanisms

- Constitutive Theory
- Dynamics and thermodynamics, energy dissipation
- Modelling, simulation and optimal design
- Phase transitions
- Mass/charge transport
- Polarization
- Stability, failure and allowable area

H-3 Device development and integration technologies

- EAPs sensors and actuators design and engineering
- EAPs-based M/NEMS, bio-M/NEMS, MOEMS
- Transducers
- System integration: driving electronics, packaging, software, hardware, signal processing and control
- Devices/system design, and modelling
- Efficiency, performance, reliability and lifetime issues
- Flexible and stretchable electronics devices

H-4 Applications of EAPs

- Biomedical
- Soft Robotics
- Biomimetics
- Biochemical
- Energy system: Power Generation and Energy Harvesting
- Optics
- Aerospace
- Microelectronics
- Noise and vibration control
- Smart structures
- Machine
- Haptic devices
- Pumps and loudspeaker
- Industry, consumer goods, etc

H-5 Advances in SMPs

- Fabrication of SMPs
- Multi-shape memory effect
- Structures: fibers, bulks, and forms
- Multifunctional properties
- Simulation and constitutive models

H-6 Applications of SMPs and their composites

- Deployable structures
- Morphing structures
- Biomedicine and bioinspiration
- MEMS and NEMS applications
- Self-healing composite system
- Textiles
- Foams

Symposium I

New Concepts and Advances in Photocatalytic Materials for Energy and Environmental Applications

Solar-driven processes are becoming a key factor to move to a low-carbon economy and sustainable society. For this reason, there is a fast growing scientific interest on this subject to replay to the societal challenges for a sustainable energy supply and clean environment. There is the need, however, to make a step-change in the development of new concepts and innovative photocatalytic materials to properly address these challenges. Photocatalysts are widely utilized to clean and remediate our environment and their use in advanced devices to produce electrical energy or solar fuels in rapidly expanding. Semiconducting photocatalytic materials possess multi-functional properties, which allow their use in various areas from photocatalytic environmental remediation, water splitting for hydrogen fuel, CO2 reduction, self-cleaning coatings, electrochromic devices and sensors, and low cost solar cells. The nano-architecture design of these materials is of critical relevance to achieve these different functional characteristics and realize an efficient energy conversion. There is the need to gather together multiple competences to accelerate the development of these nanomaterials for solar energy and environmental applications.

This Symposium, which follow the one on the same topic held at CIMTEC 2014, aims to provide a multi-disciplinary forum for scientists, engineers and industry experts to break new ground in the discussion, and realize a cross fertilization and progress in the understanding of the design criteria for their use. Among the recent developments that will be highlighted in the symposium are advances in synthesis of novel materials with tailored nano-architecture; the preparation of thin films and nanostructures; the advanced characterization by experimental and theoretical methods of these materials and of their structure-performance relationships; processing techniques, device fabrication and stability; advances in environmental applications and in air quality improvement; novel concepts, technologies and materials for photocatalysis.

Session Topics

I-1 Design elements and advanced concepts for photo-functional materials

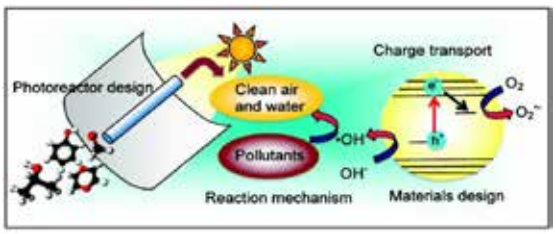
- Band-gap engineering of photocatalysts: optical, electronic, and catalytic modifications
- Multiphoton band-gap engineering, photonic materials
- Superhydrophilic, amphiphilic and antifogging surfaces
- Hybrid photocatalytic nanomaterials, Heterojunctions
- Optimizing interfaces in multilayer systems
- New types of quantum-dots and robust senstizers, antenna effects

I-2 Understanding fundaments of photoinduced processes and charge transport

- Charge transfer and recombination
- Theoretical and computational investigation
- Computational screening of new materials
- Relation between nanostructure and photofunctional behavior
- Photoelectrochemical devices

I-3 Design approaches for advanced applications

- Development of high surface area and porous photocatalytic materials and photoanodes
- Innovative materials for third generation solar cells (Dye sensitized solar cells, quantum dotc ells, tandem/multi-junction cells, hot-carrier cells, etc.)
- Photocatalytic solar fuel (H2, CO2 reduction) generation
- Selective photo-oxidations for organic synthesis, tandem systems
- Environmental applications: air /water treatment, anti-bacterial surfaces
- Photo-catalytic fuel cells



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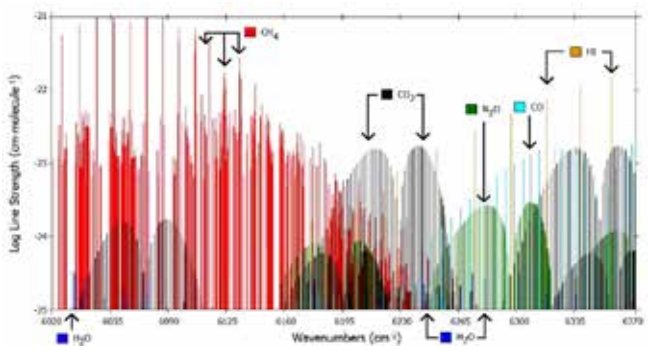
Symposium J

Functional Nanomaterials for New Generation Solid State Gas Sensors



Solid state gas sensors based on electrical and electrochemical transduction principles are receiving increasing attention in both industry and academia for their widespread range of applications spanning from comfort, safety, security, medicine to environmental monitoring and process engineering.

The today availability of a large palette of new nanomaterials with very peculiar functional properties is an unprecedented tool to address the demand for more sensitive, selective, stable, smaller size and with a lower operating temperature gas sensors suitable for microelectronics integration.

Through the exploitation of the high reactivity of nanomaterials due to their extremely high surface-to-volume ratio, their very special surface states, quantum confinement effects and outstanding electronic properties, the goal is to create a new generation of stable and reproducible miniaturized sensors with increased sensitivity and selectivity, shorter response time, good reversibility, low energy consumption, and suitable to be mass produced at low cost.

This symposium aims at enlightening recent progress and perspective views of materials and technology achievements in solid state nanosensors for gas and organic and inorganic volatile compounds detection.

