SPIE. SMART STRUCTURES+
NONDESTRUCTIVE EVALUATION

6–10 March 2022
Long Beach, California, USA

SUBMIT ABSTRACTS BY
25 AUGUST 2021
Present and discuss the latest research next year in Long Beach

The leading event that features advanced sensing and materials

Smart Structures + NDE is the meeting where research is shared in technologies for automotive, aerospace, civil infrastructure, Industry 4.0, advanced materials and sensor systems for NDE, and structural health monitoring. Each year this important community comes together to share and discuss current research, hear the latest breakthroughs, and connect with colleagues. The 2022 Call for Papers is now open. Review the topic areas and see where your research fits best.

Submit your abstract today: www.spie.org/ssncall

ABSTRACT SUBMISSIONS ARE DUE 25 AUGUST.

An invitation to participate

SPIE Smart Structures + Nondestructive Evaluation looks forward to gathering again in person next year. At this event you’ll experience five days of thought-provoking sessions, plenary talks, and networking events that will bring the community together again in an attractive and safe location.

This meeting represents a unique community for reporting state-of-the-art research and development in sensors, advanced materials, and structural health monitoring. The event includes the latest technologies for automotive, aerospace, civil infrastructure, Industry 4.0, advanced materials and sensor systems for NDE, and structural health monitoring.

Come share with—and learn from—world experts, researchers, and innovators discussing advancements in nondestructive evaluation technologies, info-tech sensors and wearable systems, EAPAD devices, and more.

We hope you will consider submitting an abstract and sharing your latest work with your community in Long Beach next year.

Until then—with much anticipation and appreciation,

Your 2022 Smart Structures + NDE Chairs

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(United States)

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Kyo D. Song, Norfolk State Univ. (United States)
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Aimy Wissa, Univ. of Illinois at Urbana-Champaign Chapter (United States)
H. Felix Wu, U.S. Dept. of Energy (United States)
Jinkyu Yang, Univ. of Washington (United States)
Tzu-Yang Yu, Univ. of Massachusetts Lowell (United States)
Daniele Zonta, Univ. degli Studi di Trento (Italy)

SPIE remains committed to advancing light-based research and meeting the needs of our constituents by providing you with an opportunity for sharing your work and connecting you with the global science and engineering community. SPIE Smart Structures + Nondestructive Evaluation 2022 is scheduled to take place as planned, and we look forward to your participation.

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Awards at SPIE Smart Structures + NDE

The awards presented at Smart Structures + Nondestructive Evaluation 2022 represent four categories of excellence across various disciplines:

• SPIE SSM/NDE Lifetime Achievement Awards
• SPIE Best Student Paper Contest
• Bioinspiration, Biomimetics, and Bioreplication Best Student Paper Award
• EAP-In-Action Demonstration Awards

To review the nomination process and criteria for each award, visit: spie.org/ssnawards

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Tel: +1 360 676 3290 • help@spie.org • #SPIEsmart
Bioinspiration, Biomimetics, and Bioreplication XI (SSN01)

Conference Chair: Raúl J. Martin-Palma, Univ. Autónoma de Madrid (Spain)
Conference Co-Chairs: Moto Knez, CIC nanoGUNE Consolider (Spain); Akhlesh Lakhtakia, The Pennsylvania State Univ. (United States)
Program Committee: Javena S. Chali, Univ. of South Australia (Australia); Chih-Hung Chang, Univ. of California, Irvine (United States); Olaf Karthaus, Chitoise Institute of Science and Technology (Japan); Kwang Jin Kim, Univ. of Nevada, Las Vegas (United States); Torben A. Lenau, Technical Univ. of Denmark (Denmark); Bert Müller, Univ. Basel (Switzerland); Maurizio Portfiri, NYU Tandon School of Engineering (United States); Akira Saito, Osaka Univ. (Japan)

Bioinspiration, biomimetics, and bioreplication arise from a flow of ideas and concepts from nature into a great variety of technoscientific disciplines. The main aim is to develop novel devices with tailored func-
tionalities and improved capacities. This is a rapidly evolving and highly multidisciplinary field that em-
brates aspects related to physics, chemistry, biol-
ogy, engineering, materials science, nanotechnology, neuroscience, mechanical properties, computing and control, design integration, optimization, multifunc-
tionality, multicontrollability, cost effectiveness, de-
sign for environment, as well as arts and humanities.

