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Conferences and courses: 18–22 August 2024

Exhibition: 20–22 August 2024

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BY 7 FEBRUARY 2024

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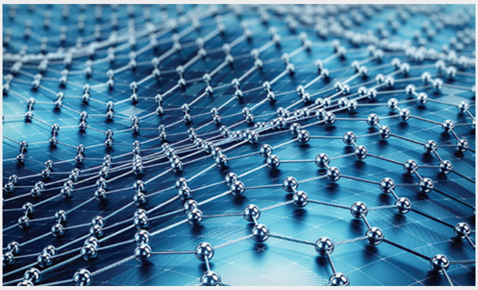

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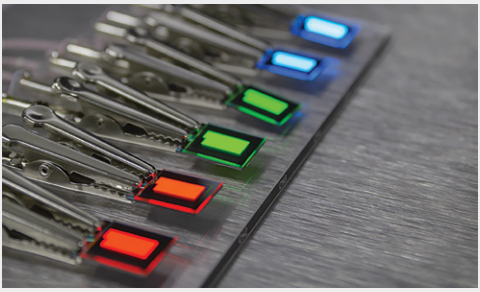
The preeminent nanotechnology conference on nanoscale developments that are transforming technology and creating new applications



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A comprehensive offering on organic-based materials and devices advancing renewable energy sources and other commercial applications.

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The premier conference for developments in optical design and engineering, impacting photonic device and applications research.

Organic Photonics + Electronics Plenary

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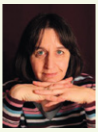
Nanoscience + Engineering Applications

Advances in metamaterials, plasmonics, quantum materials and devices, optical trapping, nanostructured devices, spintronics, artificial intelligence, and more

SYMPOSIUM CHAIRS



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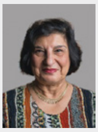
Organic Photonics + Electronics

Organic and hybrid materials and devices that advance sustainable energy sources and other applications

SPIE ORGANIC PHOTONICS + ELECTRONICS 2024 SYMPOSIUM CHAIRS



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Univ. of California, Santa Barbara (USA)

Optical Engineering + Applications

Optical design, testing, and fabrication, signal and image processing, photonic devices and applications, remote sensing, and particle technologies

OPTICAL ENGINEERING + APPLICATIONS 2024 PROGRAM TRACK CHAIRS

Optical Design
José Sasián, Wyant College of Optical Sciences (USA)

Optical Alignment, Testing, and Fabrication
H. Philip Stahl, NASA Marshall Space Flight Ctr. (USA)

Signal, Image, and Data Processing
Khan Iftekharuddin, Old Dominion Univ. (USA)

Photonic Devices and Applications
Ruyan Guo, The Univ. of Texas at San Antonio (USA)

Remote Sensing and Atmospheric Propagation
Stephen Hammel, Naval Information Warfare Ctr. Pacific (USA)
Alexander M. J. van Eijk, TNO Defence, Security, and Safety (Netherlands)

X-Ray, Gamma-Ray, and Particle Technologies
Ali Khounsary, Illinois Institute of Technology (USA)
Ralph James, Savannah River National Lab. (USA)

Metamaterials, Metadevices, and Metasystems 2024 (OP101)

Conference Chairs: **Nader Engheta,** Univ. of Pennsylvania (United States); **Mikhail A. Noginov,** Norfolk State Univ. (United States); **Nikolay I. Zheludev,** Univ. of Southampton (United Kingdom), Nanyang Technological Univ. (Singapore)

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Metamaterials offer a paradigm for manipulating and controlling waves using spatial and/or temporal inhomogeneities to achieve interesting functionalities. The conference agenda includes topics on tunable, switchable, nonlinear, and quantum metamaterials and metasurfaces, with various applications. It 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 meso-, micro- and nanoscale forces, interactions, strong and weak coupling and application of artificial intelligence techniques.

The conference will have the special session "Photonic Quantum Engineering" featuring presentations of the University of Stuttgart group, organized by Prof. Harald Giessen.

Active Photonic Platforms (APP) 2024 (OP102)

Conference Chairs: **Ganapathi S. Subramania,** Sandia National Labs. (United States); **Stavroula Foteinopoulou,** The Univ. of New Mexico (United States)

Program Committee: **Andrea Alù,** The City Univ. of New York (United States); **Koray Aydin,** Northwestern Univ. (United States); **Harish Bhaskaran,** Univ. of Oxford (United Kingdom); **Paul V. Braun,** Univ. of Illinois (United States); **Che Ting Chan,** Hong Kong Univ. of Science and Technology (Hong Kong, China); **Zhigang Chen,** San Francisco State Univ. (United States), Nankai Univ. (China); **Dmitry N. Chigrin,** DWI an der RWTH Aachen e.V. (Germany); **Shanhui Fan,** Stanford Univ. (United States); **Didier Felbacq,** Univ. Montpellier (France); **Juejun Hu,** Massachusetts Institute of Technology (United States); **Stephen Hughes,** Queen's Univ. (Canada); **Boubacar Kante,** Univ. of California, Berkeley (United States); **Mercedeh Khajavikhan,** The Univ. of Southern California (United States); **Alexander V. Kildishev,** Purdue Univ. (United States); **Nathaniel Kinsey,** Virginia Commonwealth Univ. (United States); **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,** Munster Technological Univ. (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); **Michelle L. Povinelli,** The Univ. of Southern California (United States); **Subramaniam Anantha Ramakrishna,** Indian Institute of Technology Kanpur (India); **Christophe Sauvan,** Univ. Paris-Saclay (France), CNRS (France); **Jörg Schilling,** Martin-Luther-Univ. Halle-Wittenberg (Germany); **Gennady B. Shvets,** Cornell Univ. (United States); **Volker J. Sorger,** Univ. of Florida (United States); **Isabelle Staude,** Friedrich-Schiller-Univ. Jena (Germany); **Andrey A. Sukhorukov,** The Australian National Univ. (Australia); **Georgios Veronis,** Louisiana State Univ. (United States); **Daniel M. Wasserman,** The Univ. of Texas at Austin (United States); **Sharon M. Weiss,** Vanderbilt Univ. (United States)

The Active Photonic Platforms (APP) 2024 conference aims to bring together scientists and engineers working in the newest developments in fundamentals and applications of structured-material platforms for active light control. **This conference will confer a Best Poster Presentation award recognized with an official SPIE certificate. To ensure consideration for this award please select "poster only" for presentation format upon submission of your abstract by February 7th 2024.**

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 interfaced with active material, which may possess tunable or dynamic photonic properties or respond to an applied stimulus. Some examples of active materials are gain materials, non-linear and electro-optic media, phase-change materials, magneto-photonic material, 2D materials, quantum emitters, other bias or strain-controlled photonic media etc.

Structured material platforms with active components can enable entirely new regimes of light control crucial to a wide range of applications and technologies for a sustainable future. Examples include energy efficient all-optical computing and communications, all-optical memory components, reconfigurable photonic devices, chip-scale low-threshold nanolasers, modulators, devices for thermal management and radiative cooling, photodetectors, biological/chemical/thermal/electrical sensors and others.

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 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
- Advances in non-linear optical phenomena and materials
- Electro-optic nanophotonic systems and modulators for devices with greener footprint
- Novel harmonic generation and frequency mixing phenomena
- Time-dependent photonic responses: theory, modeling and experimental realization
- PT-symmetric, non-Hermitian and pseudo-Hermitian photonic systems
- Topological and non-reciprocal photonic platforms; optical isolators
- Tunable and dynamically changeable optical properties and systems
- Reconfigurable photonic platforms and effects
- Novel lasing systems: polariton, quantum-dot, and random lasers
- Tailoring quantum emitters: structured photonic environment; time-periodic driving
- Low-threshold lasing and energy-efficient chip-scale light sources
- Weak and strong coupling: cavity QED; phonon polaritons; exciton polaritons
- Non-classical sources (e.g., quantum dots, quantum wires, NV-centers etc.): physics and advances in experimental realization

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Active Photonic Platforms (APP) 2024 (OP102) continued

- Chiro-optical activity with nanocomposites, supramolecular systems or nanostructured media
- Phase-change materials for photonic devices
- All-photonic memory and neuromorphic devices
- Graphene and carbon-based materials for photonics and optoelectronics
- Photonics with 2D and quasi-2D materials: hBN, transition metal dichalcogenides (TMDs), Black phosphorous (BP), MXenes (transition metal carbides, nitrides or carbonitrides)
- Van der Waals heterostructures; twisted Van der Waals heterostructures; photonic Moire' lattices
- Hybrid integration with 2D/quasi-2D material or material with dynamically changeable optical properties
- Novel magneto-photonic phenomena and systems
- Advances in fabrication of photonic structures with active materials including sustainable approaches for manufacturing
- Photonic approaches for cooling and thermal management: fundamentals and applications for sustainability
- Novel systems for light absorption enhancement
- Sensors and photodetectors based on active control of light
- Optofluidic chips
- Optomechanical devices; optical MEMs for energy-efficient telecommunications.