Matter covered includes:

- Basic principles of gas and volatile compounds sensors
- New nanomaterials for semiconductor and electrochemical gas sensors; novel functionalization approaches by molecular engineering; nanostructure design and control of the major factors affecting sensing performance;
- Gas sensor devices design and evaluation: nanosensor architectures by top-down, bottom-up or combined approaches for (multi)signal layers; functional hybrid heterostructures; integration process into macroscopic and micromachined substrates; sensitivity, selectivity, response time, power consumption and signal stability and reproducibility
- Ongoing and prospective applications

Authors are encouraged to submit abstracts to one of the following Sessions:

J-1 New nanocarbons (CNTs, graphene, new 2D materials)-based gas sensors; nanosilicon-based gas sensors

J-2 Semiconductor/ion conduction oxides-based gas nanosensors

J-3 Nanometal-based gas sensors; polymer-based gas sensors

J-4 Nanocomposite/hybrid/heterostructure-based gas sensors

Spello - "Porta di Venere"

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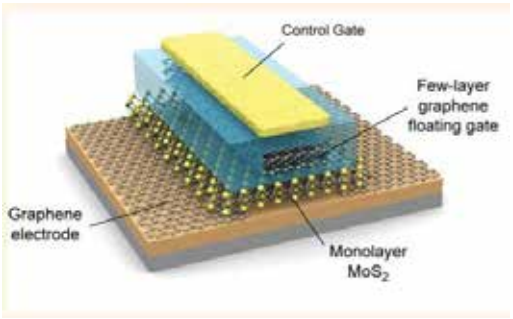
Symposium K

Non-volatile Memory Devices: materials, emerging concepts and applications



Non-volatile memory devices are currently key elements of several electronic and portable systems (digital cameras, solid state disks, smartphones, computers, e-books, tablets,..) and their market and potential applications are expected to continuously increase in the next years. Even though the Flash memory represents today the leading technology, several emerging non-volatile memory concepts, exploiting innovative inorganic and organic materials, as well as new storage mechanisms, are under investigation to achieve better performance, higher scalability, and to address novel applications. Besides pursuing the downscaling of non-volatile memories in terms of minimum size and integration density, which is approaching physical limits, the new paradigm is to develop devices that can integrate multiple functionalities, such as computing and storing information at the same time. This approach will enable the fabrication of novel nanoelectronics circuits with potential applications in several fields, including flexible electronics, computation schemes emulating the brain functionality, non-volatile logics.

This symposium, which follows the ones on the same topic held in previous CIMTEC Conferences, will address recent advances on organic and inorganic non-volatile memory devices, with focus on innovative storage concepts beyond Flash, new materials and devices, integration schemes and selectors for the storage elements, understanding and modelling of the physical mechanisms for data storage down to the nanoscale, memristive devices and novel applications towards adaptive electronics.


Gubbio - "Palazzo dei Consoli"

Session Topics

K-1 Resistance switching memories (ReRAM)
- Electrochemical metallization (EMC) and valence change (VCM) memories
- Polymer-based and hybrid organic & inorganic memory devices
- Advanced characterization techniques, mechanisms and modelling
- 3D architectures, cross-bar arrays and selectors

K-2 Phase change memories (PCM)
- New materials and concepts for PCM, including low-dimensional cells
- Theory and modelling
- Interfacial phase change memories
- Integration schemes and scaling

K-3 Magnetic, ferroelectric and multiferroic materials for memory devices
- Tunnel junctions and spin transfer torque (STT)
- Racetrack memory and emerging three terminal magnetic device materials
- FeRAM and Ferroelectric FET
- Novel materials including organic ferroelectric and magnetic materials and nanostructures for memories

K-4 Memristive materials, devices and emerging applications
- Novel memristive-based circuits
- Non-volatile logics
- Neuromorphic architectures, reconfigurable electronics and cognitive applications

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Symposium L

Smart and Interactive Textiles

SMART and Interactive Textiles are designed and developed to sense and adapt/respond with their environment in a predetermined manner. This behavior characterizes their multidisciplinary scope and offers numerous end uses in Medical, Sports and Fitness, Military, Fashion, Automotive, Aerospace, Build Environment and Energy Industries. We have already seen SMART textile products in protective and performance clothing, fabric switches, heating and cooling, wearable technologies, monitoring health care, nano fabrics and toys.

The major players in the USA are; E.I. Du Pont De Nemours & Co, Exmovere Holdings, Inc., International Fashion Machines, Inc., Kimberly-Clark Health Care, Marktek Inc., Milliken & Company, Textronics, Inc., Noble Biomaterials, Inc., Outlast Technologies LLC., in the UK; QinetiQ, Intelligent Clothing Ltd., in Germany; Interactive Wear AG, in the Netherlands; Royal Philips Electronics N.V., Schoeller Textiles AG in Switzerland, Toray Industries in Japan and Smartex S.r.l in Italy.

The world market for SMART and Interactive Textiles is to grow in CARG at over 20% in the next three years. But with demand exceeding supply due to complex Research and Development and with slow product to market, this Symposium is timely because it aims to promote recent research achievements and to provoke new discussions and for new innovations by bringing the international academy and industry communities together. The collaboration and cooperation for this exceptionally multidisciplinary area is highly recognized by this symposium and I call all researchers and companies with single discipline/ multidiscipline expertise to come forward and participate in the symposium. The Symposium, which follows the ones on the same topic held in previous CIMTEC Conferences, will highlight four sessions under; Adaptive/Active Textiles, e-Textiles, Functionality, Manufacturing and Applications and Commercial and End Uses, but they are neither exclusive nor they are limited to them. SMART and Interactive Textiles are particularly important in providing the means of increasing quality of life and as such they are the underpinning materials for well being and recreation, for patient rehabilitation and the elderly population and for energy.

Session Topics

L-1 Adaptive/active textiles
- Nanoscale modification of the intrinsic properties of fibres by making them sensitive to electric and magnetic fields, to motion, humidity, light, temperature, and chemical and biochemical environments
- Integrating/dispersing/coating textiles with stimuli-responsive smart materials (e.g. electroactive, shape memory, Cuprous-Zinc SMA, phase change, micro capsules, encapsulated Bi-gels, Bi-material film laminates, membranes, nanotubes, graphene, conductive, chromic materials) for new or improved functionality
- From active to ultra SMART
- Textile sensors

L-2 E-textiles
- Advances in conformable electronics for fabric based devices
- Embedding sensing/actuation/communication capability into functional fabrics and into wearable wireless platforms: sensors, processors, power sources, interconnects, antennas
- Advances in fibertronics and e-textile hybrid systems.
- Electronics OEMs and components
- Packaging issues
- Sensors networks, data mining, signal processing and control

L-3 Functionality, manufacturing, application
- Functionality
- Sensing and actuating
- Communication and information
- Energy harvesting and storage
- Environmental protection
- Thermal regulation,
- Optical/photonic
- Antibacterial
- Self cleaning, hydrophobic
- Self shaping, self healing

L-4 End uses, commercial and applications
- Design, Manufacturing, Testing, Qualification, Reliability, Field trials
- Healthcare and medical
- Ergonomics and rehabilitation
- Fashion
- Work and emergency disaster wear
- Telemonitoring (elderly, sports, patients, infants, military, fire and special forces)
- Military and security
- Sport and wellness
- Lighting systems
- Civil engineering
- Structural monitoring and control
- Transportation (automotive, aerospace)
- Personal mobile systems
- Energy & environment

Symposium M

Next Generation Micro/Nano Systems

Technologies for the fabrication of devices and systems at micro- and nano-scales continue to advance and diversify due to the rising demands for miniaturisation, cost reduction, functional integration and performance enhancement coming from a number of applications including energy, transport, telecommunications, information technology, civil engineering, medicine and other important areas of our everyday life. Nevertheless, the development of innovative micro-nanofabrication approaches is becoming not only a technological step, but it is strongly correlated with our personal and social life.

For this reason, worldwide, scientific and technological research focused on the development and the manufacturing systems that employ nano- and micro-structures is at the forefront of scientific and economic competition.

In this context, the next generation of Micro/Nano Systems has to provide advanced functionalities through combination of innovative nanomaterials and micro- nanotechnologies, for envisaging an increasing technological development on a broad range of powerful applications addressing societal challenges.