The 12th edition of this conference welcomes con-
tributions from industry, academia, and government research organizations. Topics of interest cover any relevant scientific or technological aspects of bio-
inspiration, biomimetics, and bioreplication, from theo-
retical considerations, production, and characteriza-
tion to practical applications.

Topics include, but are not limited to:
- fundamental processes (aerodynamics, adhesion, superhydrophobicity and self-
cleaning, nano and microfluidics, structural colors, optics, rheology, photonics, locomotion, visual systems)
- materials (biomaterials, composites, structural materials, high-strength membranes, ultralightweight structures, self-healing materials)
- devices (sensors, multifunctional devices, miniature devices, neuromorphic devices and systems, photonic devices)
- applications (robotics, architecture, biomedicine and pharmaceuticals, marine uses, communications and informatics, artificial muscles, functional/decorative coatings, construction, transportation, manufacturing)
- energy efficiency, resource efficiency, waste management, and biobeneficial bioinspiration.

The conference will include several invited talks, con-
tributed talks, and posters.

BEST STUDENT PAPER AWARD

The Bioinspiration, Biomimetics, and Bioreplication XI conference chairs will choose the Best Student Paper Award from their conference. This award is sponsored by the Optical Society of Southern California. A cash prize will be given to the first, second, and third place winners.

ABSTRACTS DUE: 25 AUGUST 2021

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Electroactive Polymer Actuators and Devices (EAPAD) XXIV (SSN02)

Conference Co-Chairs: John D. W. Madden, The Univ. of British Columbia (Canada); Herbert R. Shea, Ecole Polytechnique Fédérale de Lausanne (Switzerland)
Program Committee: Barbara J. Ake, Lebanese American Univ. (Lebanon); Joseph Bar-Cohen, Jet Propulsion Lab. (United States); Ray H. Baughman, The Univ. of Texas at Dallas (United States); Holger Böse, Fraunhofer-Institut für Silicatforschung ISC (Germany); Eric Cattan, Polytechnique Hauts-de-France (France); Hyouk Ryeel Choi, Sungkyunkwan Univ. (Korea, Republic of); Marco Fontana, Scuola Superiore Sant’Anna (Italy); Edwin W. H. Jager, Linköping Univ. (Sweden); Human Janiès, Kaunas Univ. of Technology (Lithuania); Martin Kaltenbrunner, Johannes Kepler Univ. Linz (Austria); Christoph Keplinger, Univ. of Colorado Boulder (United States); Kwang Jin Kim, Univ. of Nevada, Las Vegas (United States); Soo Jun Adrian Koh, Max-Planck-Institut für Intelligente Systeme (Germany); Gabbar M. Kovacs, CTO System AG (Switzerland); Maaraa Krümann, Jinsong Leng, Harbin Institute of Technology (China); Tiefeng Li, Zhejiang Univ. (China); Jürgen Maas, Technische Univ. Berlin (Germany); Il-Kwon Oh, KAIST (Korea, Republic of); Toribio F. Otero, Univ. Politecnica de Cartagena (Spain); Gibling Pei, Univ. of California, Los Angeles (United States); Aaron D. Price, Western Univ. (Canada); Jonathan M. Rossiter, Univ. of Bristol (United Kingdom); Stefan S. Seelecke, Univ. des Saarland (Germany); Jun Shintake, The Univ. of Electro-Communications (Japan); Anuvat Sirivat, Chulalongkorn Univ. (Thailand); Anne Ladegaard Skov, Technical Univ. of Denmark (Denmark); Geoffrey M. Spinks, Univ. of Wollongong (Australia); Ji Su, NASA Langley Research Ctr. (United States); Kentaro Takagi, Toyohashi Univ. of Technology (Japan); Rocco Vertechy, Univ. degli Studi di Bologna (Italy); Frédéric Vidal, Univ. de Cergy-Pontoise (France); Thomas Wallmersperger, TU Dresden (Germany); Jian Zhu, The Chinese Univ. of Hong Kong, Shenzhen (China)

Electroactive Polymers (EAP) are enabling many new opportunities in health, wearable tech, space, robotics, and other industries. Their characteristics include the ability to undergo larger displacements than almost any other class of smart materials, the pliability needed for biomimetic and other mechanically flexible systems, and low density. Of particular interest is their potential to augment, improve upon, and one day, replace biological muscles. Besides their attractive characteristics as actuators, they are enabling new types of generators and sensors. We are providing a forum where researchers can share their knowledge and inventions to improve our community’s understanding of EAP performance, modeling of electro-mechanics and chemistry, techniques of processing and characterization, control electronics, and new applications for EAP. In summary, this conference is seeking to advance our knowledge of, promote the development of, and increase the recognition of EAP technology.

