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- UV and Higher Energy Photonics: From Materials to Applications
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Metamaterials and artificial electromagnetic media that are structured on the subwavelength scale were initially suggested for the negative-index ‘superlens’. Later, as metamaterials became a paradigm for engineering electromagnetic space and controlling the propagation of waves, the field of transformation optics was born. The research agenda is now focused on achieving quantum, tunable, switchable, nonlinear, sensing and data processing functionalities as well as control of light-matter interactions in weak and strong coupling regimes. This heralds the emergence of the new fields of metadevices and metasystems.

The conference is a platform to discuss cutting-edge research on photonic, terahertz, microwave, thermal, acoustic and mechanical metamaterials, metadevices and metasystems with advanced functionalities attained through the exploitation of the entire plethora of quantum and classical mesoscale and nanoscale forces and interactions.

Save the date

ABSTRACTS DUE:
12 February 2020

AUTHOR NOTIFICATION:
20 April 2020
The contact author will be notified of acceptance by email.

MANUSCRIPT DUE DATE:
29 July 2020

PLEASE NOTE: Submissions imply the intent of at least one author to register, attend the symposium, present the paper as scheduled, where it is an oral or poster presentation, and submit a full manuscript by the deadline.
ACTIVE PHOTONIC PLATFORMS XII  
(OP102)

Conference Chairs: Ganapathi S. Subramaniam, Sandia National Labs. (USA); Stavroula Fotenopoulou, The Univ. of New Mexico (USA)

Program Committee: Andrea Alù, The City Univ. of New York (USA); Koray Aydin, Northwestern Univ. (USA); Harish Bhaskaran, Univ. of Oxford (United Kingdom); Paul V. Braun, Univ. of Illinois at Urbana-Champaign (USA); Che Ting Chan, Hong Kong Univ. of Science and Technology (Hong Kong, China); Zhiqiang Chen, Nankai Univ. (China), San Francisco State Univ. (USA); Dmitry N. Chigrin, RWTH Aachen Univ. (Germany); Shanhui Fan, Stanford Univ. (USA); Didier Felbacq, Univ. Montpellier (France); Juejun Hu, Massachusetts Institute of Technology (USA); Stephen Hughes, Queen’s Univ. (Canada); Boubacar Kante, Univ. of California, San Diego (USA); Mercedes Khajavikhan, Univ. of Southern California (USA); Alexander V. Kildishev, Purdue Univ. (USA); Nathaniel Kinsey, Virginia Commonwealth Univ. (USA); Yuri S. Kivshar, The Australian National Univ. (Australia); A. Femius Koenderink, AMOLF (Netherlands); Aude L. Lereu, Institut Fresnel (France); Cefe López, Consejo Superior de Investigaciones Científicas (Spain); Liam O’Faolain, Cork Institute of Technology (Ireland), Tyndall National Institute (Ireland); Rupert F. Oulton, Imperial College London (United Kingdom); Nicolae-Coriolan Panoiu, Univ. College London (United Kingdom); Ruwen Peng, Nanjing Univ. (China); Ekaterina Potyrina, Air Force Research Lab. (USA); Michelle L. Povinelli, The Univ. of Southern California (USA); Subramaniam Anantha Ramakrishna, Indian Institute of Technology Kanpur (India); Christophe Sauvan, Lab. Charles Fabry (France); Jörg Schilling, Martin-Luther-Univ. Halle-Wittenberg (Germany); Gennady B. Shvets, Indian Institute of Technology Delhi (India); Andrey A. Sukhorukov, The Australian National Univ. (Australia); Philippe Tassin, Chalmers Univ. of Technology (Sweden); Kosmas L. Tsakmakidis, National and Kapodistrian Univ. of Athens (Greece); Georgios Veronis, Louisiana State Univ. (USA); Daniel M. Wasserman, The Univ. of Texas at Arlington (USA); Sharon M. Weiss, Vanderbilt Univ. (USA)

Platforms comprising artificially patterned materials exploit the synergy between material photonic responses and structural form to enable transformative light-matter interactions which continually push forward the state-of-the-art in light control capabilities. While tremendous progress has been made with only passive materials, such as metals and dielectrics, the potential of photonic platforms transcends into new unexplored domains when active material and/or material with tunable or dynamic photonic properties are incorporated. Examples of such material are gain or non-linear media, phase-change materials, magneto-photonic material, 2D materials, as well as quantum emitters. Structured material platforms with active components can enable entirely new regimes of light control that is crucial to a wide range of applications including chip-scale all-optical computing and communications, nanoscale thresholdless lasers, modulator, thermal management and detector devices, as well as biological/chemical sensors.

The Active Photonic Platforms XII conference aims to bring together scientists and engineers working in the newest developments in fundamentals and applications of structured-material platforms for active, dynamic, and tunable control of light. Topics will cover active photonic platforms functional across the EM spectrum, from THz to UV frequencies, as well as new exotic types of light propagation, which could cover active photonic platforms functional across the EM spectrum, from THz to UV frequencies, as well as new exotic types of light propagation, which could open entirely new directions in active photonics. Contributions from academia, government, industry, and other research organizations are solicited in areas including:

- theory and modeling approaches for non-linear and gain photonic media
- non-linear optical phenomena, materials, and devices
- novel harmonic generation and frequency mixing phenomena
- modeling and experimental realization of time-dependent photonic responses
- tunable and dynamically changeable optical properties and photonic devices
- dynamically reconfigurable platforms and photonic effects
- novel lasing platforms, nanolasers, and integrable chip-scale light sources
- emission control in structured photonic environment: weak and strong coupling, cavity QED; polariton, quantum-dot, and random lasers
- physics and applications of nanoscale sources (e.g. quantum dots, quantum wires, NV-centers etc.) for photonic devices
- PT-symmetric, non-Hermitian and pseudo-Hermitian photonic systems
- topological and non-reciprocal photonic platforms
- phase-change materials for photonic devices
- photonic memory and neuromorphic devices
- photonic structures for quantum information: non-classical sources and detectors
- graphene- and carbon-based materials for photonic and optoelectronic devices

Continued
ACTIVE PHOTONIC PLATFORMS XII (OP102) continued

- photonic platforms with atomically thin materials such as hBN or transition-metal-dichalcogenides or their heterostructures (e.g. Van der Waals heterostructures)
- novel magneto-photonic phenomena and platforms
- advances in fabrication of photonic structures with active materials
- novel absorption and thermal management platforms
- photovoltaics, thermophotovoltaics, and photodetectors
- chemical sensors and biosensors based on active control of light
- opto-fluidic and optomechanical tunable devices.