Plasmonics: Design, Materials, Fabrication, Characterization, and Applications XXII (OP103)

Conference Chairs: **Takuo Tanaka,** RIKEN (Japan); **Yu-Jung Lu,** Research Ctr. for Applied Sciences - Academia Sinica (Taiwan), National Taiwan Univ. (Taiwan)

Program Committee: **Martin Aeschlimann,** Rheinland-Pfälzische Technische Univ. Kaiserslautern-Landau (Germany); **Hatice Altug,** Ecole Polytechnique Fédérale de Lausanne (Switzerland); **Harry A. Atwater Jr.,** Caltech (United States); **David J. Bergman,** Tel Aviv Univ. (Israel); **Humeyra Caglayan,** Tampere Univ. (Finland); **Che Ting Chan,** Hong Kong Univ. of Science and Technology (Hong Kong, China); **Yun-Chorng Chang,** Research Ctr. for Applied Sciences - Academia Sinica (Taiwan); **Harald W. Giessen,** Univ. Stuttgart (Germany); **Naomi J. Halas,** Rice Univ. (United States); **Dai-Sik Kim,** Ulsan National Institute of Science and Technology (Republic of Korea); **Wakana Kubo,** Tokyo Univ. of Agriculture and Technology (Japan); **Laurens K. Kuipers,** Kavli Institute of Nanoscience Delft (Netherlands); **Mikhail Lapine,** Univ. of Technology Sydney (Australia); **Ai Qun Liu,** Nanyang Technological Univ. (Singapore); **Olivier J. F. Martin,** Ecole Polytechnique Fédérale de Lausanne (Switzerland); **Peter Nordlander,** Rice Univ. (United States); **George C. Schatz,** Northwestern Univ. (United States); **Tigran V. Shahbazyan,** Jackson State Univ. (United States); **Vladimir M. Shalaev,** Purdue Univ. (United States); **Gennady B. Shvets,** Cornell Univ. (United States); **Din Ping Tsai,** City Univ. of Hong Kong (Hong Kong, China); **Prabhat Verma,** Osaka Univ. (Japan); **Hongxing Xu,** Wuhan Univ. (China); **Shumin Xiao,** Harbin Institute of Technology Shenzhen Graduate School (China); **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.

The Plasmonics: Design, Materials, Fabrication, Characterization, and Applications conference requires a 500-word Abstract for Review.

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 nanoplasmonics: QED effects, plasmon-assisted quantum information, spasing, and nanolasing in plasmonic nanostructures
- microscopic theory of plasmonic properties
- plasmonic imaging, including probe ultramicroscopies, superlenses, and hyperlenses
- novel plasmonic systems such as graphene
- nanoplasmonic Fano resonances
- electron-plasmon interactions
- active plasmonics theory and design
- plasmonic thermal effects
- advanced design strategies including machine learning, inverse design
- chiral photonics and plasmonics
- spin and angular momentum of photons and plasmons

PLASMONIC MATERIALS AND STRUCTURE FABRICATIONS

- nanofabrication of novel materials
- chemical fabrication including bottom up and self-organized processes
- lithographic and nanopatterning fabrication (top down)
- biomimetic and bio-inspired fabrication
- active, tunable, and reconfigurable methods
- rapid and large area fabrication.

PLASMONIC PHENOMENA 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 metals
- extraordinary transmission, diffractive, and refractive phenomena
- novel plasmonic systems such as graphene
- Fano resonances in nanoplasmonic systems
- plasmon polariton propagation in arrays of metal nanoparticles and metal nanoplasmonic waveguides

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Plasmonics: Design, Materials, Fabrication, Characterization, and Applications XXII (OP103) continued

- semiconductor plasmonics
- fundamental physics of left-handed (negative-refraction) plasmonic materials
- active plasmonics
- topological plasmonics
- plasmonics in 2D materials.

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
- environmental applications
- medical and health applications
- photovoltaic applications and efficient light harvesting.

Optical Trapping and Optical Micromanipulation XXI (OP104)

Conference Chairs: **Kishan Dholakia,** Univ. of St. Andrews (United Kingdom); **Halina Rubinsztein-Dunlop,** The Univ. of Queensland (Australia)

Conference Co-Chair: **Giovanni Volpe,** Göteborgs Univ. (Sweden)

Program Committee: **Ashley R. Carter,** Amherst College (United States); **Jürgen W. Czarske,** TU Dresden (Germany); **Yale E. Goldman,** Univ. of California, Davis (United States); **Reuven Gordon,** Univ. of Victoria (Canada); **Catherine M. Herne,** State Univ. of New York at New Paltz (United States); **Masud Mansuripur,** Wyant College of Optical Sciences (United States); **James Millen,** King's College London (United Kingdom); **David C. Moore,** Yale Univ. (United States); **Justus C. Ndukaife,** Vanderbilt Univ. (United States); **Daniel H. Ou-Yang,** Lehigh Univ. (United States); **Daryl Preece,** Beckman Laser Institute and Medical Clinic (United States); **Ruben Ramos-Garcia,** Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); **Nick Vamivakas,** The Institute of Optics, Univ. of Rochester (United States); **Karen P. Volke-Sepúlveda,** Univ. Nacional Autónoma de México (Mexico); **Yuebing Zheng,** The Univ. of Texas at Austin (United States)

This conference draws well over one hundred presentations and an even larger number of participants. In addition to an immersive program of oral presentations, our poster sessions have a tradition of ensuring an excellent level of interaction and feedback. Special sessions ensure that technical advances are widely shared. Participants are also well served by the special attention given to community-building activities. Early career researchers are especially encouraged and highlighted.

Joint sessions will be planned with the "Emerging Topics in Artificial Intelligence" conference.

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

- precision measurement, including testing fundamental physics
- ”gonzo” trapping (i.e., trapping at extremes)
- cavity optomechanics
- high-sensitivity detectors
- toward (or in) the quantum limit of opto-mechanics
- photonic devices for optically induced forces
- shaping the flow of information: energy and momentum
- systems with broken symmetry, including optical angular momentum
- statistical mechanics of small systems
- virus and single-molecule biophysical studies and technologies
- using the photonic toolbox to study cells and their organelles
- studies of dynamical biophysical systems, including 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
- approaches to optical force and momentum measurement
- 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
- next-generation fabrication technologies, including nanoscale assembly with optical forces
- optical tweezers coupled with novel forms of microscopyv
- 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
- machine learning for designing relevant systems, for particle tracking, and for data analysis.

Photonic Computing: From Materials and Devices to Systems and Applications (OP105)

Conference Chairs: **Xingjie Ni,** The Pennsylvania State Univ. (United States); **Wenshan Cai,** Georgia Institute of Technology (United States)

Program Committee: **Nicola Andriolli,** Scuola Superiore Sant'Anna (Italy); **Alexandra Boltasseva,** Purdue Univ. (United States); **Hui Cao,** Yale Univ. (United States); **Hongwei Chen,** Tsinghua Univ. (China); **Boubacar Kanté,** Univ. of California, Berkeley (United States); **David J. Moss,** Swinburne Univ. of Technology (Australia); **Cheng-Wei Qiu,** National Univ. of Singapore (Singapore); **Junsuk Rho,** Pohang Univ. of Science and Technology (Republic of Korea); **Bhavin J. Shastri,** Queen's Univ. (Canada); **Hiroki Takesue,** NTT Basic Research Labs. (Japan); **Jason G. Valentine,** Vanderbilt Univ. (United States)

The field of photonic computing is rapidly evolving, with significant advancements in theory, materials, devices, systems, and applications. This transformative field is ushering in changes across a plethora of areas. In recent years, innovative areas such as photonic edge computing, photonic neuromorphic computing, photonic co-processors/accelerators, and photonic quantum computing have emerged and rapidly gained traction.

Photonic edge computing explores the potential for faster, more efficient data processing at the network periphery, a critical need in the age of Internet of Things (IoT). Meanwhile, photonic neuromorphic computing offers a novel non-von-Neumann approach to emulate the architecture of neural networks in the brain, promising substantial advancements in artificial intelligence (AI) and machine learning applications. Photonic co-processors and accelerators provide an avenue to supercomputing performance, with the photonic components performing specialized tasks, such as tensor processing, at a speed far surpasses their electronic counterparts. Lastly, photonic quantum computing, fully exploiting photons' quantum mechanical properties and robustness to decoherence, is at the forefront of efforts to achieve quantum computational advantage or supremacy which is a long-anticipated milestone toward practical quantum computers.

By spotlighting these emerging key areas of photonic computing, we aim to stimulate discussions that extend the frontiers of current possibilities. Each of these areas brings unique benefits and potential applications that could revolutionize various areas including information technology, healthcare, environmental science, and more. Our vision for this conference transcends the traditional confines of academic discourse – we seek not only to promote scientific exploration but also to stimulate the practical application of these potentially disruptive technologies. With valuable support from the esteemed SPIE community, our proposed conference aspires to bring together researchers, scientists, and industry professionals globally. By sharing their latest breakthroughs, exchanging innovative ideas, and fostering synergic collaborations, we aim to shape the future of photonic computing.