Papers are solicited on but not limited to the follow-
ing EAP related topics:
- advances in actuation, sensing, and proprioception using polymer materials, as well as carbon-based and inorganic materials, plus Transduction via electrical, thermal, optical/ electromagnetic or other forms of energy
- theoretical models, analysis, and simulation, including computational chemistry
- measurement, testing, and characterization methods
- manufacturing technologies, including electroding, synthesis, processing, shaping, and fabrication
- design and engineering of actuators, sensors, and their integration into devices and systems
- technology from miniature scale (MEMS, micro, and nano) to large devices
- applications in artificial muscles, robotics, biomimetics, energy harvesting, medical, industry, etc.

• driving electronics, system integration, and packaging
• control algorithms for devices and their implementation in software and hardware.

2022 EAPAD KEYNOTE PRESENTATION
Our Keynote for 2022 will be Professor Allison Okamura from Stanford University, director of the CHARM Lab (https://charm.stanford.edu), who will talk about her lab’s latest developments in haptic devices that allow touch-based information transfer between humans and intelligent systems, enabling communication in a salient but private manner.

EAP-IN-ACTION DEMONSTRATION SESSION
This industry and academic session, held annually as part of the SPIE’s EAPAD conference, is an opportu-
ity to showcase working Electroactive Polymer materials and applications. State-of-the-art capa-
bilities that make EAP one of the leading “actua-
tors-of-choice” are on display, new materials and application areas are continuing to emerge and this session offers up-close demonstrations of EAP ma-
terials in action. The demonstration format enables interaction between the technology developers and potential users as well as a “hands-on” experience with this emerging technology.

An award will be given to the three best EAP-in-Action demonstrations.

Details can be found on the SPIE Awards page.

COURSE ON ELECTROACTIVE POLYMER ACTUATORS, SENSORS, AND DEVICES
A course on Electroactive Polymer Actuators, Sen-

rors, and Devices will be scheduled for Sunday 6 March, prior to the start of the symposium. This pro-
vides a background on working principles of EAPs, as well as their advantages and challenges.

Details and registration information for the course will be online in December.
EAP-IN-ACTION DEMONSTRATION SESSION

This industry session, held annually as part of the SPIE’s EAPAD conference has shared advances through technical demonstrations for over 20 years. The session turns the spotlight on Electroactive Polymers (EAP) materials and applications, illustrating the state-of-the-art capabilities that make EAP one of the leading “actuators-of-choice”. New materials and application areas are continuing to emerge and this session offers up-close demonstrations of EAP materials in action. The demonstration format enables interaction between the technology developers and potential users as well as a “hands-on” experience with this emerging technology. An award certificate will also be given to the top three Best EAP-In-Action Demonstration Award winners. Details can be found online on the Awards page at www.spie.org/ssnawards.

Active and Passive Smart Structures and Integrated Systems XVI (SSN03)

Conference Chair: Jae-Hung Han, KAIST (Korea, Republic of)

Conference Co-Chairs: Shima Shahab, Virginia Polytechnic Institute and State Univ. (United States); Jinkyu Yang, Univ. of Washington (United States)