This conference will confer an award for the best oral presentation by a student author. Only contributed presentations both submitted by a student on or before 12 February 2020, and presented by a student author are eligible for this award (the submitting and presenting author should be a student at the time of the abstract submission). The award winner(s), announced at the conclusion of the meeting, will be presented with an original SPIE award certificate, and receive a special mention in the introduction of the conference proceedings volume.

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PLASMONICS: DESIGN, MATERIALS, FABRICATION, CHARACTERIZATION, AND APPLICATIONS XVIII (OP103)

Conference Chairs: Din Ping Tsai, The Hong Kong Polytechnic Univ. (Hong Kong, China); Takuo Tanaka, RIKEN (Japan)

Program Committee: Martin Aeschlimann, Technische Univ. Kaiserslautern (Germany); Hatice Altug, Ecole Polytechnique Fédérale de Lausanne (Switzerland); Harry A. Atwater Jr., California Institute of Technology (USA); David J. Bergman, Tel Aviv Univ. (Israel); Humeysa Caglayan, Tampere Univ. (Finland); Che Ting Chan, Hong Kong Univ. of Science and Technology (Hong Kong, China); Yun-Chong Chang, Academia Sinica (Taiwan); Harald W. Giessen, Univ. Stuttgart (Germany); Naomichi Halas, Rice Univ. (USA); Dai-Sik Kim, Seoul National Univ. (Korea, Republic of); Wakana Kubo, Tokyo Univ. of Agriculture and Technology (Japan); Laurens K. Kuipers, FOM Institute for Atomic and Molecular Physics (Netherlands); Mikhail Lapine, The Univ. of Sydney (Australia); Ai Qun Liu, Nanyang Technological Univ. (Singapore); Yu-Jung Lu, National Taiwan Univ. (Taiwan); Olivier J. F. Martin, Rice Univ. (USA); George C. Schatz, Northwestern Univ. (USA); Tigran V. Shahbazyan, Jackson State Univ. (USA); Vladimir M. Shalaev, Purdue Univ. (USA); Gennady B. Shvets, Optoelectronics Research Ctr. (United Kingdom); Nikolay I. Zheludev, Optoelectronics Research Ctr. (United Kingdom), Nanyang Technological Univ. (Singapore)

Plasmonics: Design, Materials, Fabrication, Characterization, and Applications is currently undergoing intense developments. Novel plasmonic materials, structures, and phenomena covered under this topic span broad multidisciplinary interests from fundamental optics, physics, and chemistry to applications in nanophotonics, biophotonics, green photonics, and biomedicine.


Papers are solicited in the following areas:

**THEORY, SIMULATION, AND DESIGN ACROSS ALL SUBAREAS**
- plasmonic phenomena and effects
- ultrafast plasmonic effects and coherent control
- plasmon polaritonics
- surface-enhanced Raman scattering
- plasmon-enhanced nonlinear phenomena
- luminescence enhancement and quenching
- quantum nanophotonics: QED effects, plasmon-assisted quantum information, spasing, and nonlinear optical nanostructures
- microscopic theory of plasmonic properties
- plasmonic imaging, including probe ultramicroscopies, superlenses, and hyperlenses
- novel plasmonic systems such as graphene
- nanophasmonic Fano resonances
- electron-plasmon interactions
- active plasmonics theory and design.

**PLASMONIC MATERIALS AND STRUCTURE FABRICATIONS**
- nanofabrication of novel materials
- chemical fabrication (bottom up)
- lithographic and nanopatterning fabrication (top down)
- biomimetic and bio-inspired fabrication
- active, tunable, and reconfigurable methods.

**PLASMON C PHENOMENON AND CHARACTERIZATION**
- quantum entanglement and interference
- spectroscopies (spectral, time-domain, combined and multidimensional)
- local probes, nano-optics, and near field phenomena
- plasmon-assisted PEEM and energy-loss spectroscopy and visualization of plasmonic phenomena
- nonlinear and coherent optical properties
- plasmonic enhanced phenomena: SERS, SEIRA, nonlinear generation, luminescence, including molecules and nanostructured materials
- extraordinary transmission, diffractive, and refractive phenomena
- novel plasmonic systems such as graphene
- Fano resonances in plasmonic systems
- plasmon polariton propagation in arrays of metal nanoparticles and metal plasmonic waveguides
- semiconductor plasmonics
- fundamental physics of left-handed (negative-refraction) plasmonic materials
- active plasmonics
- topological plasmonics.

**PLASMONICS DEVICES AND SYSTEMS**
- plasmonic quantum devices
- plasmonic sensors
- nanoplasmonic waveguides and resonators
- plasmonic nanocircuits; logical nanoscale elements
- plasmonic ultramicroscopies and nanoscopic spectroscopies
- plasmonics-assisted memory
- plasmonic transistors
- plasmonic nanolasers and spasers
- nanoplasmonic antennas and their applications in nanoscopes, photodetectors, solar cells, and lighting devices
- prospective graphene nanoplasmonic devices
- sensing based on Fano resonances
- modulators and switches based on active plasmonics
- low-frequency plasmons and their applications
- solar energy harvesting
- devices for telecommunications
- medical and health applications.
OPTICAL TRAPPING AND OPTICAL MICROMANIPULATION XVII (OP104)

Conference Chairs: Kishan Dholakia, Univ. of St. Andrews (United Kingdom); Gabriel C. Spalding, Illinois Wesleyan Univ. (USA)

Program Committee: Ashley R. Carter, Amherst College (USA); Reuven Gordon, Univ. of Victoria (Canada); Catherine M. Herne, State Univ. of New York at New Paltz (USA); Masud Mansuripur, College of Optical Sciences, The Univ. of Arizona (USA); James Millen, King’s College London (United Kingdom); David C. Moore, Yale Univ. (USA); Justus C. Ndukaife, Vanderbilt Univ. (USA); Lene Broeng Oddershede, Niels Bohr Institute (Denmark); Daniel H. Ou-Yang, Lehigh Univ. (USA); Daryl Preece, Univ. of California, San Diego (USA); Ruben Ramos-Garcia, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); Halina Rubinsztein-Dunlop, The Univ. of Queensland (Australia); Nick Vamivakas, Univ. of Rochester (USA); Yuebing Zheng, The Univ. of Texas at Austin (USA)

2020 aims to promote a vision looking forward, for the next extensions of what we celebrate, quite generally, as the legacy of Arthur Ashkin, whose early work on optical trapping has spawned enormous productivity and enhancement of fundamental knowledge across the sciences.