Low-Dimensional Materials and Devices 2024 (OP106)

Conference Chairs: **Nobuhiko P. Kobayashi,** Univ. of California, Santa Cruz (United States); **A. Alec Talin,** Sandia National Labs. (United States); **Albert V. Davydov,** National Institute of Standards and Technology (United States)

Conference Co-Chair: **M. Saif Islam,** Univ. of California, Davis (United States)

Program Committee: **Deji Akinwande,** The Univ. of Texas at Austin (United States); **Kristine A. Bertness,** National Institute of Standards and Technology (United States); **Sonia Conesa-Boj,** Technische Univ. Delft (Netherlands); **Hamed Dalir,** Univ. of Florida (United States); **Alexey Koposov,** Institute for Energy Technology (Norway); **Andrey Krayev,** HORIBA Scientific (United States); **Marina S. Leite,** Univ. of California, Davis (United States); **Paola Prete,** Istituto per la Microelettronica e Microsistemi (Italy); **Volker J. Sorger,** Univ. of Florida (United States); **George T. Wang,** Sandia National Labs. (United States); **Sanshui Xiao,** DTU Fotonik (Denmark)

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, characterization, and modeling of low-dimensional materials tailored to their unique 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, CNTs, 1D van-der-Waals materials), 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 2024 (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: **Steve Blair,** The Univ. of Utah (United States); **Zhanghai Chen,** Xiamen Univ. (China); **Yasin Ekinci,** Paul Scherrer Institut (Switzerland); **Torsten Frosch,** Technische Univ. Darmstadt (Germany); **Naomi J. Halas,** Rice Univ. (United States); **Hans D. Hallen,** North Carolina State Univ. (United States); **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); **Kuniaki Konishi,** The Univ. of Tokyo (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 (United States); **Jérôme Plain,** Univ. de Technologie de Troyes (France); **Remo Proietti Zaccaria,** Istituto Italiano di Tecnologia (Italy); **Olivier Soppera,** Institut de Sciences des Matériaux de Mulhouse (France); **Yunshan Wang,** The Univ. of Utah (United States)

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 and MATERIALS more specifically nanostructured materials, 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.

We would like again this year to emphasis on **environmental sciences and sustainability using high energy photons either through applications like decontamination by photocatalysis, disinfection and germicidal techniques using UV photons or sustainable absorbing or emitting materials (rare-earth free materials) as an example.**

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 HIGH ENERGY MATERIALS AND LIGHT SOURCES
- high band gap semiconductors
- **nanostructured absorbing and/or emitting materials**
- 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**
- **disinfection/germicidal techniques**
- 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 XXI (OP108)

Conference Chairs: **Balaji Panchapakesan,** Vellore Institute of Technology (India); **André-Jean Attias,** Yonsei Univ. (Republic of Korea), Sorbonne Univ. (France); **Wounjhang Park,** Univ. of Colorado Boulder (United States)

Program Committee: **Bharat Bhushan,** The Ohio State Univ. (United States); **Stephane Bruynooghe,** Carl Zeiss Jena GmbH (Germany); **Francesco Chiadini,** Univ. degli Studi di Salerno (Italy); **Pankaj Kumar Choudhury,** Zhejiang Univ. (China); **Luca Dal Negro,** Boston Univ. (United States); **Elizabeth A. Dobisz,** SLAC National Accelerator Lab. (United States); **Ghassan E. Jabbour,** Univ. of Ottawa (United States); **Yi-Jun Jen,** National Taipei Univ. of Technology (Taiwan); **Anders Kristensen,** Technical Univ. of Denmark (Denmark); **Akhlesh Lakhtakia,** The Pennsylvania State Univ. (United States); **Tom G. Mackay,** The Univ. of Edinburgh (United Kingdom); **Robert Magnusson,** The Univ. of Texas at Arlington (United States); **Dorota A. Pawlak,** ENSEMBLE3 sp. z o.o. (Poland); **Michael T. Postek,** Univ. of South Florida (United States); **Dianne L. Poster,** National Institute of Standards and Technology (United States); **Anne E. Sakdinawat,** SLAC National Accelerator Lab. (United States); **Andrew M. Sarangan,** Univ. of Dayton (United States); **Motofumi Suzuki,** Kyoto Univ. (Japan); **Tomas Tolenis,** ELI Beamlines (Czech Republic); **Chee Wei Wong,** UCLA Samueli School of Engineering (United States)

Nanoengineering 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 extended well into the nanometer regime. Over-extended technologies are pushing sizes and densities into ranges that challenge reliability and basic physics. Nanoengineering 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 materials 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 optoelectronic 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 communications, 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 diagnosis, chemical/biological/environmental sensing, new nanomechanic applications, and new medical devices and prosthetic methods.

Critical to this realization of robust nanomanufacturing is the development of appropriate instrumentation, metrology, and standards. As novel applications emerge, the demand for highly sensitive and efficient measurement tools with the capability of rapid, automated, 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 commercial 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.

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

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Nanoengineering: Fabrication, Properties, Optics, Thin Films, and Devices XXI (OP108) continued

- 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 NANOLITHOGRAPHY FOR PHOTONICS APPLICATIONS

- electrospinning, 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 road map?

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
- 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 NANOTECHNOLOGIES

- 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.

Enhanced Spectroscopies and Nanoimaging 2024 (OP109)

Conference Chairs: **Prabhat Verma,** Osaka Univ. (Japan); **Yung Doug Suh,** Ulsan National Institute of Science and Technology (Korea, Republic of)

Program Committee: **Tamitake Itoh,** Kwansei Gakuin Univ. (Japan), AIST (Japan); **Ryo Kato,** Tokushima Univ. (Japan); **Satoshi Kawata,** Osaka Univ. (Japan); **Naresh Kumar,** ETH Zurich (Switzerland); **Jung-Hoon Lee,** Soonchunhyang Univ. (Korea, Republic of); **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 (United States); **Markus B. Raschke,** Univ. of Colorado Boulder (United States); **Bin Ren,** Xiamen Univ. (China); **P. James Schuck,** Columbia Univ. (United States); **Zachary D. Schultz,** The Ohio State Univ. (United States); **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. (United States); **Peng Xi,** Peking Univ. (China); **Hongxing Xu,** Wuhan Univ. (China); **Taka-aki Yano,** Tokushima Univ. (Japan); **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-, nanogap- and particle-enhanced Raman spectroscopy (SERS, NERS, 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.

Emerging Topics in Artificial Intelligence (ETAI) 2024 (OP110)

Conference Chairs: **Giovanni Volpe,** Göteborgs Univ. (Sweden); **Joana B. Pereira,** Karolinska Institute (Sweden); **Daniel Brunner,** FEMTO-ST (France); **Aydogan Ozcan,** UCLA Samueli School of Engineering (United States)

Program Committee: **Johan Åkerman,** Göteborgs Univ. (Sweden); **Jonas Andersson,** Volvo Car Corp. (Sweden); **Frank Cichos,** Univ. Leipzig (Germany); **Margaretta Colangelo,** Margaretta Colangelo Ventures (United States); **Miguel C. Cornelles Soriano,** Instituto de Física Interdisciplinar y Sistemas Complejos (Spain); **Jürgen W. Czarske,** TU Dresden (Germany); **Meltem Elitas,** Sabanci Univ. (Turkey); **Yong Fan,** Penn Medicine (United States); **Francesco Ferranti,** Vrije Univ. Brussel (Belgium); **Claudio Gallicchio,** Univ. di Pisa (Italy); **Mattias Goksör,** IFLAI AB (Sweden); **Antoni Homs-Corbera,** Cherry Biotech (France); **Pablo Loza-Alvarez,** ICFO - Institut de Ciències Fotòniques (Spain); **Kathy Lüdge,** Technische Univ. Ilmenau (Germany); **Carlo Manzo,** Univ. de Vic (Spain); **Paula Merino Serrais,** Cajal Institute (Spain); **Mite Mijalkov,** Karolinska Institute (Sweden); **Armand Niederberger,** Stanford Photonics Research Ctr. (United States); **Yair Rivenson,** Pictor Labs (United States); **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,** Univ. of Florida (United States); **Ugur Tegin,** Koç Univ. (Turkey); **Lei Tian,** Boston Univ. (United States); **Mattia Veronese,** Univ. degli Studi di Padova (Italy); **Axel Wismüller M.D.,** Univ. of Rochester Medical Ctr. (United States)

The ETAI conference provides a forum for a highly interdisciplinary community combining artificial intelligence with photonics, spintronics, 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.

ETAI actively engages with industry to foster commercialization and provides networking opportunities for young and established researchers. By bringing experts from different fields and backgrounds together, ETAI provides new fundamental insights and identifies technological applications as well as commercialization opportunities.

The topics covered in ETAI include but are not limited to:

- 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
- alternative computing concepts such as neural networks and Ising machines to overcome the end of Moore and Dennard scaling
- fundamental aspects of photonic non-digital computing
- integrated photonics and nonlinear optical components for next generation computing
- spintronic sensor integration for data acquisition and photonic subsystems
- 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.

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.
- spintronics-enhanced optical system design using machine learning.

ARTIFICIAL INTELLIGENCE FOR MICROSCOPY

- computational microscopy
- data-driven optical reconstruction methods
- digital video microscopy
- generation of training datasets.

ARTIFICIAL INTELLIGENCE FOR OPTICAL TRAPPING

- particle detection
- optical trap calibration
- feedback control.

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Emerging Topics in Artificial Intelligence (ETAI) 2024
(OP110) continued

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.

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.

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

SPINTRONICS FOR NEUROMORPHIC COMPUTING
- spin-based devices for neuromorphic systems
- magnetic textures in neuromorphic computing.

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

SPINTRONICS IN ARTIFICIAL INTELLIGENCE
- materials and phenomena for spintronic applications in AI
- integration of spintronics with neural networks and computing architectures
- spintronic data processing and its impact on AI efficiencies.

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.

AWARDS FOR BEST PRESENTATION AND BEST POSTER WILL BE PRESENTED TO SELECT EARLY RESEARCHERS.