Program Committee: Steven R. Anton, Tennessee Technological Univ. (United States); Andreas F. Arrieta, Purdue Univ. (United States); Hiroshi Asanuma, Chiba Univ. (Japan); Diann E. Brei, Univ. of Michigan (United States); Matthew Bryant, North Carolina State Univ. (United States); Gregory P. Carman, Univ. of California, Los Angeles (United States); Eun Jung Chae, California State Univ., Long Beach (United States); Seung-Bok Choi, Inha Univ. (Korea, Republic of); Amir H. Danesh-Yazdi, Rose-Hulman Institute of Technology (United States); Carlos De Marqui Jr., Univ. de São Paulo (Brazil); Alper Erturk, Georgia Institute of Technology (United States); Alison B. Flattau, Univ. of Maryland, College Park (United States); Mehdi N. Ghasemi-Nejad, Univ. of Hawai‘i at Manoa (United States); James M. Gibert, Purdue Univ. (United States); Victor Giurgiutiu, Univ. of South Carolina (United States); Nam Soo Goo, Konkuk Univ. (Korea, Republic of); Faramarz Gordaninejad, Univ. of Nevada, Reno (United States); Nakhiah C. Goulbourne, Univ. of Michigan (United States), The National Science Foundation (United States); Ryan L. Harne, The Pennsylvania State Univ. (United States); Daniel J. Inman, Univ. of Michigan (United States); Hyung-Jo Jung, KAIST (Korea, Republic of); Jung-Ryu Lee, KAIST (Korea, Republic of); Soobum Lee, Univ. of Maryland, Baltimore County (United States); Junrui Liang, ShanghaiTech Univ. (China); Wei-Hsin Liao, The Chinese Univ. of Hong Kong (Hong Kong, China); Zhu Mao, Univ. of Massachusetts Lowell (United States); Mostafa A. Nouh, Univ. at Buffalo (United States); Gyuhae Park, Chonnam National Univ. (Korea, Republic of); Yi-Chung Shu, National Taiwan Univ. (Taiwan); Henry A. Sodano, Univ. of Michigan (United States); Jiong Tang, Univ. of Connecticut (United States); Lilhua Tang, The Univ. of Auckland (New Zealand); Serife Tol, Univ. of Michigan (United States); Kon-Well Wang, Univ. of Michigan (United States); Ya S. Wang, Texas A&M Univ. (United States); Norman M. Wereley, Univ. of Maryland, College Park (United States); Byeng D. Youn, Seoul National Univ. (Korea, Republic of); Haileng Zhang, Univ. of North Texas (United States); Lei Zuo, Virginia Polytechnic Institute and State Univ. (United States)

In addition to the 250-word summary abstract, authors are welcome to submit an extended abstract (approximately 2 pages long, or 1,000 words) for review purposes.

Acceptance priority will be given to authors who submit a 2-page summary of their work. The file must be a PDF to upload during the abstract submission process. The extended abstract, used for selecting the papers by session organizers, can include figures, test results, and references. The short abstract will be included in the publication that is provided to the conference attendees.

This conference, largely resulting from merge of the former ‘Damping and Isolation’ and ‘Smart Structures and Integrated Systems’ conferences, as well as a part of ‘Modeling, Signal Processing, and Control’ focuses on topics related to design, analysis, fabrication, and testing of active/passive smart dynamic structural systems. Structural vibration, damping, and acoustic control of integrated systems can be enhanced through passive, active, and hybrid approaches. The conference emphasis is on the interplay of actuation, sensing, and processing capabilities to create active systems with new function capabilities. The goal is to create a multidisciplinary forum to bring together developments in diverse application areas in aeronautical, space, marine, transportation, civil applications, etc. The scope of the conference ranges from system level evaluation of smart structures to development, modeling, and optimization of new actuation and sensing techniques for integrated systems. Authors are encouraged to describe developments in active materials, ‘smart’ structural components, and integration of these and other constituent technologies into advanced systems that hold the potential for expanding the application of active and passive smart structures and integrated systems.

The primary topics for the conference are organized into the following eleven sessions:

• energy harvesting and scavenging
• metamaterials and metastructures
• biological-inspired systems and bio-MEMS
• passive and active vibration isolation systems
• magneto rheological systems
• SMA- and piezo-based materials and systems
• micro- and nano-integrated systems
• aircraft, MAV/UV, and morphing systems
• smart sensing and signal processing for diagnostics and prognostics
• modeling, optimization, signal processing, control, and design of integrated systems
• acoustics and fluid-structure interaction.

Authors can select the session topic that best fits their work during the abstract submission process.

ABSTRACTS DUE: 25 AUGUST 2021

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A vision for versatile and autonomous material and structural platforms motivates the research community to advance the materials science, mechanical synthesis, and multiphysics understanding of innovative multifunctional materials.

This conference will bring together researchers across disciplines to share about technical efforts aimed to design, fabricate, manufacture, and characterize novel materials and structural systems that exhibit the core functions of autonomy in engineered matter. These functions include sensory mechanisms, actuation capabilities, adaptive mechanical-material frames, decision-making functionality, and energy capture and conversion processes.

All together, this conference will foster interdisciplinary discussions on recent innovations that scrutinize the behavior and mechanics of multifunctional materials.