These fast technology developments have contributed to the growth in many areas of the research (health, food, environment and ICT) where they can bring significant impact.

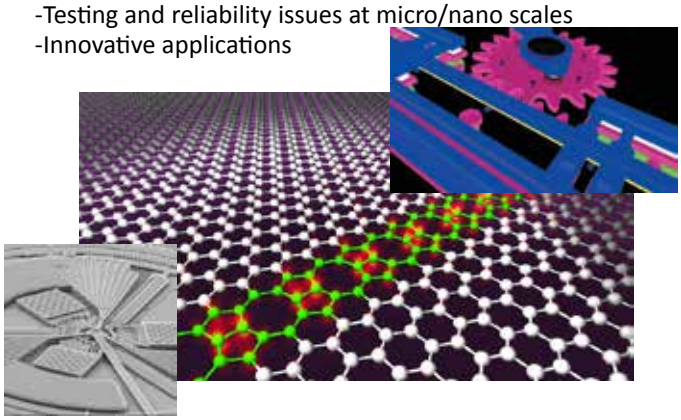
If the major technological issue of the microelectronics is related to the scaling down of the critical dimensions and to reduction of the power consumption and costs, the fully exploitation of MEMS/NEMS requires innovative concepts, advanced processes, and pioneering designs and simulation approaches for materials and devices to be integrated in reliable, performing and cheap practical systems.

In order to satisfy all these expectations, the integration of heterogeneous micro nano-technologies with new active, responsive, and nano-engineered materials, such as piezoelectrics, nanowires, graphene, bioactive and biodegradable ceramics and polymers, plays an important role.

The objective of the Symposium, which follows the ones on the same topic held in previous CIMTEC Conferences, is twofold: a) to share the progress in the field and b) to identify the technological orientation and future challenges offered by the connection between innovative materials and micro/nanotechnologies. The involvement of representatives of key research disciplines will offer a podium to enable community building and networking, the sharing of progress in both technology and application development, and the identification of common interests.

Subject matter include but is not limited to:

-Advanced materials for sensors and actuators
-Nanoscale and quantum effects
-Innovative devices and sensing principles
-Design, simulation and theoretical concepts
-Technologies for MicroNanoBioSystems (MNBS)
-System Integration and Electronics for smart sensors
-Novel lithographic and nanotechnology approaches
-Testing and reliability issues at micro/nano scales
-Innovative applications



Session Topics

M-1 Physical MEMS/NEMS

M-2 Chemical micro/nano-sensors and systems

M-3 MOEMS/NOEMS

M-4 Smart micro-nano system and components integration

M-5 Radio frequency MEMS

M-6 Energy harvesting and power supply MEMS

M-7 Micro(nano)fluidics and Lab on Chip; Bio-MEMS/NEMS

M-8 Flexible sensors technology

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Symposium N

Progress in Wearable/ Wireless and Implantable Body Sensor Networks for Healthcare Applications

Fuelled by the rapid growth in physiological sensors, microfluidics, wireless communication capabilities, and developments in materials chemistry and rapid prototyping/3D printing, new generations of wearable wireless and implantable body sensor technologies are emerging, driven by demand across a broad range of civilian and military applications. Of primary interest for this technology is personal health and healthcare applications, especially those requiring continuous monitoring of vital parameters of people suffering from chronic diseases such as asthma, diabetes, epilepsy, Parkinson's disease and heart attacks. However, in spite of advances in wearable/ wireless BSNs and implantable bio-sensors and monitoring devices, further progress is needed in system integration, sensor miniaturisation, long-term reliability, autonomous operation, context aware operation, and data transmission and signal processing, for BSNs to become a truly pervasive technology that is compliant with non-technical legal, regulatory and ethical constraints. This Symposium, which follows the ones on the same topic held in previous CIMTEC Conferences, will share some Sessions with Symposium "Smart and Interactive Textiles", and aims at bringing together researchers and engineers of academia and industry from multiple disciplines to address and debate these technical and regulatory challenges.

Session Topics

N-1 Advances in sensing devices for biomedical monitoring

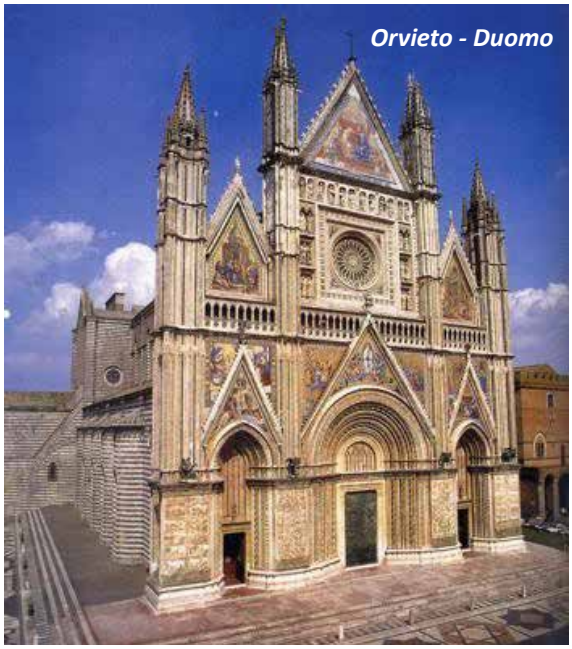
N-2 Smart fabrics and wearable patches

N-3 Wearable and implantable sensor integration

N-4 Low power electronics, energy harvesting, sensor network architecture

N-5 Materials chemistry/biology and rapid prototyping/3D printing additive fabrication technologies

N-6 Applications in healthcare and personal health monitoring



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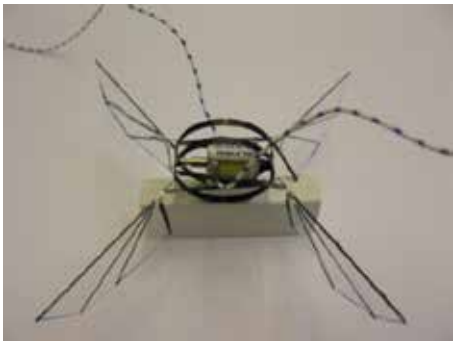
Symposium O

Mining Smartness From Nature

From Bio-inspired Materials to Bionic Systems



Nature has been engineering its creations for millions of years and evolution has resolved many of nature challenges leading to highly effective solutions achieved by minimal use of resources. A deep insight into the intelligent and complex laws of nature governing biological events is a key of immense potential to discover highly effective and efficient ways in which life' s strategies can be successfully applied to human systems for long-term sustainability. Novel and efficient materials, structures, tools and processes have already resulted from mimicking or adapting mechanisms and capabilities from nature and more may be envisaged for the near future because of : i- the increased understanding of the biological world and how to manage matter down to the atomic scale; ii- the development of novel algorithms and theories, and iii- the exponentially increasing power for computation and multi-scale simulation of processes, materials, structures and whole systems. Objective of this symposium, that follows the ones on the same subject held in the frames of CIMTEC 2008 and 2012, is to merge biological information with materials science, engineering and medical sciences at the purpose of exploring new ideas and accomplishments, for the practice of bio-inspired design to gather momentum and offer innovative solutions.