This conference, each year, draws well over one hundred presentations and an even larger number of participants, and is clearly growing. Still, poster sessions take place with sufficient room and degree of refreshment to ensure an excellent level of interaction. Notably, this conference has a truly international character. The proceedings of the conference contain a large collection of relevant papers, making a valuable contribution to the field. Early career researchers are especially encouraged and highlighted.

Papers are solicited on (but not restricted to) the following areas:

- new fundamental physics
- “gonzo” trapping (i.e., trapping at extremes)
- cavity optomechanics
- high-sensitivity detectors
- toward (or in) the quantum limit of optomechanics
- photonic devices for optically induced forces
- shaping the flow of information: energy and momentum
- optical angular momentum
- statistical mechanics of small systems
- single molecule manipulation and study
- using the photonic toolbox to study cells and their organelles
- studies of active swimmers and hydrodynamics
- optofluidics and optically shaped structures
- optically driven microrheology, mechanobiology, and micromechanical properties
- enhanced sensitivity and resolution of optical force actuators
- optical manipulation of matter through gaseous media
- foundations of the electromagnetic theory of force and momentum
- radiation pressure, tractor beams, and solar sails
- near-field micromanipulation, plasmonic, and nanoparticle trapping
- beam shaping and aberration and wavefront correction
- optical sorting, optical lab-on-a-chip, and microfluidics
- optically manipulated robotics and novel samples
- nanoscale assembly with optical forces
- optical tweezers coupled with novel forms of optomechanics
- alternative and hybrid force systems (e.g., hybrid AFM-optical force systems, or combinations with acoustic, magnetic, or other forces)
- nonlinear optical responses mediated through forces (translation, electrostriction)
- optically bound matter
- holographic optical systems: from speckle to studies of neurons.

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PHYSICAL CHEMISTRY OF SEMICONDUCTOR MATERIALS AND INTERFACES IX (OP105)

Conference Chairs: Christian Nielsen, Queen Mary Univ. of London (United Kingdom); Daniel Congreve, The Rowland Institute at Harvard (USA)

Conference Co-Chair: Andrew J. Musser, Cornell Univ. (USA)

Program Committee: John B. Asbury, The Pennsylvania State Univ. (USA); Artem A. Bakulin, Imperial College London (United Kingdom); Natalie Banerji, Univ. Bern (Switzerland); Hugo A. Bronstein, Univ. of Cambridge (United Kingdom); Jenny Clark, The Univ. of Sheffield (United Kingdom); Felix Deschler, Technische Univ. München (Germany); Alexandre Fürstenberg, Univ. de Genève (Switzerland); David S. Ginger, Univ. of Washington (USA); Naomi S. Ginsberg, Univ. of California, Berkeley (USA); Paul A. Lane, The National Science Foundation (USA); Robert Lovrincic, Technische Univ. Braunschweig (Germany); Paul Meredith, Swansea Univ. (United Kingdom); Linda A. Peteanu, Carnegie Mellon Univ. (USA); Lee J. Richter, National Institute of Standards and Technology (USA); Carlos Silva, Georgia Institute of Technology (Canada); Sergei Tretiak, Los Alamos National Lab. (USA); Lauren Webb, The Univ. of Texas at Austin (USA); Omer Yaffe, Weizmann Institute of Science (Israel)

Physical processes which are controlled by the material properties of a semiconductor play an essential role in many physico-chemical applications, ranging from energy conversion and generation to catalysis and biological membranes. Recent developments in organic and hybrid (nano-) materials highlight the importance of surfaces and interfaces in quantum confined systems. At the same time, the study of the excited state properties in bulk materials, and their connection to material properties, such as structure and elemental composition, remains a relevant topic. The detailed study of the physics and physical chemistry in nanomaterials and at their interfaces led to the development of specialized experimental and theoretical techniques with increasing complexity. New forms of nonlinear spectroscopy, imaging, and scanning-probe techniques continue to emerge in conjunction with sophisticated theoretical methods capable of treating correlated systems of increasing size and over timescales of femto- to nanoseconds.

The intent of this conference is to bring together an interdisciplinary group of scientists from academia, industry, and government laboratories who study fundamental processes of emerging and established semiconductor materials, and their interfaces, from bulk to the nanoscale.

For 2020 the scope of the conference will focus on the following topics:

• physical chemistry of hybrid perovskite materials
• photophysics of emerging semiconductor materials and nanostructures
• electron and energy transfer mechanisms at interfaces
• physical processes in solar energy conversion
• exciton physics in semiconductors
• carrier transport in complex systems
• confinement effects in nanostructures
• physical understanding of biological and bioelectronics systems
• emerging experimental tools to study interfaces and nanomaterials
• advances in modeling of electronic processes in semiconductors and nanomaterials
• multidimensional spectroscopies
• structure-property relations in nanomaterials
• interface engineering.

ABSTRACTS DUE: 12 February 2020
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The contact author will be notified of acceptance by email.

MANUSCRIPT DUE DATE: 29 July 2020
PLEASE NOTE: Submissions imply the intent of at least one author to register, attend the symposium, present the paper as scheduled, where it is an oral or poster presentation, and submit a full manuscript by the deadline.
Low-dimensional material systems possessing at least one of their dimensions in the nanometer scale offer intriguing physical properties and undiscovered pathways toward revolutionary new device concepts for flexible and transparent electronics, photonics, quantum computing, and other advanced applications. Fabrication of quantum dots, nanowires, ultra-thin films, and heterostructures result in building blocks that reveal a wealth of interesting physical properties including quantum phenomena. Control of synthesis and processing at the nanometer scale offers unprecedented opportunities to tailor microscopic and macroscopic physical properties of such material systems. To further pursue these tremendous opportunities, many fundamental questions need to be addressed and technological barriers need to be overcome. This conference provides a forum for the presentation and discussion of synthesis, processing, and characterization of low-dimensional materials tailored to their unique and peculiar physical properties. Design, fabrication, and characterization of novel device platforms that employ low-dimensional materials are also of interest, as well as interfacing and integration of such devices toward novel electronics, photonics, sensors, and energy conversion and storage.