Topics of interest may include but are not limited to the design, modeling, and experimental evaluation of:

- sensing and actuation materials
- self-regulating and energy transduction materials
- adaptive, programmable, and cognitive materials and structures
- hybrid matter bridging engineering and biology
- manufacturing and mechanics of multifunctional materials

This conference considers new ideas, technologies, and potential applications across a wide range of disciplines critical to nano-, bio-, and info-technologies-based sensors and wearable systems, as applied to health monitoring of human and complex systems in engineering and medicine.

This year’s theme focuses on emerging areas of wearable technology, Internet of Things (IoT), virtual reality and augmented reality, smart textile in virtual reality and augmented reality, smart textile in wearable technology, and further exploration of the Internet of Things (IoT) in 3D printing. The conference aims to extend beyond the traditional topics of 3D printing for space to include other areas such as Internet of Things (IoT) in 3D printing,

WEARABLE TECHNOLOGIES AND INTERFACING WITH INDUSTRIES

- e-textile based smart garments
- health monitoring e-bra, e-bro, and e-band aid
- monitoring health conditions with flexible wireless EEG, EOG, EMG sensors
- smart communication module with smart phone, Wi-Fi, GSM, GPRS
- panel with industries pursuing the wearable technology
- organic thin film and printable electronics
- integration of flex electronics for wearable devices
- wearable power
- smart textiles
- textile-based supercapacitors

3D PRINTING AND SMART SENSOR SYSTEM INNOVATION

- 3D printing of materials (e.g., metal, polymer, ceramic, composites, etc.)
- Internet of Things (IoT) in 3D printing
- 3D printing in biomedical and medical applications; tissue engineering, surgery, orthopedics, healthcare
- 3D printing of nano and microsensor systems
- 3D printing for space
- 3D printing of textile garments, nanomaterials and integration 3D technologies

NOVEL MATERIALS AND INTEGRATION TECHNOLOGIES

- nanomaterials
- carbon materials
- 3D nanostructures
- biomaterials
- nanowires
- integration of nano- and micro-sensors with microelectronics
- integration of sensors with flexible organic electronics
- novel nanomaterials for wearable systems
- materials for flexible RFID systems.

continued
CALL FOR PAPERS

Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems (SSNO6)

Conference Chair: Daniele Zonta, Univ. degli Studi di Trento (Italy), Univ. of Strathclyde (United Kingdom)

Conference Co-Chairs: Branko Glisic, Princeton Univ. (United States); Zhongqing Su, The Hong Kong Polytechnic Univ. (Hong Kong, China)

Program Committee: Hiroshi Anasuma, Chiba Univ. (Japan); Chih-Chen Chang, Hong Kong Univ. of Science and Technology (Hong Kong, China); Genda Chen, Missouri Univ. of Science and Technology (United States); Alison B. Flattau, Univ. of Maryland, College Park (United States); Faramarz Gordaninejad, Univ. of Nevada, Reno (United States); Benjamin L. Grasso, Naval Surface Warfare Ctr. Carderock Div. (United States); Ryan L. Harne, The Pennsylvania State Univ. (United States); Jung-Wuk Hong, KAIST (Korea, Republic of); Neil A. Hoult, Queen’s Univ. (Canada); Haiping Huang, The Univ. of Texas at Arlington (United States); Ying Huang, North Dakota State Univ. (United States); Mohammad Reza Jahanshahi, Purdue Univ. (United States); Gi-Woo Kim, Inha Univ. (Korea, Republic of); Jeong-Tae Kim, Pukyong National Univ. (Korea, Republic of); Simo Laflamme, Iowa State Univ. (United States); Hui Li, Harbin Institute of Technology (China); Jian Li, The Univ. of Kansas (United States); Su Li, Clemson Univ. (United States); Wei-Hsin Liao, The Chinese Univ. of Hong Kong (Hong Kong, China); Maria Pina Limongelli, Politecnico di Milano (Italy); Chin-Hsiung Loh, National Taiwan Univ. (Taiwan); Kenneth J. Loh, Univ. of California, San Diego (United States); Theodore E. Matikas, Univ. of Ioanna (Greece); Norbert G. Meyendorf, Univ. of Dayton (United States); Akira Mita, Keio Univ. (Japan); Isabel M. Morris, New Mexico Institute of Mining and Technology (United States); Rebecca Napoliolito, The Pennsylvania State Univ. (United States); Ching Tai (Alex) Ng, The Univ. of Adelaide (Australia); Yi-Qing Ni, The Hong Kong Polytechnic Univ. (Hong Kong, China); Hae Young Noh, Carnegie Mellon Univ. (United States); Wieslaw M. Ostachowicz, The Szewalski Institute of Fluid-Flow Machinary (Poland); Piervincenzo Rizzo, Univ. of Pittsburgh (United States); Donghyeon Ryu, New Mexico Institute of Mining and Technology (United States); Liming W. Salvino, Office of Naval Research (Singapore); Fabio Semperlotti, Purdue Univ. (United States); Wei Song, The Univ. of Alabama (United States); Wieslaw J. Staszewski, AGH Univ. of Science and Technology (Poland); R. Andrew Swartz, Michigan Technological Univ. (United States); Tyler N. Tallman, Purdue Univ. (United States); Jiong Tang, Univ. of Connecticut (United States); Marco Torboli, Ulsan National Institute of Science and Technology (Korea, Republic of); Enrico Tubaldi, Univ. of Strathclyde (United Kingdom); Ming L. Wang, Northeastern Univ. (United States); Xingwei Wang, Univ. of Massachusetts Lowell (United States); Ya Wang, Texas A&M Univ. (United States); Yang Wang, Georgia Institute of Technology (United States); Rosalind M. Wynn, Villanova Univ. (United States); Fuh-Gwo Yuan, North Carolina State Univ. (United States)