Sessions will encompass a broad spectrum of biologically inspired technologies and will cover new achievements in biological mechanisms as models for mimicking, bio-inspired materials, bio-sensors, bio-actuators, adaptive and autonomous structures, bio-photonics, bio-inspired robots, intelligent software, systems and control, etc. for applications ranging from energy and environment, home, sport and leisure, to aerospace structures, medical diagnostics and therapeutics and information technology.

Session Topics

O-I Algorithms, mechanisms and structures in nature as inspiration for mimicking
Evolution strategy as a mean of optimisation; Modelling and simulation of biological mechanisms; Biomechanics, DNA origami, self replication; Theory, modelling, numerical simulation of processes, properties and behaviour of nano to macro biological structures and systems.

O-2 Bio-inspired and bio-enabled materials and manufacturing

- Biomineralization, biomimetic processing, self-assembly, template-directed synthesis, patterning ...
- DNA-/peptide/protein-/lipid-based hierarchically

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organized functional structures; organic/inorganic hybrid composites, fibers, coatings, functionally graded materials; lighweight/self-healing/damping/ self-adaptive materials...

O-3 Functional bio-inspired surfaces and interfaces

Sticking/anti-adhesive/superhydrofobic/self-cleaning/ thermo- and hydro- regulating/anti friction/drag reduction/sound generation,/defense surfaces; reversible stimuli-sensitive biointerfaces; multifunctional bio-inspired surfaces. Bionanointerfaces.

O-4 Bio-inspired sensors and actuators

- Bio-sensing and sensors: visual and acoustic, smell and taste, infrared, distance, electric and magnetic field, fluid flow, strain, flow, optical, tactile, artificial nose, artificial tongue, etc.
  Bio-inspired smart sensor networks
- Bio-inspired actuators, nano actuators
  Biomolecular sensors and actuators

O-5 Biologically inspired systems and robotics

- Signal processing, micro and molecular machines, Neuromorphic devices
- Haptic interfaces and systems; Power supplies and harvesting; Control algorithms and systems; Cognition; Cyber technology; Mobility; Energetically autonomous robots; Biomimetic techniques for expressive animation
- Bio-MEMSINEMS; Bio-nanorobotics

O-6 Bio-inspired optics and photonics

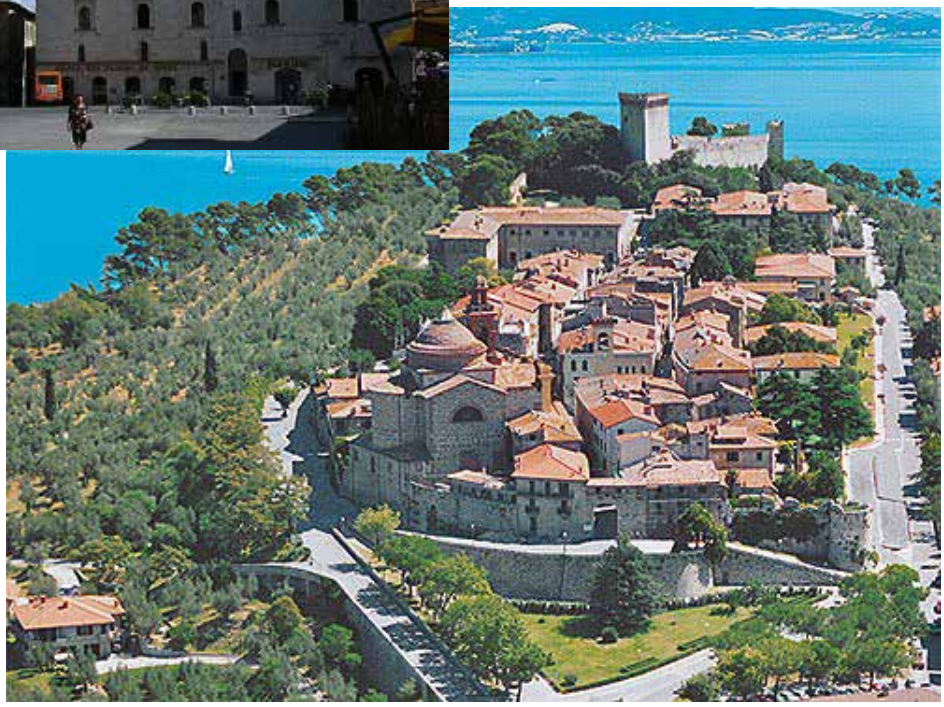
Nature strategies to control light. 3D natural photonic architectures.Structural colors. Self-assembly of tunable hierarchical biophotonic structures. Smart optical coatings, color-tunable biophotonic fibers, bioinspired light collectors, photonic encryption systems, biophotonic MEMS, plasmonic structures…

O-7 Biologically inspired functional/smart structures

Morphing/deployable/packable structures. Nastic structures. Compliant structures. Lightweight structures. Autonomous smart structures and systems.

O-8 Ongoing and perspective applications of bio-inspired technologies

Todi - "Piazza del Popolo"



Lago Trasimeno - "Castiglione del Lago"

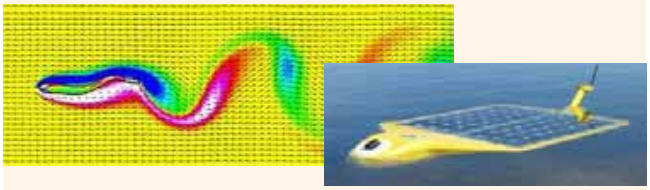
Special Session O-9 / P-5

Biomimetic Design and Motion Control in Autonomous and Remotely Operated Underwater Vehicles

Joint Session between Symposium O "Mining Smartness from Nature: From Bio-inspired Materials to Bionic Systems" and Symposium P "Embodying Intelligence in Structures and Integrated Systems"

Bioinspired autonomous undersea vehicles (AUVs) and Remotely Operated Vehicles (ROVs) that exploit swimming modes of fishes and other characteristics of aquatic animals have been the object of interest for many years for their strategic importance in a number of applications including, among others, surveillance and environmental monitoring. Contributions for both propulsion and manoeuvring purposes have been gained from hydrodynamics, adaptive and smart materials and structures and neuroscience-based control. Nevertheless further research and development advances are required to move forward to extensive real applications. Main focus of this special session is to collect state-of-the-art contributions to the following and related areas:

- Hydrodynamics of underwater propulsion
- Biomechanics of aquatic animals locomotion and biological control systems as inspiration for underwater vehicles
- UAVs and ROVs bio-inspired propulsion and maneuvering
- Perception and cognition in underwater unstructured environment
- Adaptive materials and morphing structures; sensors and actuators
- Embodied control of propulsion and locomotion in water
- Neurorobotics and neuro-inspired control in underwater robots
- Modelling and simulation of processes and structures



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Special Session O-10 / P-6

Biomimetic Morphing of Unmanned Aerial Vehicles

Joint Session between Symposium O "Mining Smartness from Nature: From Bio-inspired Materials to Bionic Systems" and Symposium P "Embodying Intelligence in Structures and Integrated Systems"

Research on Unmanned Air Vehicles (UAVs) is gaining increasing strategic importance driven by civil, commercial, research, security and military purposes. Progress achieved in morphing UAVs may also be an ideal platform for novel approaches to increase the capabilities of manned aircraft. Biomimetic design of morphing UAVs is aimed at addressing novel concepts of active materials and biomimetic multifunctional structures, fluid dynamics and neuroscience based control capable of autonomously and adaptively change aircraft shape to optimal configurations for maneuvering purposes in a variety of flying conditions by taking inspiration and exploiting the flapping flight of insects and birds.