Topics of interest include:
- fabrication of zero-dimensional (core-shell nanoparticles, quantum dots), one-dimensional (nanowires and nanorods), and two-dimensional (van-der-Waals layers such as transition metal dichalcogenides), and their device integration
- templated, catalyzed and uncatalyzed, tip assisted, field induced, locally heated synthesis methods of low-dimensional materials
- self-limiting deposition technique such as atomic layer deposition (ALD) that can produce ultrathin and conformal thin film structures for many applications including thin film devices, display technology, energy storage and capture, solid state lighting
- exploration of strain and extended defects effect on synthesis and spatial ordering of nanoscale structures and on their optical and transport properties
- introduction of electrically/optically active impurities and their roles in low-dimensional structures; dopant spatial distributions and segregation
- electrical contact formation and interface properties between nanoscale structures and metal contacts
- nanoscale synthesis compatible to and integral onto CMOS devices; scalable and mass-manufacturable interfacing for electronics, photonics, optoelectronics, sensing and energy conversion
- 3D heterogeneous integration, application of advanced patterning techniques for positioning and dimension control of nanostructures, integration with MEMS
- electrical, optical, mechanical and structural characterization, including in-situ and in-operando techniques, of the low-dimensional structures and device platforms; correlation of composition, microstructure, and defects to the material physical properties and device performance.
UV AND HIGHER ENERGY PHOTONICS: FROM MATERIALS TO APPLICATIONS 2020 (OP107)

Conference Chairs: Gilles Lérondel, Univ. de Technologie Troyes (France); Yong-Hoon Cho, KAIST (Korea, Republic of); Atsushi Taguchi, Hokkaido Univ. (Japan)
Conference Co-Chair: Satoshi Kawata, Osaka Univ. (Japan)

Program Committee: Sanford A. Asher, Univ. of Pittsburgh (USA); Steve Blair, The Univ. of Utah (USA); Zhanghai Chen, Fudan Univ. (China); Yasin Ekinci, Paul Scherrer Institut (Switzerland); Torsten Frosch, Leibniz-Institut für Photonische Technologien e.V. (Germany); Naomi J. Halas, Rice Univ. (USA); Hans D. Hallen, North Carolina State Univ. (USA); Chennupati Jagadish, The Australian National Univ. (Australia); Junyong Kang, Xiamen Univ. (China); Yoichi Kawakami, Kyoto Univ. (Japan); Jong Kyu Kim, Pohang Univ. of Science and Technology (Korea, Republic of); Yasuaki Kumamoto, Kyoto Prefectural Univ. of Medicine (Japan); Paul T. Matsudaira, National Univ. of Singapore (Singapore); Eva Monroy, CEA Grenoble (France); Fernando Moreno, Univ. de Cantabria (Spain); Yukihiro Ozaki, Kwansei Gakuin Univ. (Japan); Sung-Jin Park, Univ. of Illinois (USA); Jérôme Plain, Univ. de Technologie de Troyes (France); Remo Proietti Zaccaria, Istituto Italiano di Tecnologia (Italy); Olivier Soppera, Univ. de Haute Alsace (France); Yunshan Wang, The Univ. of Utah (USA)

Recently, there has been a rapid and significant progress in the field of UV and higher energy photonics (UV to EUV) due to the availability of new UV and high energy light sources. Nano-materials such as nucleotides and proteins known as the essential biomolecules in living cells and semiconducting or plasmonic materials used in advanced nano-devices are analyzed and detected, imaged, and/or manipulated with use of UV and higher energy photons. Starting from the material growth related aspects, this conference includes theories and novel concepts on UV and higher energy photonics. It also includes experiments and developments of methods and instruments, which are used as devices for applications in catalysis, nano-lithography, nano-imaging, disinfection, analytical sensing but also in nano-photonics, bio-medical photonics, materials sciences and green and environmental sciences. The chairs of the conference proudly announce that the Young Scientist Award will be given to two outstanding presentations respectively in oral and poster sessions. Successful candidates must convey significant scientific content with a demonstrated excellent style of presentation including questions and discussions. In addition, from 2020, potentially four contributed papers will be promoted to invited contribution.

UV AND HIGHER ENERGY MATERIALS AND LIGHT SOURCES
- high band gap semiconductors
- LEDs and lasers for UV and higher energy
- nonlinear and ultrafast photonics for UV and higher energy
- fiber optics for UV and higher energy
- photonic crystal fibers
- high harmonic generation
- UV to EUV optics and sources.

UV AND HIGHER ENERGY MICROSCOPY AND SPECTROSCOPY
- resonant Raman microscopy
- nonlinear microscopy
- super-resolution microscopy
- plasmonics in UV and DUV
- coherent scattering imaging
- resonance Raman spectroscopy
- absorption spectroscopy
- fluorescence spectroscopy.

APPLICATIONS OF UV, DEEP UV, VACUUM UV, AND EXTREME UV PHOTONICS
- holography
- lithography
- photocatalysis
- decontamination
- material properties
- materials processing
- photoresists
- photodissociation
- photodamage
- environmental analysis
- energy production.

UV AND DEEP UV BIOSENSING AND ANALYSIS WITH UV AND HIGHER ENERGY PHOTONICS
- biosensor and analysis
- structure and dynamics of biomolecules
- native fluorescence
- photochemical effect on biomolecules.
NANOENGINEERING: FABRICATION, PROPERTIES, OPTICS, THIN FILMS, AND DEVICES XVII (OP110)

Conference Chairs: Balaji Panchapakesan, Worcester Polytechnic Institute (USA); André-Jean Attias, Sorbonne Univ. (France); Yonsei Univ. (Korea, Republic of); Wounjhang Park, Univ. of Colorado Boulder (USA)

Program Committee: Bharat Bhushan, The Ohio State Univ. (USA); Stephane Bruynooghe, Carl Zeiss Jena GmbH (Germany); Francesco Chiadini, Univ. degli Studi di Salerno (Italy); Pankaj Kumar K. Choudhury, Univ. Kebangsaan Malaysia (Malaysia); Luca Dal Negro, Boston Univ. (USA); Maziar Ghazinejad, California State Univ., Fresno (USA); Frédéric Guittard, Univ. de Nice Sophia Antipolis (France); Sarah Haigh, The Univ. of Manchester (United Kingdom); Ghassan E. Jabbour, Arizona State Univ. (USA); Klaus Jäger, Helmholtz-Zentrum Berlin für Materialien und Energie GmbH (Germany); Yi-Jun Jen, National Taipei Univ. of Technology (Taiwan); Anders Kristensen, DTU Nanotech (Denmark); Akhlesh Lalhtakia, The Pennsylvania State Univ. (USA); Tom G. Mackay, The Univ. of Edinburgh (United Kingdom); H. Angus Macleod, Thin Film Center, Inc. (USA); Robert Magnusson, The Univ. of Texas at Arlington (USA); Dorota A. Pawlak, Institute of Electronic Materials Technology (Poland); Michael T. Postek, Retired, National Institute of Standards and Technology (USA); Dianne L. Poster, National Institute of Standards and Technology (USA); Geoffrey B. Smith, Univ. of Technology, Sydney (Australia); Motofumi Suzuki, Kyoto Univ. (Japan); Jun Tanida, Osaka Univ. (Japan); Tomas Tolens, Ctr. for Physical Sciences and Technology (Lithuania); Chee Wei Wong, Columbia Univ. (USA); Wei Wu, The Univ. of Southern California (USA); Anatoly V. Zayats, King’s College London (United Kingdom)