This conference requires a 500-word Review Abstract during the submission process.

Advanced sensors, smart materials, and smart structures technology represent an emerging multidisciplinary field that has unlimited potential of broad engineering applications. This particular conference focuses on the new sensor technologies and phenomena that apply to the civil, mechanical, and aerospace engineering fields. To name a few, these applications include structural health monitoring (SHM), nondestructive evaluation (NDE), damage/deterioration assessment, security and emergency management, and asset management. The potential benefits of applying advanced sensors, smart materials, and smart structures technology to civil, mechanical and aerospace systems are many and they cover improved system reliability, enhanced system performance and functionality, enhanced security, decreased life cycle costs, and reduction of physical dimensions and weight.

Researchers in academia, government laboratories, and industry are making progress in advancing the state of the art of the sensor-based technologies addressed by this conference. This conference will provide a forum to bring together experts in the relevant but diverse fields to discuss recent advances and future challenges including international research collaboration.

Papers on new and emerging technologies are solicited; examples of topics of interest are given in (but not limited to) the list below:

NEW TECHNOLOGICAL ADVANCES
- machine learning
- human-centric sensing and control
- low-cost smart materials
- large-scale monitoring systems
- multifunctional sensors sensor networks and autonomous operation
- sensors for harsh and extreme environments
- sensors using wireless systems
- fiber optic sensing
- photonic, phononic, and phoxonic crystal sensors
- computer vision and image analysis techniques
- active and semi-active control systems
- wearable sensors for biomedical applications.

MODELING OF SMART MATERIALS AND SENSOR PERFORMANCE
- sensor integration with structure
- sensor behavior
- reliability investigations
- smart material response under loads and strain.

DESIGN ENGINEERING AND IMPLEMENTATION
- design/characterization/creation of multifunctional sensory systems
- smart components, devices, and sub-assemblies
- novel materials for sensing, actuation, and design

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SMART STRUCTURES + NONDESTRUCTIVE EVALUATION 2022

Nano-, Bio-, Info-Tech Sensors and Wearable Systems II

SMART STRUCTURES + NONDESTRUCTIVE EVALUATION 2022 (SSN05) continued

SMART OPTICAL MATERIALS AND DEVICE APPLICATIONS
- field coupling techniques for control and operation
- refractive index shifters
- smart optics and active lens
- characterization methodology of smart materials
- new device concepts with smart optical materials
- bandgap energy model and restructuring
- error-free temporal and spatial tenability.

ENERGY MATERIALS AND LONG-LASTING MICRO-POWER SYSTEM
- energetic materials with quantum modification
- mobilization of deep potential-well
- enhanced surface energy for artificial catalysis
- micro-power device concepts for long-life
- emerging and nascent materials for micro-power devices.

INTEGRATED NANO- AND MICRO-STRUCTURES
- smart sensors, smart actuators
- smart Microsystems
- nanosystems
- drug delivery systems
- nondestructive methods for nano-engineered materials, nano-structures, and nano-devices.

REMOTE CONTROL AND COMMUNICATION
- micro-antenna, rectenna
- remote sensing
- RF MEMS
- reconfigurable antenna
- microwave and millimeter wave components and devices.