Focus of this Special Session is to collect state of the art contributions to the following and related topics:

- Avian Inspired Multifunctional Morphing Air Vehicles
- Bio-inspired locomotion control
- Biomechanics of bird and insect flight
- Distributed sensing and actuation
- New smart, adaptive materials and biomimetic/bio-inspired multifunctional structures for airframe morphing
- Bioinspired sensor and actuators; structurally integrated distributed actuation and sensing systems
- Self-Adaptive Neuromorphic Circuits
- Micro sensors and actuators for insect-size robots
- Assessing power efficiency and actuation performance in field testing
- Numerical simulations; video demonstrations

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Symposium P

Embodying Intelligence in Structures and Integrated Systems

Research is actively pursued aimed at applying multi-functional capabilities of smartness and intelligence to existing and novel structures and systems. Degree of smartness/intelligence varies from semi-passive smart materials, which adaptively respond to an external stimulus, by varying some of their characteristics, to mechatronic systems that embody the inherent capability of self-sensing, diagnosis and control by the synergistic integration of smart materials, sensors, actuators and control electronics. The dream is for future structures and systems, where integrated smart devices would be used to sense exogenous stimuli and internal material conditions decide on course of action, and then autonomously implement an effective reaction strategy.

A number of applications and integrations of smart materials, devices and structures into industrial systems are emerging nowadays. More are in the offing, driven by the availability of new multifunctional materials and by the exponential increase in computing capabilities, and refined design, modelling, control and optimisation strategies that create the premises for a potential expansion to smart autonomous structures and systems.

The conference, which follows the ones on the same subject organized in the frames of CIMTEC 2008 and CIMTEC 2012, will highlight advances in adaptive materials and in novel sensor/actuator and micro systems, and their integration in mechatronic structures and systems of various complexities.

Among the scopes of the Symposium will be:

i. Physical mechanisms, constitution behaviour, processing characterization and modelling of new smart and multifunctional materials and devices for intelligent structures and systems,
ii. system level evaluation of smart structures,
iii. the interplay of actuation, sensing and processing capabilities,
iv. the ideation and numerical modelling and simulation of new actuation and sensing techniques for integrated systems,
v. the analysis, design and testing of active/passive smart dynamic and static structural components and signal processing,
vi. micro and nano technology, control electronics and materials science involved in interfacing different materials and functions,
vii. reports on traditional industrial systems where the incorporation of smart materials and integrated devices favours an enabling new capability or remarkable performance enhancement and/or cost reduction,
viii. solutions to new industrial and commercial applications of smart materials and integrated structures that have well matured beyond the concept stage and new ideas and directions for future developments.

Contributions are seeked from experts of materials science, theoretical and applied mechanics, electronics, electromechanics and manufacturing.

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Hoon SOHN, South Korea
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Wieslaw J. STASZEWSKI, Poland
David WAGG, UK

Session Topics

P-1 Smart Materials/Sensors/Actuators/MEMS/NEMS

- Ferroelectrics, piezoelectrics, electrostrictives, magneto-strictives
- Shape memory metals and polymers
- ER/MR fluids, ferro-fluids
- Multifunctional (nano)materials and (nano) composites
- Self healing materials systems
- Multifunctional sensors and sensor networks
- Wireless sensors networks
- Sensors for harsh and extreme environments
- Fibre optics sensors
- Nano-sensors
- Actuator and nano-actuator devices
- MEMS/NEMS technologies
- Physical mechanisms, constitutive behaviour
- Software tool and optimal design
- On-duty smart materials and devices behaviour
- Modelling of smart materials and sensor/actuator performance

P-2 Integration Technologies

- Embedded and distributed sensors: simulation, performance, self-diagnostics
- Sensor characterisation, qualification, standardisation, reliability
- Sensor/actuator coupling with structure, interfaces and interfacial problems
- Energy transfer mechanisms, structural dynamics
- Energy harvesting and scavenging
- Integrated micro- and nano-structures
- Mechatronic systems integration
- Model development and control design for integrated systems and microsystems
- Optimisation techniques for sensor/actuator selection, architecture and feedback design
- Signal processing: data mining, neural networks, data fusion for large sensor arrays, fault recognition and recovery
- Remote control and communication

P-3 Smart Structures and Integrated Systems

- Passive, active and hybrid vibration control systems
- Active and semi-active shape control
- Smart components, devices and sub-assemblies
- Nastic and morphing structures
- Fault tolerant structures
- Structural health monitoring
- Damage detection, mitigation and repair
- Remote sensing
- Adaptive and self/diagnosing structures
- Autonomous intelligent structures and sensing systems

P-4 Ongoing and Perspective Applications

- Aerospace, MAV/UAV
- Morphing systems
- Civil engineering
- Defence
- Naval and ground transportation
- Marine and offshore structures
- Flexible robotics
- Energy systems
- Communication technologies

Special Session O-9 / P-5

Biomimetic Design and Motion Control in Autonomous and Remotely Operated Underwater Vehicles

Joint Session between Symposium O "Mining Smartness from Nature: From Bio-inspired Materials to Bionic Systems" and Symposium P "Embodying Intelligence in Structures and Integrated Systems"

Programme Chair: Cecilia LASCHI, Italy

(Full details see page 18)

Special Session O-10 / P-6

Biomimetic Morphing of Unmanned Aerial Vehicles

Joint Session between Symposium O "Mining Smartness from Nature: From Bio-inspired Materials to Bionic Systems" and Symposium P "Embodying Intelligence in Structures and Integrated Systems"

Programme Chair: Daniel INMAN, USA

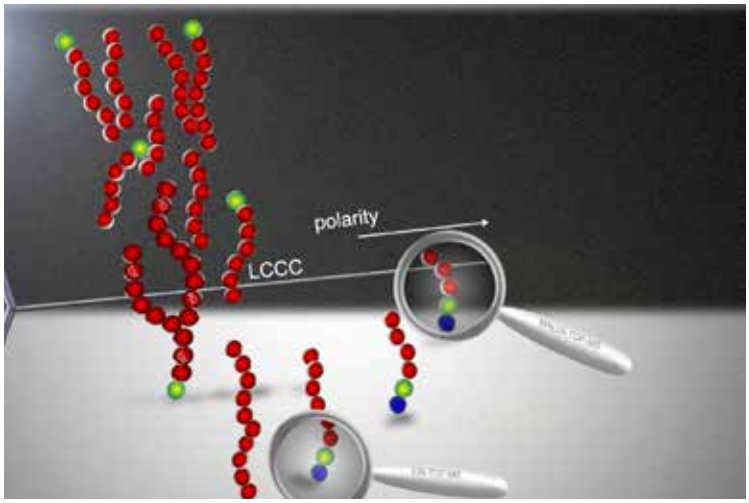
(Full details see page 18)