Nanotechnology is an essential bridge that utilizes nanoscience and nanotechnology to enable a broad spectrum of totally new materials, functionalities, applications, devices, and products. Conventional photonic manufacturing technologies have extend- ed well into the nanometer regime. Over-extended technologies are pushing sizes and densities into ranges that challenge reliability and basic physics. Nanotechnology also allows for manipulating matter at the nanoscale. Newly engineered materials, processes, ultrahigh precision and metrologies are emerging. Novel synthesized nanomaterials, based on 1D, 2D, and 3D architectures, nanocomposites and hierarchical assemblies based on such mate- rials offer exciting opportunities. Nanostructured thin films display unique phenomena, thus enabling the improvement of traditional applications or the development of novel applications. Newly attainable design and fabrication of miniature optical elements have enabled the development of micro/nano- quantum-scale optical, near field optics, and opto-electronic elements in ever more diverse application areas. New low power logic and memory devices, expanded functionality, systems on a chip, solar cells, energy storage devices, biotechnology, photonics, photovoltaics, molecular electronics and optics are emerging. Application areas are highly diversified and include telecommunications, data communica- tions, consumer electronics, microwave photonics, optical computing, neural networks, optical storage, non-volatile data storage, information display, optical imaging, printing, optical sensing, optical scanning, renewable energy harvest and storage, medical di- agnosis, chemical/biological/environmental sensing, new nanomechanic applications, and new medical devices and prosthetic methods.

Critical to this realization of robust nanomanufactur- ing is the development of appropriate instrumenta- tion, metrology, and standards. As novel applications emerge, the demand for highly sensitive and efficient measurement tools with the capability of rapid, au- tomated, and thorough coverage of large functional areas at high precision is emerging. The newly upcoming nanotechnologies present new opportunities and challenges in materials processing, device design, and integration. Drivers for commer- cial deployment include increased functionality, small form factor, performance, reliability, cost, as well as renewable energy and climate change mitigation. Papers are solicited in the areas of:

LIGHT-MATTER INTERACTIONS IN 1D AND 2D NANOMATERIALS

• 1D and 2D photo-physics
• photoconductivity and photocurrents in 1D and 2D nanomaterials and composites
• novel architectures based on 1D and 2D nanomaterials for enhanced light-matter interactions
• photo-thermal phenomenon in nanoscale materials and their composites
• novel devices based on 1D and 2D nanomaterials for photonics.

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PHOTON UPCONVERSION
• exploration of new photon upconversion materials, nanomaterials, and nanostructures
• synthesis and surface modification techniques for photon upconversion materials
• nanophotonic approach for photon upconversion enhancement, including but, not limited to, plasmonic nanostructures, metamaterials, photonic crystals, and nanocavities
• applications of photon upconversion materials, including, but not limited to, solar energy conversion, imaging, sensing, and therapeutics
• theory and modeling of photon upconversion processes
• advanced spectroscopy and other characterizations of photon upconversion materials.

NANOSTRUCTURED THIN FILMS
• fabrication techniques
• characterization
• homogenization studies and modeling
• hybrid nanostructures
• multifunctionality at the nanoscale
• plasmonics
• organic and inorganic nanostructured thin films
• sculptured thin films
• nanostructured porous thin films
• two-dimensional materials
• carbon-based nanostructures
• topological insulators and photonic topological insulators
• functionalization of nanostructures
• thin-film sensors
• superhydrophobicity
• biomedical applications
• bioinspired and biomimetic thin films
• structural evolution.

INNOVATIVE PATTERNING, MATERIALS ENGINEERING, NANOFABRICATION, AND NANOLOITHOGRAPHY FOR PHOTONICS APPLICATIONS
• electrosprinning, imprinting, and embossing techniques
• fabrication, processing, and replication techniques
• directed self-assembly techniques
• engineered nano- and micro-structured materials
• synthesis of nanotubes, nanowires, and two-dimensional materials such as graphene
• stacked 2D atomic crystals
• molecular patterning and ordering.

HIGH PRECISION NANOPositioning AND FEEDBACK, NEW METROLOGIES FOR PHOTONICS
• proximal probe manipulation techniques
• nanomotors and actuators
• nano-alignment techniques, tolerance
• tribology nanotechnologies
• new metrology instrumentation, methods, and standards for measuring nanodevices
• metrology for placement precision
• novel measurement and inspection methodologies
• high resolution optics, including full-field, near-field and scanning probe microscopy, scatterometry, and interferometric techniques
• x-ray techniques
• synchrotron techniques
• optical detectors for state of the art instrumentation
• particle beam (electron, ion) microscopy and elemental analysis
• atomic force microscopy.

NANOMANUFACTURING OF 1D AND 2D NANOMATERIALS FOR PHOTONICS APPLICATIONS
• liquid phase exfoliation of 1D and 2D nanomaterials
• new developments in liquid phase exfoliation for low cost nanomanufacturing
• chemical vapor deposition of 1D and 2D nanomaterials for manufacturing
• new green synthesis methods for low cost manufacturing of 1D and 2D nanomaterials
• scalable manufacturing of nanocomposites based on 1D and 2D nanomaterials
• properties of scalable nanomanufactured products
• scalable nanomanufacturing: innovative device architectures
• scalable nanomanufacturing: what is the roadmap?

DEVICES AND PROPERTIES OF NANOSTRUCTURES FOR PHOTONICS (EXPERIMENT AND/OR THEORY)
• nanoelectronic and nanomagnetic devices and structures
• waveguiding nanodevices and nanostructures
• nano-MEMS devices and structures
• near field optics based devices
• NOMS: Nano-Opto-Mechanical Systems
• photovoltaic cells and structures

Save the date

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NANOSCIENCE

NANOENGINEERING: FABRICATION, PROPERTIES, OPTICS, THIN FILMS, AND DEVICES XVII (OP110) continued

• biological devices and structures
• molecular devices and structures
• atomic devices and structures
• quantum devices and structures
• nanosensors
• smart mechanical actuators
• 1D nanotubes
• stacked 2D atomic crystals.