Spintronics XVII (OP111)

Conference Chairs: **Jean-Eric Wegrowe,** Ecole Polytechnique (France); **Joseph S. Friedman,** The Univ. of Texas at Dallas (United States); **Manijeh Razeghi,** Nothwestern Univ. (United States)

Conference Co-Chair: **Henri Jaffrès,** Unité Mixte de Physique CNRS/Thales (France)

For years 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 information storage, 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. topological spin structures, topological insulators, Majorana fermions, antiferromagnetic spintronics, spin photonics and spin optics, ultra-fast phenomena and THz emission 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, topological spin textures
- new structures and emerging applications (magnetoresistive devices, MRAMs, spin logic, ultra-fast memories , etc.)
- neuromorphic computing
- spin photonics, spin lasers, THz emission, and spin optics
- superconducting spintronics.

Quantum Nanophotonic Materials, Devices, and Systems 2024 (OP112)

Conference Chairs: **Cesare Soci,** Nanyang Technological Univ. (Singapore); **Matthew T. Sheldon,** Texas A&M Univ. (United States); **Igor Aharonovich,** Univ. of Technology, Sydney (Australia)

Program Committee: **Mario Agio,** Univ. Siegen (Germany), CNR-INO (Italy); **Vikas Anant,** Photon Spot, Inc. (United States); **Alex Clark,** Univ. of Bristol (United Kingdom); **Jennifer A. Dionne,** Stanford Univ. (United States); **Andrei Faraon,** Caltech (United States); **F. Javier García de Abajo Sr.,** ICFO - Institut de Ciències Fotòniques (Spain); **Stephan J. Goetzinger,** Max-Planck-Institut für die Physik des Lichts (Germany); **Mohammad Hafezi,** Joint Quantum Institute (United States); **Zubin Jacob,** Purdue Univ. (United States); **Je-Hyung Kim,** Ulsan National Institute of Science and Technology (Korea, Republic of); **Laura Kim,** Univ. of California, Los Angeles (United States); **Sejeong Kim,** The Univ. of Melbourne (Australia); **Mark Lawrence,** Washington Univ. in St. Louis (United States); **Chao-Yang Lu,** Univ. of Science and Technology of China (China); **Patrick Maletinsky,** Univ. Basel (Switzerland), Qnami (Switzerland); **Maiken H. Mikkelsen,** Duke Univ. (United States); **Kae Nemoto,** National Institute of Informatics (Japan); **Teri W. Odom,** Northwestern Univ. (United States); **Dan Oron,** Weizmann Institute of Science (Israel); **Matthew A. Pelton,** Univ. of Maryland, Baltimore County (United States); **Marina Radulaski,** Univ. of California, Davis (United States); **Kartik Srinivasan,** National Institute of Standards and Technology (United States); **Daniel L. Stick,** Sandia National Labs. (United States); **Mark Tame,** Stellenbosch Univ. (South Africa); **Ewold Verhagen,** AMOLF (Netherlands); **Ulrike Woggon,** Technische Univ. Berlin (Germany); **Valery Zwiller,** KTH Royal Institute of Technology (Sweden)

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 aims 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 dichalcogenides
- quantum plasmonics
- quantum meta-optics
- 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
- optomechanical devices
- 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.

Liquid Crystals XXVIII (OP211)

Conference Chair: **Iam Choon Khoo,** The Pennsylvania State Univ. (United States)

Program Committee: **Timothy J. Bunning,** Air Force Research Lab. (United States); **Marcel G. Clerc,** Univ. de Chile (Chile); **Julian S. Evans,** Zhejiang Univ. (China); **Jean-Pierre Huignard,** Institut Langevin-ESPCI-Univ. PSL (France); **Malgosia Kaczmarek,** Univ. of Southampton (United Kingdom); **Oleg D. Lavrentovich,** Kent State Univ. (United States); **Wei Lee,** National Yang Ming Chiao Tung Univ. (Taiwan); **Tsung-Hsien Lin,** National Sun Yat-Sen Univ. (Taiwan); **Kenneth L. Marshall,** Univ. of Rochester (United States); **Atsushi Shishido,** Tokyo Institute of Technology (Japan); **Francesco Simoni,** Univ. Politecnica delle Marche (Italy); **Nelson V. Tabiryan,** BEAM Engineering For Advanced Measurements Co. (United States); **David M. Walba,** Univ. of Colorado Boulder (United States); **Shin-Tson Wu,** CREOL, The College of Optics and Photonics, Univ. of Central Florida (United States)

Liquid crystals in their various mesophases are technologically important electro-optic materials. They possess many unique and useful physical and optical properties and are widely used in various optoelectronic display, beam/image, and optical information processing systems, with response times ranging from milli-, through micro-, nano- to pico- and femto-seconds, covering a wide spectral range from near UV to infrared. In recent years, innovation in nanofabrication and development of plasmonic nanostructures have also led to the emergence of liquid crystalline metamaterials and metasurfaces that possess emergent functionalities and properties that hold high promises for applications in advanced optical and photonic devices/systems.

This conference provides a forum for presentations of research results on all aspects of liquid crystal material and optical sciences and technologies. The emphasis is on new, novel, or unique liquid crystalline materials and other soft matters, optical properties and phenomena, and their applications in display, information, and image processing systems, electro-optics and nonlinear optics.

Papers are solicited from the following and related topics:

- new liquid crystalline materials, soft matters and complex fluids, possessing large and broadband birefringence, ferroelectricity, chirality and other characteristics suitable for advanced electro-optical applications
- new optical and electro-optical processes and phenomena of fundamental or applied significance
- advance LC display science and technologies, optical alignment, holography, storage, and switching materials, processes, and devices
- liquid crystal incorporating nano-particulate and nanostructures; tunable metamaterials and metasurfaces
- nonlinear optics: materials, phenomena, and applications
- bio-photonics and sensor, ultrafast pulse modulations, beam and phase front manipulations.

Organic and Hybrid Light Emitting Materials and Devices XXVIII (OP212)

Conference Chairs: **Ji-Seon Kim,** Imperial College London (United Kingdom); **Tae-Woo Lee,** Seoul National Univ. (Republic of Korea); **Franky So,** North Carolina State Univ. (United States)

Program Committee: **Chantal Andraud,** Ecole Normale Supérieure de Lyon (France); **Hugo A. Bronstein,** Univ. of Cambridge (United Kingdom); **Paul L. Burn,** The Univ. of Queensland (Australia); **Moon Kee Choi,** Ulsan National Institute of Science and Technology (Republic of Korea); **Malte C. Gather,** Univ. of St. Andrews (United Kingdom); **Xiwen Gong,** Univ. of Michigan (United States); **Russell J. Holmes,** Univ. of Minnesota, Twin Cities (United States); **Hironori Kaji,** Kyoto Univ. (Japan); **Yun-Hi Kim,** Gyeongsang National Univ. (Republic of Korea); **Jeong-Hwan Lee,** Inha Univ. (Republic of Korea); **Jongwook Park,** Kyung Hee Univ. (Republic of Korea); **Linda A. Peteanu,** Carnegie Mellon Univ. (United States); **Lina Quan,** Virginia Polytechnic Institute and State Univ. (United States); **Barry P. Rand,** Princeton Univ. (United States); **Ifor D. W. Samuel,** Univ. of St. Andrews (United Kingdom); **Sihong Wang,** The Univ. of Chicago (United States); **Ken-Tsung Wong,** National Taiwan Univ. (Taiwan); **Seunghyup Yoo,** KAIST (Republic of Korea)

Preliminary List of Invited Speakers:

Ifor Samuel, Univ. of St. Andrew

Malte Gather, Univ. of Cologne

Seunghyup Yoo, KAIST

Biwu Ma, Florida State Univ.

Russell Holmes, Univ. of Minnesota

Kenan Gundogdu, North Carolina State Univ.

Qing Gu, North Carolina State Univ.

Lina Quan, Virginia Tech

This conference centers on the science and technology of organic and hybrid light emitting materials and devices for displays, lighting, lasers, and other photonics applications. The scope of the conference will cover the following areas:

- highly efficient molecular and polymeric light emitters and devices
- thermally activated delayed fluorescent materials
- 2D and 3D metal-organic perovskites light emitting materials
- quantum dot light emitting materials and devices
- efficient white emitting materials and devices for lighting
- organic and perovskite lasers
- organic and perovskite photonics
- device failure mechanisms and durability studies
- novel substrates and electrodes for flexible devices
- physics of carrier injection, transport, and recombination
- ultrafast spectroscopy and photophysics of excited states
- stretchable and wearable LEDs
- carbon, 2D, and other nano-scale emitters
- scintillators
- novel applications of nano- and micro-scale emitters.