11th International Conference

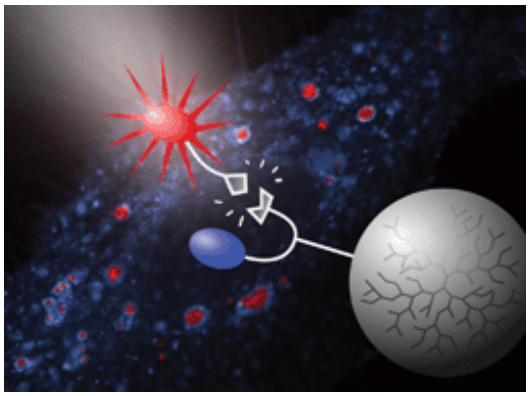
Medical Applications of Novel Biomaterials and Nanotechnology

The convergences among materials, electronics and biological systems at the nanoscale are fuelling unprecedented opportunities in the biomedical area through the development of novel minimally invasive targeted therapies, imaging and diagnosis methods. Major objectives of the conference, that follows the same subject held in previous CIMTEC conferences, is to provide a synergic approach covering applied chemistry and physics, materials science, electronics, biochemistry and medicine to enlighten how deeper insights into biological events and its interplay with nanotechnology may support the development of new generations of materials, micro-nano-devices and molecular level approaches to solve relevant biomedical problems.

The conference particularly aims to report recent progress in the synthesis and characterization of new or creatively modified stimuli-responsive, active and multifunctional metals, ceramics, polymers, gels; smart nanoparticles, functionalized 1-D and 2.D nanostructures, Q-dots; hybrid, composites, self-organized materials, hierarchical bio-nanostructures, as well as the potential for their implementation in selected challenging areas of nanomedicine such as: i- multi-scale approaches to regenerate and engineer new soft and hard tissue; ii-innovative targeted drug delivery and release platforms; and iii-new materials systems for medical imaging/ therapy including multi-modal theranostics.



Materials and micro/nano devices for implantable neural interfaces and the prospects of functionalized carbon nanotubes and graphene in medicine will be the objective of two Focused Sessions to complement conference contents.



Overall, the study of systemic interactions in the body environment such as side effects, biocompatibility and biofunctionality will be essential issues to promote the discussion for bioinspired strategies in materials and device design to be effectively implemented into clinical practice.

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Assisi - "Basilica Superiore"

Topics:

Q-1 Advances in stimuli responsive, active and multifunctional biomaterials

- Smart nanoparticles, functionalized 1-D and 2-D nanostructures, Q-dots
- Stimuli-responsive polymers and gels, liquid crystalline elastomers
- Shape-memory and shape-changing polymers and alloys
- Bioactive and biodegradable ceramics and glass
- Multifunctional thin films and coatings; multilayer constructs
- Active/stimuli responsive hybrid, composite, self organized hierarchical nanostructures
- Supramolecular materials, natural and bio inspired materials
- Molecular modelling of structures and functions

Q-2 Multifunctional materials in tissue engineering and regenerative medicine

- Hydrogel-based biomaterials; porous scaffolds; nanoparticles; metal, ceramic, polymer, lipid-based and composite functional materials
- 3D scaffold design, fabrication and evaluation
- Microfabrication techniques (microfluidic tools, bioimprinting, micro/nanopatterning)
- Growth factors delivery vehicles
- Biomaterials to modulate stem-cell microenvironments
- Vascularization of tissue-engineered constructs
- Self healing mechanisms
- Biomimetic materials for engineering load-bearing tissues
- Biomechanics of soft and hard tissues
- In vitro and in vivo studies, biocompatibility, biofunctionality and tossicological issues
- Advanced modeling and characterization methods for biomaterials, scaffolds and tissues

Q-3 Smart drug /gene delivery and release systems

- Systems for targeted delivery: peptides, proteins, gene therapy agents and vaccines
- Carrier vehicles: nanoparticles/nanotubes, liposomes, polymeric micelles, dendrimers,
- Drug targeting and targeting and imaging agents to site/specific delivery.
- Controlled release systems, triggering mechanisms
- In-vitro and in-vivo studies and models for drug transport, absorption metabolism and retention mechanisms


Assisi - "Basilica Inferiore"

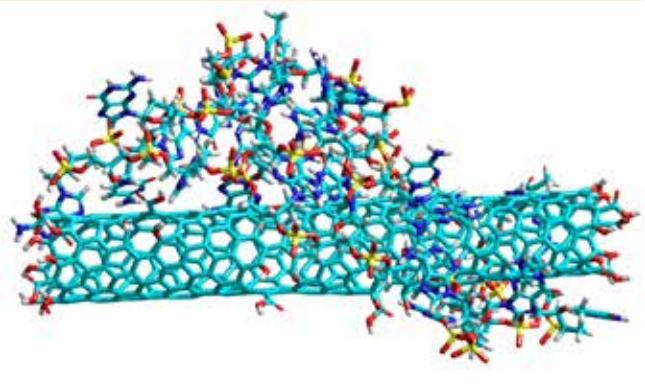
Q-4 Nanomaterials systems for bio-imaging and therapy

- Functionalized inorganic and organic nanoparticulate system for bio-imaging:
  metallic, metal oxide, polymeric, QDs
- Nanotubes and nanowires
- Agents/devices for in-vitro and in-vivo imaging, diagnostics and therapy:
  Optical /nanophotonic agents
  Nanomagnetic agents
  Photoacustic agents
  Nanothermal agents
  Radiological agents
  Multimodal bio-imaging agents
  Theranostic nanocarriers
  Multimodal theranostic agents


Perugia - "Teatro Morlacchi"

Focused Session Q-5

Biomedical Applications of Carbon Nanotubes and Graphene: Opportunities and Challenges



The intensive research being carried out as from several years on the biomedical applications of carbon nanotubes (CNTs, MVCNTs) and graphene and its derivatives (G, GO, GQDs), is based on the several fascinating properties of these materials such as high specific surface area, exceptional electronic, optical, thermal and mechanical properties, intrinsic biocompatibility, scalable production and affordable costs. These combined with the relevant propensity of nanotubes and graphene to be biologically/chemically functionalized are directing remarkable interest to a wide range of potential biomedical uses, from smart drug/gene delivery, tumor targeting, bioimaging, biosensing, biocompatible scaffolds for cell culture, to implantable neural interfaces, antibacterial materials and prospective multifunctional/multimodal theranostic platforms. However, in spite of the encouraging progress so far achieved, there exist significant challenges to be faced with before acceptable protocols for effective introduction of carbon nanotubes and graphene materials and devices in clinical practice can be proposed such as: the development of more effective and reproducible nanomaterials achievable by further refining the synthesis techniques; designing novel approaches to biological and chemical functionalization and to micro/nanoelectronic integration; upgrading the therapeutic and diagnostic potential in the specific application fields; gaining a deeper insight of the interactions of carbon nanoparticles with cells and tissues as well as a proper understanding of the safety concerns posed by the toxicological risks related to the in vivo use of carbon nanoparticles.

Scope of this Focused Session is to spotlight the present state-of-the-art and stimulate an open discussion among specialists for identifying viable solutions to the several problems till open for a widespread use of CNTs and graphene in nanomedicine.