NANO- AND MICRO-OPTICS
• physics, theory, design, modeling, and numerical simulation of optical nano- and micro-structures
• diffractive and refractive micro-structures for beam shaping and manipulation
• photonic microcircuits in silica, polymer, silicon, compound semiconductors, ferroelectrics, magnetics, metals, and biomaterials
• 1D, 2D, and 3D photonic crystals
• quantum dots, wells, and wires
• guided-wave and free-space optical interconnects
• optical alignment, tolerance, and coupling
• characterization (optical, electrical, structural, etc.)
• integration with guided-wave systems
• integration with photonic devices including VCSELs, modulators, and detectors
• nano- and micro-optic-based optical components, modules, subsystems, and systems for communications, information processing, computing, storage, photovoltaic power generation, information display, imaging, printing, scanning, and sensing
• graphene-and transition metal dichalcogenides based devices
• molecular devices.

ENERGY HARVESTING AND STORAGE NANTECHNOLOGIES
• nanostructured materials for efficient light trapping, photon absorption, charge generation, charge transport, and current collection in photovoltaic cells and modules
• nanostructured solar cells
• polymer solar cells based on 1D and 2D nanomaterials
• solar thermal phenomenon based on 1D and 2D nanomaterials
• photoelectrochemical cells based on 1D and 2D nanomaterials

• nanocomposites, nanocoatings, and nanolubricants for power-generating wind turbines
• nanocomposites for smart behavior: reciprocity in electroactuation
• nanotechnologies for batteries and ultracapacitors, including powder-based, carbon-nanotube-based, silicon-nanowire-based and graphene-based electrodes.

COMMERCIALIZATION OF NANO- AND MICRO-STRUCTURE PHOTONIC AND OTHER DEVICES, MODULES, AND SYSTEMS
• nanomanufacturing methodology
• in-situ and in-operando inspection
• 3D critical dimension metrology
• characterization of nanostructured functional surfaces
• characterization of nano-objects used in novel devices or products
• assembly and packaging
• reliability
• novel concepts.

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ENHANCED SPECTROSCOPIES AND NANOIMAGING 2020 (OP111)

Conference Chairs: Prabhat Verma, Osaka Univ. (Japan); Yung Doug Suh, Korea Research Institute of Chemical Technology (Korea, Republic of); Sungkyunkwan Univ. (Korea, Republic of)

Program Committee: Katrin F. Domke, Max-Planck-Institut für Polymerforschung (Germany); Masayuki Futamata, Saitama Univ. (Japan); Tamitake Itoh, AIST (Japan); Dayong Jin, Univ. of Technology, Sydney (Australia); Satoshi Kawata, Osaka Univ. (Japan); Dangyuan Lei, City Univ. of Hong Kong (Hong Kong, China); Alfred J. Meixner, Eberhard Karls Univ. Tübingen (Germany); Yukihiro Ozaki, Kwansei Gakuin Univ. (Japan); Matthew A. Pelton, Univ. of Maryland, Baltimore County (USA); Markus B. Raschke, Univ. of Colorado Boulder (USA); Bin Ren, Xiamen Univ. (China); P. James Schuck, Columbia Univ. (USA); Zachary D. Schultz, The Ohio State Univ. (USA); Ze Xiang Shen, Nanyang Technological Univ. (Singapore); Takayuki Umakoshi, Osaka Univ. (Japan); Siva Umapathy, Indian Institute of Science, Bengaluru (India); Katherine A. Willets, Temple Univ. (USA); Peng Xi, Peking Univ. (China); Hongxing Xu, Wuhan Univ. (China); Renato Zenobi, ETH Zurich (Switzerland)

There is a huge demand for research tools allowing one to “see” and investigate materials and biological samples at a resolution of true nanoscale and to characterize and sense constituents at molecular levels as well to understand biochemical process at nanoscale. Optical techniques such as nanospectroscopy and nanoimaging make this possible. Tools involving enhanced and confined light in optical spectroscopy and imaging have pushed the spatial resolution far beyond the diffraction limits of light and the detection sensitivity to new scales. Continuous improvements open ways to novel applications at the forefront of scientific knowledge.

The purpose of this interdisciplinary conference is to encompass all aspects of enhanced and confined light for nanospectroscopy and nanoimaging, including theory and novel concepts, experimental demonstration of novel concepts, major developmental progress and applications to any field in science, in particular, biological, medical, chemical, and the material sciences.

Papers are solicited in (but not restricted to) the following areas:

- NANOSPECTROSCOPIC AND SENSING TECHNIQUES
  - surface- and particle-enhanced Raman spectroscopy (SERS, PERS)
  - surface-enhanced infrared absorption spectroscopy (SEIRAS)
  - shell-isolated nanoparticle-enhanced Raman spectroscopy (SHINERS)
  - stimulated Raman spectroscopy (SRS) at high spatial resolution
  - dielectric-enhanced spectroscopies
  - enhanced spectroscopies for molecular sensing.

- NEAR-FIELD NANOIMAGING TECHNIQUES
  - near-field scanning optical microscopy (NSOM/SNOM)
  - tip-enhanced Raman scattering (TERS) microscopy
  - tip-enhanced photoluminescence (TE-PL) microscopy
  - tip-enhanced coherent anti-Stokes Raman scattering (TE-CARS) microscopy.

- OTHER NANOSCALE OPTICAL SPECTROSCOPIC/SENSING/IMAGING TECHNIQUES
  - new/unconventional experimental techniques for nanospectroscopy and nanoimaging
  - new/unconventional techniques for molecular detection and sensing
  - growth/fabrication of plasmonic/dielectric materials for nanospectroscopy and nanoimaging
  - growth/fabrication of plasmonic devices for molecular sensing
  - theoretical/simulation studies in related fields of nanospectroscopy
  - other nonlinear optical spectroscopy/microscopy at nanoscale.