Organic, Hybrid, and Perovskite Photovoltaics XXV (OP213)

Conference Chairs: **Gang Li,** The Hong Kong Polytechnic Univ. (Hong Kong, China); **Natalie Stingelin,** Georgia Institute of Technology (United States)

Conference Co-Chairs: **Hyun Suk Jung,** Sungkyunkwan Univ. (Republic of Korea); **Tse Nga Ng,** Univ. of California, San Diego (United States); **Fei Huang,** South China Univ. of Technology (China); **Ellen Moons,** Karlstad Univ. (Sweden); **Barry P. Rand,** Princeton Univ. (United States)

Program Committee: **Harald W. Ade,** North Carolina State Univ. (United States); **Derya Baran,** King Abdullah Univ. of Science and Technology (Saudi Arabia); **David Beljonne,** Univ. de Mons (Belgium); **Hendrik J. Bolink,** Univ. de València (Spain); **Paul L. Burn,** The Univ. of Queensland (Australia); **Alexander Colsmann,** Karlsruher Institut für Technologie (Germany); **Daniel Congreve,** Stanford Univ. (United States); **Renaud Demadrille,** Systèmes Moléculaires et nanoMatériaux pour l'Énergie et la Santé (France); **Giulia Grancini,** Univ. degli Studi di Pavia (Italy); **Martin J. Heeney,** Imperial College London (United Kingdom); **Zakya H. Kafafi,** Lehigh Univ. (United States); **Bumjoon Kim,** KAIST (Republic of Korea); **Monica Lira-Cantú,** Institut Català de Nanociència i Nanotecnologia (ICN2) (Spain); **Paul Meredith,** Swansea Univ. (United Kingdom); **Ana Flávia Nogueira,** Univ. of Campinas (Brazil); **Hideo Ohkita,** Kyoto Univ. (Japan); **Annamaria Petrozza,** Istituto Italiano di Tecnologia (Italy); **Ifor D. W. Samuel,** Univ. of St. Andrews (United Kingdom); **Shuxia Tao,** Technische Univ. Eindhoven (Netherlands); **Yana Vaynzof,** TU Dresden (Germany); **Iris Visoly-Fisher,** Ben-Gurion Univ. of the Negev (Israel); **Atsushi Wakamiya,** Kyoto Univ. (Japan); **Hin-Lap (Angus) Yip,** City Univ. of Hong Kong (Hong Kong, China)

The SPIE conference on Organic, Hybrid and Perovskite Photovoltaics will celebrate its 25th anniversary in 2024. The aim of this meeting is to bring together scientists, engineers, and technologists from multiple disciplines to report on and discuss the fundamental issues that affect device operation, including efficiency and long-term stability. The theme of the conference will be "state-of-the-art" performance of organic, hybrid and perovskite solar cells and photodetector, and their applications in future technologies. The scope of the conference includes high-performance light-harvesting and carrier transporting materials, highly efficient and stable organic, hybrid and perovskite solar cells and photoreactors, as well as device and materials physics including interfaces, film structure and morphology, and charge transport. The conference will also cover new techniques for fabrication, encapsulation, and printing of solar cells on large-area flexible substrates, all aspects with respect to materials and device sustainability, recycling and future upcycling opportunities; as well as how AI, automatization and machine learning can assist advancing these technologies.

The scope of the conference will cover but is not limited to the following areas:

- molecular and macromolecular photovoltaics
- hybrid organic/inorganic photovoltaics (including dye-sensitized solar cells)
- metal halide perovskite solar cells
- tandem and multi-absorber solar cells
- organic and organic/inorganic photodetectors
- plasmonic and photonic structures for light management
- electron and hole transport materials, contacts, electrode materials
- exciton diffusion, charge carrier generation, transport, and recombination
- interface phenomena
- structure/processing/property interrelationships
- large-area processing and fabrication (including encapsulation, printing of solar cells)
- stability, lifetime, and reliability
- sustainability of materials and devices, recycling and upcycling
- automated lab approaches, and including of AI and machine learning.

HIGHLIGHTS:

- A joint session with Physical Chemistry of Interfaces and Nanomaterials
- A joint session with New Concepts in Solar and Thermal Radiation Conversion.

Manuscripts for the conference proceedings will be peer-reviewed.

Authors are invited to submit an original manuscript to the *Journal of Photonics for Energy*, which is now covered by all major indexes and Journal Citation Reports.

Organic and Hybrid Sensors and Bioelectronics XVII (OP214)

Conference Chairs: **Ioannis Kymissis,** Columbia Univ. (United States); **Emil J. W. List-Kratochvil,** Humboldt-Univ. zu Berlin (Germany); **Sahika Inal,** King Abdullah Univ. of Science and Technology (Saudi Arabia)

Program Committee: **Magnus Berggren,** Linköping Univ. (Sweden); **Annalisa Bonfiglio,** Univ. degli Studi di Cagliari (Italy); **Paul L. Burn,** The Univ. of Queensland (Australia); **Paschalis Gkoupidenis,** Max-Planck-Institut für Polymerforschung (Germany); **Alon Gorodetsky,** Univ. of California, Irvine (United States); **George G. Malliaras,** Univ. of Cambridge (United Kingdom); **Rosaria Rinaldi,** Univ. del Salento (Italy); **Ifor D. W. Samuel,** Univ. of St. Andrews (United Kingdom); **Ruth Shinar,** Iowa State Univ. of Science and Technology (United States); **Franky So,** North Carolina State Univ. (United States); **Arash Takshi,** Univ. of South Florida (United States); **Luisa Torsi,** Univ. degli Studi di Bari Aldo Moro (Italy)

Preliminary List of Invited Speakers:

Kiana Aran, Keck Graduate Institute

Uli Lemmer, Karlsruher Institut für Technologie

Paul Burn, The Univ. of Queensland

Yoeri van de Burgt, Eindhoven Univ. of Technology (Keynote)

Leong Wei Lin, Nanyang Technological Univ.

Eleonora Macchia, Univ. of Bari

Sohini Kar-Narayan, Univ. of Cambridge

Paschalis Gkoupidenis, Max-Planck-Institut für Polymerforschung

Ronald Osterbacker, Åbo Akademi

Guglielmo Lanzani, Istituto Italiano di Tecnologia

Sihong Wang, The Univ. of Chicago

Oana Jurchescu, Wake Forest Univ.

Tina Ng, Univ. of California, San Diego

The need for small-size and on-chip integrable and inexpensive detecting systems, including for biological and medical applications, have prompted the development of easily processable organic field-effect transistor (OFET)- and light-emitting diode (OLED)-based sensors integrated with organic or hybrid photodetectors. The growing activity and progress in flexible, organic, printable, and hybrid electronics enable the development of skin display electronic, as well as flexible wearable and implantable sensors. OLEDs and OLED arrays in optogenetics for potential implantable optical-neural interfaces, as well as modulation of neuronal networks activity is a biophotonics platform of growing interest. A better understanding of the organic/living tissue interface, which will lead to the design of better biosensing and biophotonics concepts, remains a challenge.

Overall fast and simultaneous detection of multiple analytes utilizing micro/nano array systems continues to open a plethora of novel applications in key areas such as clinical analysis, environment monitoring, food and beverage safety, and homeland security. Solution or easily processable two-dimensional metal oxides, carbon-based, and hybrid organic/inorganic 2D and 3D materials have proven useful as active layers in chemical and biological transducers. Novel technological approaches that allow the integration of functional bio-receptors into device structures are also critically important to endow such devices with recognition capabilities. Continued research and development efforts are needed, including with newly emerging technologies on hybrid memory devices and logic elements to further improve sensors' performance level and low-cost manufacturability.

This conference will focus on progress in chemical, biological, medical, and physical sensors and actuators, including image sensors and flexible/stretchable e-skin, and large-scale devices from carbon-based, solution processable metal-oxides, and hybrid organic/inorganic materials. Devices such as organic-, quantum dot, 2D semiconductor, and perovskite-based photodetectors and organic bioelectronic devices, including neural interfaces, optogenetics, diagnostics, drug delivery devices, food analysis, water sensing, and tissue engineering concepts using optical and electrical activation will be discussed.

The conference will focus also on the science and technology of next generation memory, logic and neuromorphic devices based on organic, hybrid, and inorganic materials. It will span a broad spectrum from fundamental science related to novel materials development and processing to addressing issues related to organic and inorganic surfaces and interfaces, to device fabrication, system integration and applications.

Contributions related (but not limited) to the following topics are solicited:

- Organic, hybrid, and inorganic devices for chemo- and biosensing and bioelectronic applications
- 2D semiconductor based materials for chemo- and biosensing and bioelectronic applications
- bio-inspired systems in organic electronics for biotechnology and medical applications
- OLEDs and organic semiconductor lasers for analytical applications
- organic light emitting transistors (OLETs) for chemo- and biosensing
- multicolor-tunable OLED arrays for absorption measurements in analytical applications
- flexible OLEDs and OLED-based wearable devices
- OLEDs in optogenetics
- luminescent conjugated polymers in disease detection
- organic electronics in medical treatment for pain relief
- organic semiconductors in plasmon-based sensors
- organic and perovskite-based photodetectors in analytical applications
- organic biocompatible materials in applications such as cell growth, tissue engineering, and drug delivery
- synthesis, characterization, and optimization of sensor materials
- flexible electronics for the manufacturing of large-area sensors and actuators
- conformable and stretchable electronics for sensing applications
- e-skin devices
- array technologies in organic electronics: microfluidics, nanoscale, and lab-on-a-chip for multiple analyte detection
- organic, hybrid, and inorganic materials-based memory, logic and neuromorphic devices
- switching mechanisms in resistive memories and memristors
- RFID applications and smart memory devices for flexible integrated systems
- hybrid heterogeneous integration of printed electronic circuit with conventional Si-electronics
- emerging materials for printed electronic applications
- large-area and high resolution S2S and R2R fabrication techniques
- use of quantum dots and QDLEDs for biosensing applications
- applications in water and food analysis.