Abstracts are solicited in the following and related areas:

Novel approaches to synthesis and functionalization of CNTs/G and their derivatives

CNTs/G in drug delivery and targeting

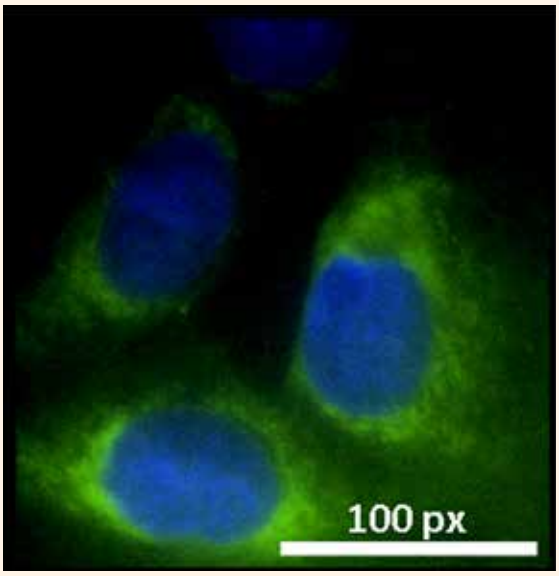
CNTs/G as biosensors

CNTs/G in bio imaging

CNTs/G in tissue engineering

CNTs/G in implantable neural interfaces

In-vitro and animal experiments; long-term reliability, biocompatibility and toxicity issues



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Focused Session Q-6

Materials Nanotechnologies for Implantable Neural Interfaces

Interfacing of external electronics to the human nervous system has been already shown to provide a powerful tool to better sensing, understanding and modulating neural functions at the central and peripheral levels. The development of implantable neural interfaces has enabled large-scale and high-resolution recording of neuronal populations in vivo and opened new application perspectives for neuroscience and for the therapy of neurological disorders. If, on one hand, a new investigation window has been opened on brain function by getting better access to brain microcircuits, on the other hand these novel neural interfaces may represent a means to partially restore lost function in the nervous system of neurological patients. The reliability and endurance of the implant, the degradation with time of neural function caused by implant/tissue mismatches in stiffness, insertion-associated injuries and foreign body reactions represent all serious problems to be overcome. However, other complex challenges are to be faced along this route, including the stable sensing of weak signals from individual or a few neurons for long periods and the implementation of microstimulation paths for a two-way control of neuronal activity. Developing new materials and architectures allowing for an efficient bi-directional interfacing of microelectronic devices with the nervous tissue and providing a high degree of biocompatibility is therefore key for successful application of neural interfaces.

This Focused Session will feature recent progress in this challenging research field whose breakthroughs are expected to have a relevant impact on the treatment of disorders of the nervous system such as e.g. spinal cord injuries, neurovegetative diseases such as e.g. Parkinson's, autism, severe mental illness, and visual cortex and retina diseases.

Abstracts are solicited in the following and related topics:

- **Novel electrode materials:**
  nanotubes/nanowire arrays, noble metal nanostructures, functional ceramics, conductive polymers, bioactive hydrogels, bioinspired mechanically adaptive nanocomposites, optically active materials, ECM-based materials/scaffolds, stretchable semiconductor-on-polymer electronics …
- **In-vitro neural interfacing studies**:
  neural tissue culture platforms; citotoxicity/biocompatibility; electrical properties..
- **Electrochemistry of electrode-electrolyte interfaces**
- **Substrate micro/nano structuring for neural development**
- **Thin film-based technologies for neuroprosthetics**
- **Surface functionalization at the nanoscale**
- **Deep-brain electrode interfacing**
- **Pheripheral neural interfacing**
- **Multifunctional neural interfaces**
- **Mechanical and electronic properties of implantable neural recording and stimulation devices**
- **In-vivo studies; systemic (physical, chemical, electrical) response to implanted neural interfaces**
- **Signal processing, reliability; long term implant stability.**

Giotto fresco

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INFORMATION TO AUTHORS & PARTICIPANTS

Location and Dates

CIMTEC 2016-7th Forum on New Materials will be held on June 5-9, 2016 in Perugia, splendid chief town of Umbria region, placed in the middle of Central Italy. The city is about 170 km from Rome and is placed in a strategic position to reach the most interesting historical and tourist places in Umbria, such as Assisi, Orvieto, Spoleto, Todi, Spello, Gubbio, Montefalco, Trevi, Trasimeno Lake and several others.
CIMTEC 2016 includes the *5th International Conference "Smart and Multifunctional Materials, Structures and Systems"* and the *11th International Conference "Medical Applications of Novel Biomaterials and Nanotechnology"*.

Conference Venue

Centro Congressi Hotel Quattrotorri
Via Corcianese 260
06074 Perugia - Italy

Technical Sessions will start Monday June 6 morning and continue until Thursday June 9.
The Conference Venue is about 8 km outside Perugia center and cannot be reached easily with public services. A complimentary transfer service between the Conference Hotels and the Conference Venue will be made available for Conference Members.

Scientific Programme

The scientific programme will consist of Plenary, Invited, Oral and Poster contributions. English will be the official language of the conference.

Abstract Submission

Abstracts are to be submitted on-line by the *Presenting Author* and prepared according to the on-line Abstract Instructions available at *http://2016.cimtec-congress.org/abstract_instructions*
Electronic submission ends on **October 15, 2015**.
Acceptance notification will be provided by December 15, 2015.
Multiple abstracts from the same *Presenting Author* are not accepted, in order to open opportunities for the broadest possible participation. Abstracts of previously unpublished matter shall only be submitted.
Abstracts of all scheduled oral and poster presentations will be made available on the conference web site to all registered participants at least 15 days in advance of the Conference.

Presentation Formats

Oral Presentations

Electronic presentation (Power Point) facilities will be available including LCD high resolution projector, PC and laser pointer. Slide projectors will not be available. Cost for any special audio-visual request will be the responsibility of the individual speaker.

Poster Presentations

Authors are kindly asked to follow carefully the guidelines for Poster Preparation that will be made available at CIMTEC 2016 website. Attendance by at least one of the authors is requested for poster presentation and publication in CIMTEC 2016 Proceedings.

Proceedings

Official Proceedings of CIMTEC 2016 will be published by Trans Tech Publications (Switzerland) in the Techna Group series "Advances in Science and Technology" as Volumes 97 onwards. Submission and uploading instructions will be provided by Trans Tech Publications in February 2016 to the Presenting Author of each paper. Submission of the written text for the Proceedings is not mandatory. Free access to the on-line edition is included in the registration fee.

Social Programme

The Social Programme will include various social activities. Details will be given in the Final Announcement.

Companions Programme

Guided visits to Perugia, Assisi, Todi, Gubbio, Orvieto and other places of high historic, artistic and tourist interest will be available to companions. Detailed programme and registration information will be provided in the Final Announcement.

Provisional Registration

Prospective participants are kindly requested to **Pre-register** at http://2016.cimtec-congress.org/pre-registration
Presenting Authors shall not Pre-register as they are automatically filed when submitting the Abstract.
The Final Announcement including the Provisional Programme, the Final Registration Form and the Hotel Booking Form will be made available by **March 15, 2016**.

Registration Fees

Early *(by April 20, 2016)*	
Full Member	710.00 EUR
Student under 27	430.00 EUR
Late and on site	
Full Member	770.00 EUR
Student under 27	490.00 EUR

Fees include VAT, general and secretariat costs, participation in the scientific sessions, coffees, lunches, conference bag, printed booklet of the final programme and other conference material, participation in the Social Programme and the free access to the on-line Proceedings.