New data laws are in effect

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EMERGING TOPICS IN ARTIFICIAL INTELLIGENCE 2020 (OP112)

Conference Chairs: Giovanni Volpe, Göteborgs Univ. (Sweden); Joana B. Pereira, Karolinska Institute (Sweden); Daniel Brunner, Institut Franche-Comte Electronique Mecanique Thermique et Optique (France); Aydogan Ozcan, Univ. of California, Los Angeles (USA)

Program Committee: Jonas Andersson, Syntronic (Sweden); George Barbastathis, Massachusetts Institute of Technology (USA); Frank Cichos, Univ. Leipzig (Germany); Margareta Colangelo, Deep Knowledge Ventures (USA); Joni Dambre, Univ. Ghent (Belgium); Danny Krautz, Optize (Germany); Alireza Marandi, Caltech (USA); Armand Niederberger, Noodle.ai (USA); Bert Jan Offrein, IBM Research - Zürich (Switzerland); Demetri Psaltis, Ecole Polytechnique Fédérale de Lausanne (Switzerland); Stephan Reitzenstein, Technische Univ. Berlin (Germany); Yair Rivenson, Univ. of California, Los Angeles (USA); Elena Rodriguez-Vieitez, Karolinska Institute (Sweden); Halina Rubinsztein-Dunlop, The Univ. of Queensland (Australia); Bhavin J. Shastri, Queen’s Univ. (Canada); Guohai Situ, Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences (China); Volker J. Sorger, The George Washington Univ. (USA); Evelyn Tang, Max Planck Institute for Dynamics and Self-Organization (Germany)

This conference provides a forum for a highly interdisciplinary community combining artificial intelligence with photonics, microscopy, active matter, biomedicine, and brain connectivity. Importantly, this conference includes topics outside the core expertise of optics and photonics. Photonics and machine learning have become decisively interdisciplinary, and we expect additional synergy and inspiration through this open-minded approach.

This conference will also actively engage industry, important to foster commercialization and utilization opportunities.

By bringing together experts from different fields and backgrounds, this conference will provide new fundamental insights, technological applications, and commercialization opportunities.

The topics that will be covered are:

- data acquisition and analysis through photonic subsystems, e.g., time series, images, video feature tracking, optical signal processing
- simulation and design of photonic components and circuits
- adaptive control of experimental setups through more robust and resilient feedback cycles
- enhanced computational microscopy using artificial intelligence
- fundamental aspects of photonic non-digital computing
- integrated photonics and nonlinear optical components for next generation computing
- alternative computing concepts such as neural networks and ising machines to overcome the end of Moore and Dennard scaling
- enhanced precision medicine, e.g., virtual tissue staining, early diagnosis, and personalized treatments
- artificial intelligence for analysis of brain connectivity
- biomimetic and neuromorphic computational architectures
- embodied intelligence in nature and technology
- evolution of adaptive behaviors in biological systems
- engineering collective behaviors in robotic swarms
- human brain haptic device interfaces
- physical insight and interpretability of artificial intelligence models
- limitations and criticism of the use of artificial intelligence.

The keynote and invited presentations will provide an exciting and broad view of this interdisciplinary research effort. The poster sessions will take place with sufficient room and refreshments to ensure an excellent level of interaction.

Abstracts are solicited on (but not restricted to) the following areas:

**ARTIFICIAL INTELLIGENCE FOR PHOTONICS**
- optical system design using machine learning
- machine learning-based solutions to inverse problems in optics
- spectroscopy enhancement using machine learning.

**ARTIFICIAL INTELLIGENCE FOR MICROSCOPE**
- computational microscopy
- data-driven optical reconstruction methods
- digital video microscopy
- generation of training datasets.

**ARTIFICIAL INTELLIGENCE FOR BIOMEDICINE**
- machine learning-enhanced optical imaging and sensing
- image segmentation
- virtual tissue staining
- artificial intelligence as a tool to enhance decision-making in personalized medicine and drug screening
- multiple-sources data structuring and combination in complex biomedical decision-making
- legal and ethical aspects of the use of artificial intelligence as a tool for decision-making in medicine.

**ARTIFICIAL INTELLIGENCE FOR OPTICAL TRAPPING**
- particle detection
- optical trap calibration
- feedback control.
ARTIFICIAL INTELLIGENCE FOR SOFT AND ACTIVE MATTER
- data acquisition using machine learning
- data analysis using machine learning
- de-noising using machine learning
- reinforcement learning in physical systems
- dynamics of complex systems
- intelligent foraging
- navigation and search strategies.

NEUROMORPHIC COMPUTING
- next generation materials for optical nonlinearity
- integration of ultra-parallel photonic architectures
- beyond 2D substrates
- physical substrates for machine learning applications.

OPTICAL NEURAL NETWORKS
- learning in optical systems
- applications for optical neural networks
- scalability of optical neural networks.

AUTONOMOUS ROBOTS
- swarming robots
- feedback control
- elaboration of sensorial inputs
- decision making.

BIOLOGICAL MODELS FOR ARTIFICIAL INTELLIGENCE
- physical foundations of biological intelligence
- translation of biological models to artificial intelligence
- collective motion in biological populations.

MACHINE LEARNING TO STUDY THE BRAIN
- machine learning methods for image segmentation
- supervised and unsupervised models
- multi-voxel pattern analysis
- predictive modelling approaches.

ARTIFICIAL INTELLIGENCE FOR BRAIN CONNECTIVITY
- measurement of brain activity and anatomy in humans and animals
- structural and functional connectomics
- graph theoretical tools
- clusters and subnetwork extraction
- dimensionality reduction techniques to identify brain networks.

MACHINE-BRAIN INTERFACES
- detection of brain activity
- haptic devices
- feedback control through brain waves.

LIMITATIONS OF ARTIFICIAL INTELLIGENCE
- the “black-box problem” of machine learning
- interpretability, explainability, and uncertainty quantification of machine-learning models
- generalization power of machine-learning models
- model selection
- development of objective benchmarks.

CALL FOR PAPERS
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AUTHOR NOTIFICATION: 20 April 2020
The contact author will be notified of acceptance by email.
MANUSCRIPT DUE DATE: 29 July 2020
PLEASE NOTE: Submissions imply the intent of at least one author to register, attend the symposium, present the paper as scheduled, where it is an oral or poster presentation, and submit a full manuscript by the deadline.
The spin degree of freedom has been directly used as an information support in nanometer-scale devices. Today applications mostly concern the huge market of hard-drive read heads, nonvolatile magnetic memories (MRAMs), or magnetic logic units. Recent developments are being considered for spin-based logic or quantum computing. New topics are emerging in frontier fields, e.g., Skyrmions and domain-wall manipulation, topological insulators, Majorana fermions, spin photonics and spin optics (the latter being based on recent developments in plasmonics), or spin-caloric phenomena. These advances make use of the fascinating developments of new materials.