SIMULATION, MODELING, AND IT SOFTWARE
- CAD/CAM for nanosystems
- design tools for integrated MEMS and NEMS
- electro-thermo-mechanical modeling
- microfluidics modeling
- virtual and augmented reality.

APPLICATIONS IN ENGINEERING AND MEDICINE
- thermoelectric energy conversion systems
- thin-film hybrid PV/thermoelectric solar panels
- biomedical
- pharmaceutical
- human-computer interactions
- brain-computer interface; brain-machine interface
- electroactive-polymer-based artificial muscles
- surgical procedures and nanosystems implementation
- wireless power feedback routines and devices for medical applications.

ABSTRACTS DUE: 25 AUGUST 2021

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Tel: +1 360 676 3290 • help@spie.org • #SPIEsmart
**Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems (SSN06) continued**

**INTERROGATION OF STRUCTURES**
- aerospace structures, composites
- geotechnical systems, mining/oil/gas exploration and production
- ship and offshore structures
- pipelines
- civil engineering structures
- monuments of cultural heritage
- conventional, nuclear, and alternative energy systems
- transportation systems and vehicles
- chemical and biochemical systems.

**SENSOR DEVELOPMENT AND APPLICATIONS**
- Innovative sensor design
- Sensor calibration and validation
- Sensor optimization
- AI technology in sensor development
- Engineering applications of sensors in civil, transportation, mechanical, and aerospace engineering areas

**CALL FOR PAPERS**

**Nondestructive Characterization and Monitoring of Advanced Materials, Aerospace, Civil Infrastructure, and Transportation XVI (SSN07)**

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This conference creates an international forum to address the current state-of-the-art technologies in nondestructive characterization and monitoring of advanced materials and aerospace components, as well as technical challenges concerning infrastructure asset management including commercial/public transportation and public utilities. The inspection technologies encompass a cradle-to-grave timeline allowing for the monitoring of the fabrication process (e.g., advanced/additive manufacturing), assessing initial component quality, in-situ monitoring and system health, as well as evaluating repairs/retrofits. The overall theme focuses on identifying and fostering improvements and new innovations regarding theory, hardware, implementation strategies, interpretation of data/results, and automation. This conference will provide a medium for communication and collaborations among engineers and scientists in the following areas:

- SHM/NDE sensor development, MEMS/NEMS, intelligent transportation systems, complex cyber-physical systems via control, networking, verification, and real-time systems to protect infrastructure including aeronautics, civil, materials, energy, automotive, medical, chemical, manufacturing, and agriculture
- continuous and life-cycle monitoring, predictive modeling, aging mechanisms for aeronautical, civil, mechanical, and manufacturing engineering structures
- novel materials and sensors/networks for structural repair/retrofit for cost mitigation, improving measurement accuracy, reliability, and safety
- SHM and NDE for additive manufacturing processes and finished parts
- modeling, simulation, and technology development at various scales ranging from nano- and micro-scale to super-large structures
- signal/image processing, data fusion, data mining, signal/image denoising, artificial intelligence, and deep learning for SHM/NDE
- augmented reality (AR), Virtual reality (VR), and mixed reality (MR) for SHM/NDE
- automated and autonomous SHM/NDE using unmanned aerial vehicles/systems (UAV/S) and unmanned underwater vehicles (UUV); urban aerial and mobility systems
- SHM/NDE technologies and applications in homeland security and counterterrorism
- mitigation of man-made and natural hazards in physical infrastructure including buildings, highway infrastructure, bridges, dams, levees, and nuclear power plants
- NDE standards, codes, regulations, and acceptance criteria
- NDE for self-healing, self-sensing materials, structures, and systems
- big data for vehicle health monitoring and redesign of structural components based on sensor data

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NDE 4.0, Predictive Maintenance, and Communication and Energy Systems in a Globally Networked World (SSN09)

Conference Chair: Norbert G. Meyendorf, Fraunhofer IKTS (Germany), Univ. of Dayton (United States)

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Kara J. Peters, North Carolina State Univ. (United States); Florian Raddatz, DLR (Germany);

W. Lance Richards, Armstrong Flight Research Ctr. (United States); Sascha Schieke, Molex, LLC (United States); Lennart Schulenburg, VisiConsult X-ray Systems & Solutions GmbH (Germany); Stefano Starna, Univ. of L'Aquila (Italy); Ripi Singh, Inspiring Next (United States); Chris Udell, Voliro Airborne Robotics (Switzerland); Bernd Valeske, Fraunhofer IZFP (Germany); Johannes Vrana, Vrana GmbH (Germany);