HIGHLIGHT:

- A joint session with the conference on Organic and Hybrid Transistors

Organic and Hybrid Transistors XXIII (OP215)

Conference Chairs: **Iain McCulloch,** Univ. of Oxford (United Kingdom); **Oana D. Jurchescu,** Wake Forest Univ. (United States)

The impressive improvement in the performance of organic thin film field-effect transistors (OTFTs) during the last two decades, coupled with the processability advantages offered by organic materials, has attracted the interest of the optoelectronics industry and has opened the way for practical, broad-impact applications of such devices. OTFTs are based on various small organic molecules, conjugated polymers and oligomers, blends of such materials, or organic-inorganic hybrids. Potential applications are currently aimed at large-area electronics and include flexible active-matrix displays with OTFT backplanes, e-paper, low-cost and low-end printable electronic circuits, devices such as RFID tags and smart cards, and sensors. The symposium also covers other emerging thin-film transistor technologies, which include oxide, carbon nanotubes (CNTs), hybrid organic/inorganic perovskites, and 2D materials.

We also invite contributions focused on organic mixed ionic-electronic conductors for organic electrochemical transistors (OECTs) and circuits. OECTs have gained a lot of attention recently given their potential incorporation in bioelectronic applications.

This conference is intended to provide a platform for discussions and exchanges between scientists with different backgrounds, all experts in the field of organic and organic/inorganic hybrid transistors in an effort to assess the state-of-the-art in this field of research and reflect on the predominant vision(s) for the future of thin-film transistor technologies.

The scope of the conference will cover research topics spanning from basic chemistry and physics of organic and hybrid semiconductors to their applications in electronic devices and circuits. Contributed papers are solicited concerning, but not limited to, the following areas:

- organic semiconductor design, synthesis, processing, and characterization
- organic semiconductor growth and morphology
- organic mixed ionic-electronic conductors
- dielectric materials
- oxide, perovskites, CNTs, 2D semiconductors
- printable electronic materials
- printing and patterning methods
- device physics, modeling, geometric design, and characterization
- ambipolar TFTs
- transparent electronics
- resistive memories and memristor devices
- single-crystal devices
- charge injection and transport properties
- integrated circuits
- neuromorphic concepts and applications
- chemical and biological sensors
- flexible OTFT display backplanes
- other OTFT applications
- device reliability, stability, and degradation
- self-assembly processes in OTFTs
- molecular devices
- integration of OTFTs with other components
- organic light emitting transistors
- memory devices
- stretchable electronic materials and devices
- plastic electronics
- fundamental processes in OTFTs.

Molecular and Nanophotonic Machines, Devices, and Applications VII (OP216)

Conference Chairs: **Zouheir Sekkat,** Univ. Mohamed V (Morocco), MAScIR/UM6P (Morocco); **Takashige Omatsu,** Chiba Univ. (Japan)

Program Committee: **Anna S. Bezryadina,** California State Univ., Northridge (United States); **Cornelia Denz,** Physikalisch-Technische Bundesanstalt (Germany); **Katsumasa Fujita,** Osaka Univ. (Japan); **Tigran Galstian,** Univ. Laval (Canada); **Yasushi Inouye,** Osaka Univ. (Japan); **Hidekazu Ishitobi,** Graduate School of Frontier Biosciences (Japan); **Satoshi Kawata,** Osaka Univ. (Japan); **Mark G. Kuzyk,** Washington State Univ. (United States);
Stefan A. Maier, Monash Univ. (Australia); **Masud Mansuripur,** Wyant College of Optical Sciences (United States); **Halina Rubinsztein-Dunlop,** The Univ. of Queensland (Australia); **Atsushi Shishido,** Tokyo Institute of Technology (Japan); **Hong-Bo Sun,** Tsinghua Univ. (China); **Din Ping Tsai,** City Univ. of Hong Kong (Hong Kong, China); **Giovanni Volpe,** Göteborgs Univ. (Sweden); **Diederik S. Wiersma,** LENS - Lab. Europeo di Spettroscopie Non-Lineari (Italy), Univ. of Florence and INRIM Turin (Italy); **Ta-Jen Yen,** National Tsing Hua Univ. (Taiwan)

Preliminary List of Invited Speakers:

Katherine Villa, ICIQ - Institut Català d'Investigació Química

Anna Chiara De Luca, Istituto di Biochimica e Biologia Cellulare

Hiroshi Masuhara, National Yang Ming Chiao Tung Univ. (Keynote)

Machines have been influencing human development over many millennia, in particular since the industrial revolution, with key discoveries that dramatically changed the world, and mankind has been pushing the limits of machines work and miniaturizing machines, with the ultimate goal of making molecular-sized machines that can perform complex and useful tasks. We are now at the dawn of a new revolution. Even though the field is still in its infancy, scientists for many years have been intrigued by this multidisciplinary research area, including biology and chemistry and physics. Innovative applications of molecular machines, as can be foreseen now, include copying, motion, actuation, energy, memory, and sensing. The macroscopic motion and functions they impart in materials under external stimulus can be used for machinery. Nanophotonic machines are of great interest as well. The basic focus of this conference is the study of molecular and nanophotonic machines and systems. Their response to, and manipulation by, external stimulus, by light for example, are of importance. The topics of the conference can be viewed as multidisciplinary, encompassing, artificial intelligence, and optical manipulation and trapping, and plasmonics, and fabrication, as well as light angular momentum interaction with photoactive matter. Systems, devices, and applications of nanophotonic and functional molecular machines, having a nonlinear response and/or photoreactivity are of great interest.

Session topics include, but are not limited to:

- molecular systems and machines
- nanophotonic machines
- artificial intelligence (AI) and nanophotonic machines
- AI and material design and device performance
- optical manipulation and trapping
- organic and nonlinear optical systems and devices
- light-matter interaction
- light-activated molecular motors and robots and devices
- DNA copying process and DNA-based nano-machines
- synthetic and bio-molecular machines and artificial muscles
- nanoparticle probes and particles for molecular machinery
- molecular switches and memories, and light-fueled molecules and systems
- photoactive soft matter
- laser micro/nanofabrication of functional materials and systems
- 3D nanoprinting
- chemical and bio-sensing
- microfluidics
- plasmonics and plasmonic machines
- plasmonically-enhanced spectroscopies and functions
- technologies and devices related to the above.

Physical Chemistry of Semiconductor Materials and Interfaces XXIII (OP217)

Conference Chairs: **Andrew J. Musser,** Cornell Univ. (United States); **Loreta A. Muscarella,** Vrije Univ. Amsterdam (Netherlands)

Conference Co-Chairs: **Minjung Son,** Boston Univ. (United States); **Derya Baran,** King Abdullah Univ. of Science and Technology (Saudi Arabia)

Program Committee: **Artem A. Bakulin,** Imperial College London (United Kingdom); **Natalie Banerji,** Univ. Bern (Switzerland); **Emily G. Bittle,** National Institute of Standards and Technology (United States); **Hugo A. Bronstein,** Univ. of Cambridge (United Kingdom); **Jenny Clark,** The Univ. of Sheffield (United Kingdom); **Daniel Congreve,** Stanford Univ. (United States); **David S. Ginger,** Univ. of Washington (United States); **Naomi S. Ginsberg,** Univ. of California, Berkeley (United States); **Paul Meredith,** Swansea Univ. (United Kingdom); **Christian Nielsen,** Queen Mary Univ. of London (United Kingdom); **Linda A. Peteanu,** Carnegie Mellon Univ. (United States); **Benjamin J. Schwartz,** Univ. of California, Los Angeles (United States); **Sergei Tretiak,** Los Alamos National Lab. (United States); **Lauren Webb,** The Univ. of Texas at Austin (United States)

This conference aims 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. Processes of interest include conversions between excited states and energy or electron transfer. Recent developments in a host of semiconductor materials highlight how these important dynamics are governed by an interplay between 1) bulk properties, such as chemical composition and intermolecular structure, 2) nanoscale properties, such as local morphologies and defect sites, and 3) properties of surfaces or interfaces formed between materials. Understanding these processes and unravelling their relation to the structure and function of the materials calls for new techniques for materials control, new spectroscopic and microscopic tools, and new theoretical methods capable of treating correlated systems of increasing size and over timescales of femto- to nanoseconds.

For 2024 the scope of the conference will focus on the following topics, welcoming experimental and theoretical contributions:

- photophysics of emerging organic and hybrid semiconductor materials and nanostructures
- emerging functional interfaces
- sustainable materials and processes for optoelectronics
- electron and energy transfer: mechanisms and interfacial engineering
- light-matter interactions in confined photonic structures in the strong-coupling regime
- emerging tools to study interfaces and nanomaterials
- physical chemistry of self-assembled systems for optoelectronic devices
- multimodal characterization and computation-driven material design and performance
- Artificial Intelligence approaches for material design and characterizations
- advances in organic & hybrid semiconductors for photocatalysis.