Accommodation

Hotel accommodation (B&B) prices range from about 160 EUR/day for 5-stars hotel to about 70-75 EUR/day for 3-stars hotel.
Further information and hotel booking forms will be provided with the final announcement and in the web.

INFORMATION TO AUTHORS & PARTICIPANTS

Visa Application

All travel, lodging and registration expenses will be the responsibility of the individual participants. Special letters of invitation to be used for Visa application will be provided upon written request addressed well in advance to the Conference organizers, *info@technagroup.it*

Weather

The weather in Perugia at the beginning of June is usually fine with temperatures ranging from 20 to 25 °C during the day and 12 to 15 °C during the night. Clothing suitable for (early) summer is recommended.

How to reach Perugia

Perugia is located in Central Italy about 170 km from Rome, and can be reached*:*

By plane:

To Rome - International Airport "Leonardo da Vinci".

A complimentary bus transfer from the airport to Perugia will be available to Members accommodated in Conference Hotels.

By train:

From Rome: at Rome Central Railway Station (Stazione Termini), take the train to Perugia.

By car:

Perugia can be reached easily by car from any direction via the network of Italian highways.

SUMMARY OF DEADLINES

October 15, 2015
Submission of Abstract

December 15, 2015
Notification of Abstract acceptance

April 20, 2016
Paper uploading for Proceedings Volumes

April 20, 2016
Registration at reduced rate

INFORMATION AND CORRESPONDENCE

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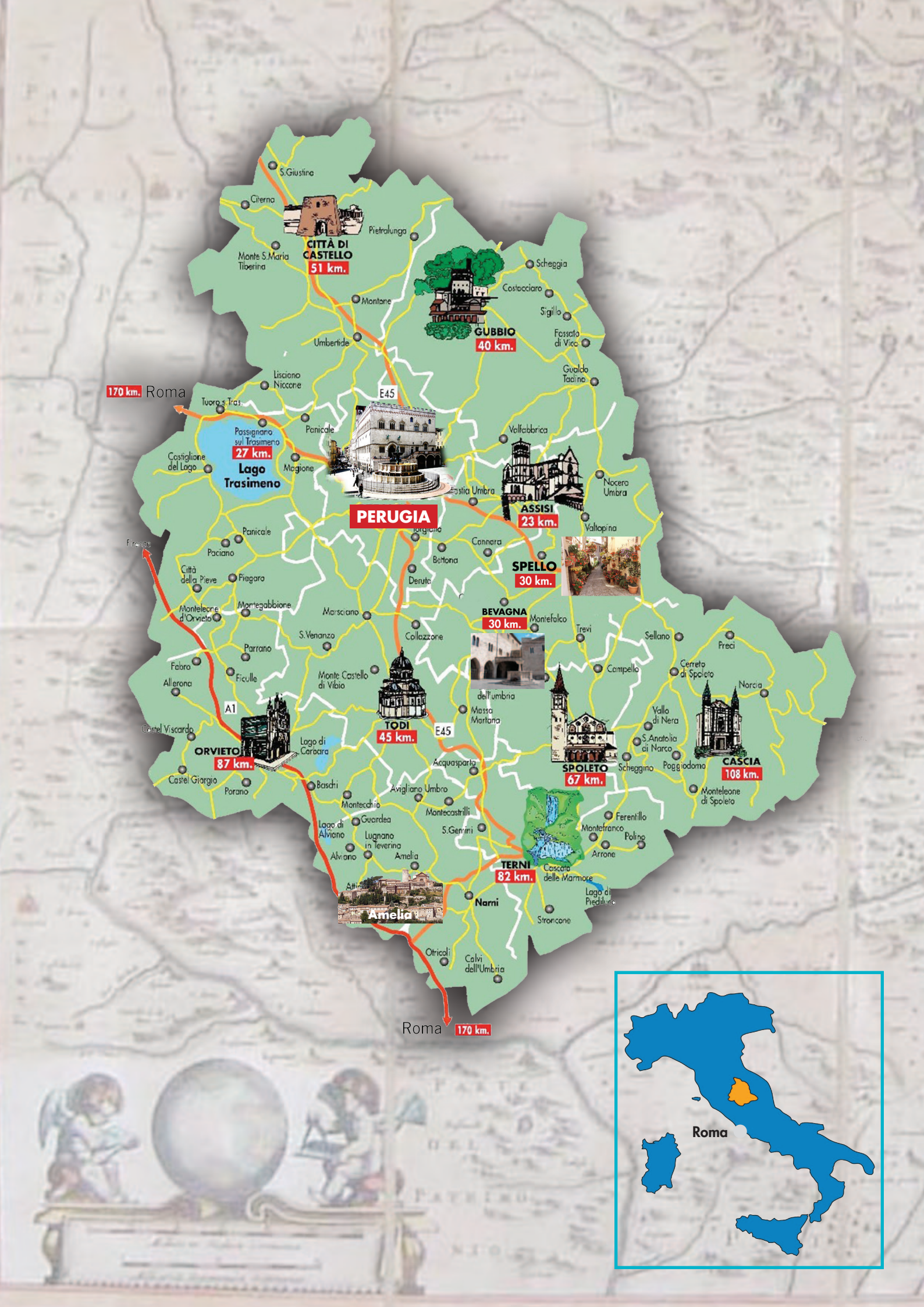
E-mail: congress@technagroup.it
Web site: http://www.cimtec-congress.org/

Congress Center Quattrotorri - Auditorium


S.Giustina
Città di Castello
51 km.
Pietralunga
Monte S.Maria Tiberina
Scheggia
Costacciaro
Sigillo
Gubbio
40 km.
Fossato di Vico
Gualdo Tadino
Umbertide
Montone
Lisciano Niccone
170 km. Roma
E45
Tuoro s.Trasimeno
Passignano sul Trasimeno
27 km.
Lago Trasimeno
Castiglione del Lago
Magione
Panicale
Perugia
Valfabbrica
Assisi
23 km.
Nocera Umbra
Valtopina
Paciano
Città della Pieve
Piegaro
Deruta
Cannara
Bettona
Spello
30 km.
Montegabbione
Monteleone d'Orvieto
Marsciano
Bevagna
30 km.
Montefalco
Trevi
Sellano
Preci
S.Venanzo
Collazzone
Parrano
Fabro
Ficulle
Allerona
Monte Castello di Vibio
Campello
Cerreto di Spoleto
Norcia
A1
Todi
45 km.
Massa Martana
Vallo di Nera
Castel Viscardo
Lago di Corbara
Orvieto
87 km.
E45
S.Anatolia di Narco
Scheggino
Poggiodomo
Cascia
108 km.
Acquasparta
Spoleto
67 km.
Castel Giorgio
Porano
Baschi
Avigliano Umbro
Montecchio
Montecastrilli
Monteleone di Spoleto
Guardea
Lago di Alviano
Lugnano in Teverina
S.Gemini
Ferentillo
Montefranco
Polino
Alviano
Amelia
Arrone
Terni
82 km.
Cascata delle Marmore
Lago di Piediluco
Narni
Stroncone
Otricoli
Calvi dell'Umbria
Roma
170 km.
Roma

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