H. Felix Wu, U.S. Dep't of Energy (United States); Christian Wunderlich, Fraunhofer IKTS (Germany); Yuan Yao, National Tsing Hua Univ. (Taiwan); Dong-Jin Yoon, Korea Research Institute of Standards and Science (Korea, Republic of)

“Industry 4.0”, “Smart Factory”, “Digital Twins”, the “Internet of Things” are all terms used to indicate a transition toward a smart, networked, and autonomous industrial ecosystem. We are in a quickly evolving industrial revolution that is made possible by the increasing number of “Internet of Things” (IoT) devices for manufacturing, large data acquisition, energy storage, and cloud-based optimized planning and communication. This new machine to machine ecosystem is resulting in an increased efficiency in manufacturing and logistics.

Industrial machinery infrastructure equipped with smart sensors, actuators, and processors is working in local or global networks. This is enabling the monitoring and optimizing of manufacturing facilities with a limited need for human intervention. Simultaneously, there is a paradigm shift in the way components are being manufactured and designed. Industry 4.0 allows producing complex individual components tailored to the needs of the consumers.

Advances in additive manufacturing, including new advances in printer operation and novel materials designed for additive technologies, are enabling a plethora of new applications of embedded smart materials and structures. Utilization of artificial intelligence such as neural networks is one potential avenue. Structural Health Monitoring (SHM) and Nondestructive Evaluation (NDE) devices will be incorporated as part of the initial design of a component and manufactured as one with multi-material printers. The component behavior can be continuously monitored to optimize maintenance and improve the design. Incorporating IoT with embedded smart sensors, processors, and memory modules allows real time information sharing across systems and networks resulting in increased efficiency, economic, and environmental benefits.

Municipalities are utilizing IoT devices to digitally transform infrastructure to improve environmental, financial, and social aspects of urban life. This is accomplished by harnessing data from vast networks of connected cameras, vehicles, and smart infrastructure. The integration of information and communication technology with physical devices connected to the IoT for networking to optimize the efficiency of city operations and services and connect to citizens. The machine to machine ecosystem will continue to expand throughout our cities using the internet for connecting us through our devices and furthering the use of NDE, SHM, blockchain, neural networks, AI, and cybersecurity.

Major topics of interest are:

**NDE 4.0**
- NDE 4.0 the next generation of NDE (integration of NDE into cyber controlled processes, digital twin, industrial IoT, data security/sovereignty, semantic interoperability, production monitoring and reliability)
- smart sensing and predictive (smart) maintenance
- value proposition of NDE 4.0
- remote NDE and automation for robotic inspection solutions, inspection by UAV systems
- NDE modelling and NDE digital twins
- industry 4.0 for NDE (AI/cloud/AR/blockchain)
- human factors and considerations including humans for NDE 4.0
- NDE using smartphones and tablets, NDE for everybody
- NDE for additive manufacturing
- NDE for electronic packaging, detection of counterfeit components, flexible electronics
- additive manufacturing as an enabler for sensor integration
- multifunctional materials utilized in NDE

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**DATA ACQUISITION, DATA HANDLING, COMMUNICATION AND SMART SENSOR SYSTEMS**
- sensors, adaptive structures, and artificial intelligence
- data collection from embedded sensors for NDE and SHM
- real time monitoring of the smart factory systems and subsystems
- predictive and prescriptive (smart) maintenance
- cloud-based data integration, communication, and planning
- big data management and processing
- IoT, cybersecurity and protection against attacks by hackers, enhancing NDE for cybersecurity
- revision-safe data formats and storage
- decision making by artificial intelligence, application of neural networks

**SMART MATERIALS AND NDE FOR ENERGY SYSTEM AND SMART CITIES**
- smart cities and intelligent information and transportation ecosystem enablers
- energy generation and harvesting, photonic energy harvesting, or acoustic/vibration energy harvesting
- green energy systems: wind, hydro power, solar, batteries, fuel cells
- energy storage technologies: chemical, electrical, thermal, kinetic, and gravity energy
- development and application of smart materials for energy systems
- NDE of energy systems (NDE and monitoring of energy storage)
- energy transmission systems, energy distribution systems; wired, wireless, optical, and other techniques

ABSTRACTS DUE: 25 AUGUST 2021
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- 250-word abstract for technical review
- 100-word summary for the program
- Keywords used in search for your paper (optional)
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