The purpose of the conference is to provide a broad overview of the state-of-the-art and perspectives, bringing together experts from different communities: fundamental physics (experimental and theoretical), materials science and chemistry, fabrication processes and industrial developments, etc. Contributions for this conference are encouraged in particular in the following areas:

- spin-coherence, semiconductor spin physics, quantum wells and quantum dots
- magnetic nanostructures, micromagnetism, spin-precession, and magnonics
- spin-injection, spin-transfer, spin-Hall and related effects
- new materials (graphene and chalcogenides, oxides, organics, etc.)
- topological matter, skyrmions
- new structures and applications (magnetoresistive devices, MRAMs, spin logic, crystalline tunnel barriers, etc.)
- neuromorphic computing
- spin photonics, spin lasers, and spin optics.
QUANTUM SCIENCES AND TECHNOLOGY

QUANTUM NANOPHOTONIC MATERIALS, DEVICES, AND SYSTEMS 2020 (OP114)

Conference Chairs: Cesare Soci, Nanyang Technological Univ. (Singapore); Matthew T. Sheldon, Texas A&M Univ. (USA); Mario Agio, Univ. Siegen (Germany)

Program Committee: Igor Aharonovich, Univ. of Technology, Sydney (Australia); Vikas Anant, Photon Spot, Inc. (USA); Inigo Artundo, VLC Photonics (Spain); Jennifer A. Dionne, Stanford Univ. (USA); Andrei Faraon, Caltech (USA); Mohammad Hafezi, Joint Quantum Institute (USA); Zubin Jacob, Purdue Univ. (USA); Christian Kurtsiefer, National Univ. of Singapore (Singapore); Mark Lawrence, Stanford Univ. (USA); Peter Lodahl, Niels Bohr Institute (Denmark); Marko Loncar, Harvard John A. Paulson School of Engineering and Applied Sciences (USA); Chao-Yang Lu, Univ. of Science and Technology of China (China); Patrick Maletinsky, Univ. Basel (Switzerland); Qnami (Switzerland); Maiken H. Mikkelson, Duke Univ. (USA); Prineha Narang, Harvard Univ. (USA); Kae Nemoto, National Institute of Informatics (Japan); Jeremy L. O’Brien, Univ. of Bristol (United Kingdom); Teri W. Odom, Northwestern Univ. (USA); Jian-Wei Pan, Univ. of Science and Technology of China (China); Pascale Senellart, Lab. de Photonique et de Nanostructures (France); Andrew J. Shields, Toshiba Research Europe Ltd. (United Kingdom); Kartik Srinivasan, National Institute of Standards and Technology (USA); Daniel L. Stiek, Sandia National Labs. (USA); Mark Tame, Stellenbosch Univ. (South Africa); Wolfgang Tittel, Univ. of Calgary (Canada); Ewold Verhagen, AMOLF (Netherlands); Ulrike Woggon, Technische Univ. Berlin (Germany)

Optics and photonics enable devices that exploit the laws of quantum physics at a fundamental level, laying the ground for a second quantum revolution. Light is widely used in emerging quantum technologies, for example to control and manipulate quantum states of matter, to generate and transmit qubits, to achieve quantum nonlinearities and many-body effects. In addition, advances in nanofabrication and circuit integration (e.g. silicon photonics, fiber optics, plasmonics) are crucial to translate proof of concepts into technological platforms for quantum simulations, metrology, sensing, imaging, communication and computing.

Quantum nanophotonic materials, devices, and systems aim at establishing a multidisciplinary forum for physicists, material scientists, and optical engineers to discuss the current progress, challenges, and future directions of the burgeoning field of quantum nanophotonics. Contributions are solicited in areas focusing on:

**MATERIAL PLATFORMS FOR QUANTUM PHOTONIC DEVICES**
- wide bandgap materials: diamond, silicon carbide, rare earths
- semiconductors: silicon, III-V and II-V compounds
- two-dimensional materials: graphene, boron-nitride, transition metal dicalcogenides
- plasmonics, metamaterials and metasurfaces
- nanoantennas
- topological materials.

**QUANTUM PHOTONIC DEVICES FOR SIMULATIONS, METROLOGY, SENSING, IMAGING, COMMUNICATION AND COMPUTING**
- nanoscale atom traps
- single-photon sources and modulators
- single-photon and photon-number discriminating detectors
- spin-photon interfaces for sensors and repeaters
- quantum gates
- opto-photon interfaces for sensors and repeaters
- quantum chemistry

**QUANTUM NANOPHOTONIC SYSTEMS**
- quantum key distribution and quantum random number generators
- quantum computers and simulators
- quantum sensors based on solid-state systems and atom chips
- quantum engineering, including nanofabrication and integration
- quantum control, including error correction and tolerance
- quantum entanglement and imaging

Save the date

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Quantum communications and quantum imaging are emerging technologies that promise great benefits beyond classical communications and classical imaging - as well as great challenges. The objective of this conference is to provide a forum for scientists, researchers, and system developers in both fields and encourage technology exchange between the quantum communication and quantum imaging research communities. Papers are solicited on the following and related topics:

**QUANTUM COMMUNICATIONS, QUANTUM INTERNET, AND QUANTUM INFORMATION**
- quantum free-space and fiber optics communications and cryptography
- quantum communications experimental demonstrations
- quantum key distribution (QKD), entangled QKD, stochastic QKD, heralded QKD
- quantum cryptography protocols
- quantum probes
- quantum communication security
- quantum communications with orbital angular momentum (OAM) states
- quantum communication using entanglement
teleportation; continuous variable teleportation counter-factual quantum communications
- Bell-state analyzer development
- nonlinear crystal and nonlinear fiber use in generating and engineering entanglement
- multiphoton and multiple-particle entangled states and entangled beams
- continuous and pulsed laser sources of entangled photons
- fundamental properties of the photon
- qubit physics
- single and multi-photon physics
- squeezed states
- slow/trapped light and photons
- amplification and transmission of photon holes
- quantum wavefunctions & measurements
- quantum probability
- quantum bi-photon physics
- frequency and polarization entanglement
- atmospheric quantum communication, satellite, and technology applications
- quantum satellites, quantum cube satellites
- quantum UAV, drone, robot and aircraft research and applications
- atmospheric effects on quantum communications systems
- atmospheric quantum communication propagation experiments, theory, simulation
- quantum computing with photons
- optical/photonic/fiber quantum computing; novel quantum computing
- photon chips
- quantum storage, gates, and control
- single-photon sources
- quantum algorithms
- fine-grained quantum computing; few-qubit quantum computing
- quantum state engineering
- quantum random number generation
- quantum information communication
- information in a photon
- quantum data compression
- compressive sensing and compressive imaging with quantum information
- nonclassical information from entangled states and non-entangled states
- non-local measurements
- quantum secret sharing
- quantum networks
- atom-photon quantum networks
- quantum repeaters, memories, switches
- entanglement of distant quantum memories
- distributed quantum computing
- atom chips
- atom-ion optics; multiphoton interference, multiparticle interference
- storage of entangled photons
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