Optics Education and Outreach VIII (OP301)

Conference Chairs: **G. Groot Gregory,** Synopsys, Inc. (United States); **Anne-Sophie Poulin-Girard,** ABB (Canada)

Program Committee: **Katie E. Chong,** Sydney Photonics Industry Network (Australia); **Barbara A. Darnell,** Cubert GmbH (United States); **Judith F. Donnelly,** Problem Based Learning Projects (United States); **Danielle J. Harper,** Wellman Ctr. for Photomedicine (United States); **Svetlana G. Lukishova,** The Institute of Optics, Univ. of Rochester (United States); **Amanda K. Meier,** Front Range Community College (United States); **Brian Monacelli,** Pasadena City College (United States), Jet Propulsion Lab. (United States); **Ignacio Moreno,** Univ. Miguel Hernández (Spain); **Bishnu P. Pal,** Mahindra University Hyderabad (India); **Matthew T. Posner,** Optonique (Canada); **Paul B. Ruffin,** Alabama A&M Univ. (United States); **Marcelo Saito Nogueira,** Tyndall National Institute (Ireland); **Danuta M. Sampson,** The Univ. of Western Australia (Australia), Lions Eye Institute {Australia); **Donn M. Silberman,** Optics Institute of Southern California (United States); **Caitriona Tyndall,** Tyndall National Institute (Ireland); **Perla Marlene Viera-González,** Univ. Autónoma de Nuevo León (Mexico); **María Viñas Peña,** Instituto de Óptica "Daza de Valdés" (Spain); **Linhui Yu,** Apple Inc. (United States); **María J. Yzuel,** Univ. Autònoma de Barcelona (Spain)

The optics industry has seen many advances in technology and applications. Continued innovation and discovery is dependent on a stream of new researchers, engineers and technicians educated in optics. The optics community needs to play a role in understanding how these new knowledge workers are trained. As individuals, we can contribute to this process by sharing our passion for science with students of all ages.

Optics Education and Outreach brings to the optical community a forum to discuss, learn, and network about trends in education and enrichment. The conference is crafted to convey to the community a snapshot of the current state of primary and secondary education in the field of optics. It also brings together individuals working outside the formal educational community who inspire youth to pursue the study of science and optics.

The conference recognizes the roles of formal and informal education. Formal education comprises optics education at universities, colleges, community colleges, through accreditation, lifelong learning, optics in K12 curricula, assessment tools, pedagogy and didactic methodology. Informal education includes outreach activities of student chapters, optical societies, companies and individuals. Reports from all areas of formal and informal education are welcome.

This conference will invite science and technology instructors to join the conversation to share their experiences and needs.

A continued focus of this year's conference is the reporting on events associated with the ongoing International Day of Light. This annual day of celebration continues the efforts begun with the International Year of Light (IYL2015). Submissions on programs initiated or continued are encouraged.

Focus areas for paper submissions:

FORMAL EDUCATION
- assessment tools to measure learning outcomes, especially for education in informal environments
- optics education at universities and community colleges
- optics and science enrichment programs for K-12
- training in multidisciplinary environments
- research in active learning, problem-based learning and pedagogy
- AI tools and techniques for optics and photonics education.

PUBLIC OUTREACH ACTIVITIES
- International Day of Light programs encouraging youth pursuit of optics and science
- science awareness programs for general audiences, from parents to government officials
- outreach activities of student chapters, local optical societies and members
- extracurricular science activities
- exploring light in nature
- outreach collaboration between industry, academia and government.

EDUCATION AND TRAINING TAILORED TO INDUSTRY NEEDS
- programs focused on technicians training
- continuous education and training for academia and industry
- in-company training, apprenticeships and internships
- local and regional economic development through optics and photonics education and research
- progress on accreditation, standards and certification
- programs in innovation and entrepreneurship.

REGIONAL, NATIONAL, AND INTERNATIONAL PROGRAMS
- progress reports on NSF, Photonics 2020 and other governmentally funded education initiatives
- programs introducing or enhancing optics education and industry worldwide
- equity, diversity and inclusion in education
- initiatives tailored to emerging economies
- education in optics in the context of sustainable development
- tackling tomorrow's challenges in optics and photonics education.

The conference proceedings for Optics Education and Outreach VIII will be open access.

Light in Nature X (OP302)

Conference Chairs: **Katherine Creath,** Optineering (United States), The Univ. of Arizona (United States); **Vasudevan Lakshminarayanan,** Univ. of Waterloo (Canada); **Joseph A. Shaw,** Montana State Univ. (United States)

Program Committee: **Indrani Bhattacharya,** Seacom Skills Univ. (India); **Maria Luisa Calvo Padilla,** Univ. Complutense de Madrid (Spain); **Dan Curticapean,** Offenburg Univ. (Germany); **Viktoria Greanya,** Wright State Research Institute (United States); **Yoko Miyamoto,** The Univ. of Electro-Communications (Japan); **Sébastien R. Mouchet,** Univ. de Namur (Belgium); **Lorian Schweikert,** The Univ. of North Carolina, Wilmington (United States); **Brian Vohnsen,** Univ. College Dublin (Ireland); **Qiwen Zhan,** Univ. of Shanghai for Science and Technology (China)

In the field of optical science and engineering there are many aspects of light we take for granted, yet do we truly understand and appreciate the nature of light in the world around us? In the natural world there are many fascinating and beautiful phenomena involving optics.

However, most of the time we take these effects for granted. Each day optical scientists and engineers discover more about the natural world when we see how new technologies such as photonic crystals mimic the natural world. Photonic crystal-like structures in peacock feathers give the plumes their color. Similar structures in butterfly wing scales provide their iridescent colors. We borrow from the natural world ideas and concepts for new technologies, i.e., biomimicry.

Beyond these structures, there are effects in the natural world such as the aurora borealis or things as everyday as rainbows and oil slicks. Polarization and color effects brighten up our world. When we look more closely, we notice that plants glow and self-bioluminescence provides information about the state of health of organisms. We may even wonder why it is that parrots have a visual response much further into the ultraviolet than we do. As optical scientists and engineers, each of us became fascinated with light at some point in our lives. We observe things in our everyday life that we don't often explore or think about, yet there are researchers who spend their careers looking at these effects in nature. This conference invites papers having to do with light in the natural world and research involving practical and experimental aspects of optics in nature broadly defined to include:

- the nature of light
- description /representation of light in nature
- use of light in nature
- optics in nature
- color in nature
- vision in both humans and other species
- bio-inspired optics
- optics in the atmosphere and in water (environmental optics)
- mechanisms behind beautiful effects in nature
- optical phenomena related to sustainable communities (e.g., optics of algae blooms, glacial ice, wildfires, etc.)
- color effects
- polarization effects
- visual response in the natural world
- unusual means of creating and detecting light - such as sonoluminescence
- information transfer in the natural world via light and photons
- photonic crystal-like and similar structures in nature
- light in art and media
- light in biological systems
- self-bioluminescence and biophotonic effects in plants, insects, and animals
- Do organisms communicate with light?
- What can we learn from the interaction of light in nature on all scales? - From the macro to the nano?
- innovative use of light in various disciplines, for example, in archeology and art
- What is present in the dark? - Astronomical topics such as dark energy? dark matter?

We look forward to an opportunity to investigate these questions in a forum uniting all optical scientists and engineers.

Optical Modeling and Performance Predictions XIV (OP311)

Conference Chairs: **Mark A. Kahan,** Synopsys, Inc. (United States); **Catherine Merrill,** Ruda Optical (United States)

Program Committee: **Robert P. Breault,** Breault Research Organization, Inc. (United States); **Thomas G. Brown,** The Institute of Optics, Univ. of Rochester (United States); **Bill J. Cassarly,** Synopsys, Inc. (United States); **Patrick R. Champey,** NASA Marshall Space Flight Ctr. (United States); **Russell A. Chipman,** Meta (United States); **Keith B. Doyle,** MIT Lincoln Lab. (United States); **G. Groot Gregory,** Synopsys, Inc. (United States); **Joseph B. Houston Jr.,** Houston Research Associates (United States); **Tony Hull,** The Univ. of New Mexico (United States); **Richard C. Juergens,** Coherent Corp. (United States), Cimarron Optical Consulting, Inc. (United States); **Marie B. Levine-West,** Jet Propulsion Lab. (United States); **Gary W. Matthews,** ATA Aerospace, LLC (United States); **James W. Mayo III,** Tau Technologies LLC (United States); **David C. Redding,** Jet Propulsion Lab. (United States); **Paul Townley-Smith,** Synopsys, Inc. (United States)

This conference is dedicated to the modeling of imaging and non-imaging optical systems and associated test-equipment and related predictions of performance over a broad range of active and passive optical systems and engineering disciplines. Unclassified papers are solicited from nano-scale systems through to components such as special fiber-optics, gratings, holographic systems, light sources and detectors, and on to large deployable telescopes. Environmental factors can range from HEL through cryogenic, configurations can span use in the laboratory to underwater and outer-space, and wavelengths can range from x-rays to THz, and on through micro and mm waves.

Papers and/or suggested panel discussions are specifically requested on current and evolving analytical techniques that address:

OPTICAL MODELS, METHODS, AND PERFORMANCE ESTIMATES
- geometrical and physical optics
- diffractive optics and holographic systems
- beam propagation
- metamaterials (including negative index, photonic crystals, cloaking)
- plasmonics and evanescent waves, thermal phonons, and topolaritons
- reconfigurable optical surfaces
- polarization
- adaptive optical components
- computational optics and designs configured with and/or incorporating AI
- radiometry
- fiber-optics and photonics
- interferometers and nullers
- image doubling
- illumination (lasers, LEDs, Micro-LEDs, OLEDS, EL tape/paint, solar, THz)
- MTF, PSF, and EE
- stray light/ghosts and narcissus; contamination consequences and control
- quantum dots
- optimization
- phase/prescription retrieval
- tolerancing and probabilistic design.

ELECTRO-OPTICAL MODELS INCLUDING RELATING FACTORS
- detector quantum efficiency and rapid read-outs
- charge diffusion
- EMI/EMC influences on E-O performance.

OPTICAL COATING PERFORMANCE
- filters
- laser damage resistance.

MEMS AND MOEMS
- electrostatics; Casimir forces
- structures.

STRUCTURAL AND OPTOMECHANICAL MODELING
- ultra-lightweight optics, nano-laminates, membrane mirrors
- mounting stresses, G-Release, and /or launch and deployment
- high impact/shock and pressure loadings
- influence functions
- vibration and damping
- closely-coupled dynamic structure-controls-optics simulations
- micro-dynamics and influences of piece-part inertia; friction/stiction; pinning
- mechanical influences such as scanning deformations and special zoom/servo effects
- thermo-elastic effects
- stress birefringence
- fracture mechanics, micro-yield, and lifetime estimates
- proof testing models
- material creep and hysteresis as a function of fabrication methods
- material anisotropy/inhomogeneity; plating, heat-treats
- bonding and bolting
- nodal accuracy; meshing.

THERMAL AND THERMO-OPTICAL MODELING
- effects of energy absorption with depth in transmissive elements; heat flow within mirrors
- thermal run-away in IR elements
- aircraft/UAV/instrument windows, missiles, and domes; inspection tie-ins
- solar loading
- cryogenics, cooling electronics

Optical Modeling and Performance Predictions XIV (OP311) continued

- thermo-optical material characterizations over new wavelengths and/or temperatures
- system sterilization
- hole drilling, welding, and laser heat treating
- HEL effects including survivability and hardening
- recursive models where thermo-elastic changes in-turn impact heating
- effects of joint resistance on conduction changes; mounting to a S/C-deck
- effects on LEDs
- effects at MEMS and nano-scale sizes
- meshing.

INTEGRATED MODELS
- closely coupled thermal-structural-optical models
- optical control systems
- global optimizers
- acquisition, pointing, and tracking
- end-to-end simulations.

SPACE-BORNE (AND/OR MICROLITHOGRAPHIC/MEDICAL) CONTAMINATION, AND RADIATIVE FACTORS
- contamination control (esp. for UV systems and large optics)
- particulate/NVR models
- photopolymerization
- radiative damage, atomic O_2
- spacecraft charging
- micro-meteoroid modeling, including spalling.

AERO-OPTICS
- boundary layer and shock wave effects
- convective effects and air-path conditioning/ self-induced turbulence.

MODELING OF VISION SYSTEMS
- HUDs
- HMDs.

APPLICATION-SPECIFIC UNIQUE OPTICAL MODELS AND PERFORMANCE PREDICTIONS
- systems using adaptive optical components
- bio and medical optics/sensing, transportable systems, vision
- hyperspectral imaging; spectroscopy
- optics for the battlefield/warfighter (air, land, space, or sea)
- image processing
- lasers/laser communication systems/LIDARs
- LEDs/solid state lighting
- machine vision
- MEMs/nano technology
- existing/evolving photonic devices, PICs, and systems
- solar technology.

OTHER
- phenomenology
- reliability
- reticles: design and fabrication; performance
- rules of thumb and scale factors of use to individual disciplines
- shutters: design and fabrication; performance
- 3D printing of glass and multi-colored components
- specialized fabrication and/or metrology
- weight, power, cost, and schedule models for E-O systems, SWaPC.

Of special interest are new methods of analysis, and contributions to a body of work that will help provide various model “anchors” and parametric relationships that correlate results with predictions.

Novel Optical Systems, Methods, and Applications XXVII (OP312)

Conference Chairs: **Cornelius F. Hahlweg,** bbw Hochschule (Germany); **Joseph R. Mulley,** IDEX Health & Science, LLC (United States)

Program Committee: **Joseph S. Choi,** Northrop Grumman Corp. (United States); **Blake G. Crowther,** Synopsys, Inc. (United States); **Stephan Fahr,** JENOPTIK Optical Systems GmbH (Germany); **Peter I. Goldstein,** Synopsys, Inc. (United States); **G. Groot Gregory,** Synopsys, Inc. (United States); **Eric Herman,** Synopsys, Inc. (United States); **Quazi Rushnan Islam,** Univ. of Rochester (United States); **R. John Koshel,** Wyant College of Optical Sciences (United States); **Sara Madaan,** The Univ. of Southern California (United States); **Bharathwaj Appan Narasimhan,** SAMSUNG Semiconductor, Inc. (United States); **S. Craig Olson,** L3Harris Technologies, Inc. (United States); **José M. Sasián,** Wyant College of Optical Sciences (United States); **Hamilton Shepard III,** Waymo, LLC (United States); **Haiyin Sun,** Special Optics (United States); **Akila S. Udage,** Align Technology, Inc. (United States); **Zhen Wang,** Gemological Institute of America (United States)

Novel Optical Systems, Methods, and Applications includes topics on new and unique optical systems as well as original and innovative design methods and applications. Papers submitted should appeal to a reasonably wide audience. Recent topic areas that have been popular include: novel instrumentation, camera systems, novel optimization and simulation methods, displays, freeform optics, novel photonics and cross-disciplinary concepts applied to optical systems. We are continuing to solicit submissions in these areas.

Also, we are continuing to solicit submissions in the fields of 3D printing/additive optics, human factors, and computational optics. Optical technologies that don't otherwise have a well-defined category are also welcome in this conference.

Novel Optical Systems, Methods, and Applications XXVII is calling for paper submissions in the following topic areas:

OPTICAL ELEMENTS, SYSTEMS AND APPLICATIONS
- freeform optics
- light field optics
- micro- and nano-optics
- liquid optics
- gradient index optics
- optics and entertainment
- optics and sound
- systems measuring or employing special effects of human perception
- optical technology inspired by biological systems
- biomedical applications
- pandemic-related applications
- miniature systems
- wearable optics
- volumetric displays and 3D imaging
- exotic and unconventional optics and systems
- multi- and hyperspectral applications
- advanced metrology methods
- photogrammetric applications
- systems employing 3D printed elements or supporting 3D printing technology
- novel photonics.

OPTICAL ANALYSIS AND DESIGN
- using phase space in design and analysis
- energy efficiency
- special optical effects
- light propagation
- extending depth of field
- history
- tricks of the trade.

COMPUTATIONAL TOOLS AND OPTIMIZATION
- open-source computing
- high-performance computing and cloud computing
- photorealistic rendering
- design and analysis software
- novel optimization and tolerancing methods
- software post-processing
- computational imaging.

CROSS-DISCIPLINARY CONCEPTS AND METHODS
- optical methods in other disciplines
- thermal analysis, modeling and design
- optoacoustic/ photoacoustic methods
- THz optics
- effects on biological systems
- human factors.

Current Developments in Lens Design and Optical Engineering XXV (OP313)

Conference Chairs: **Virendra N. Mahajan,** Wyant College of Optical Sciences (United States); **Simon Thibault,** Univ. Laval (Canada); **Ching-Cherng Sun,** National Central Univ. (Taiwan)

Conference Co-Chair: **Alfonso Padilla-Vivanco,** Univ. Politécnica de Tulancingo (Mexico)

Program Committee: **Julie L. Bentley,** The Institute of Optics, Univ. of Rochester (United States); **Nathalie Blanchard,** INO (Canada); **Florian Bociort,** Technische Univ. Delft (Netherlands); **Marie-Anne Burcklen,** Institut d'Optique Graduate School (France); **Kit Cheong,** Optical Systems Design, LLC (United States); **Kristy Dalzell,** Raytheon ELCAN Optical Technologies (Canada); **José Antonio Díaz Navas,** Univ. de Granada (Spain); **Alice Fontbonne,** ONERA (France); **Sen Han,** Univ. of Shanghai for Science and Technology (China); **Tsung-Xian Lee,** National Taiwan Univ. of Science and Technology (Taiwan); **Jessica DeGroote Nelson,** Edmund Optics Inc. (United States); **Jocelyn Parent,** ImmerVision (Canada); **Anne-Sophie Poulin-Girard,** ABB (Canada); **Yuzuru Takashima,** Wyant College of Optical Sciences (United States); **David Vega,** Ansys, Inc. (United States)

In 2024, as the conference celebrates its 25th anniversary, a special session on the history of the last 25 years will be on the program.

Optical design is a fascinating activity, ranging as it does from lens design and modeling with the help of the immensely powerful design software currently available, to the semi-intuitive art of creating the conceptual design, which underlies any successful optical system. The 'art' depends on a wide-ranging knowledge of many of the sub-disciplines that make up optical engineering, which in turn encompasses the interaction between optics and all the activities that turn an optical design into an operational instrument. Beyond ray tracing, the optical designer may employ the tools of radiative transfer, electromagnetic theory for detailed diffraction or polarization modeling, principles of scattering for stray light analysis and control, and other appropriate modeling tools and techniques for deriving suitable performance metrics arising from such fields as spectroscopy, astronomy, vision, or microscopy. Beyond optical design, the optical engineer is concerned with the fabrication of components, assembly and alignment techniques, metrology and calibration, as well as the interaction with other engineering disciplines such as mechanical, thermal, electronic, and software.

The Current Developments conference serves the multi-faceted discipline that is lens design and optical engineering, and the multi-talented individuals that dedicate themselves to this field. This perennial conference, held since 1984 under a number of slightly varied titles, will continue to spotlight the hot topics in lens design and optical engineering while still covering the breadth of this field. The lens designer and the optical engineer, often the same person, will find this conference a home to stay abreast of the frontiers of this constantly evolving field. Contributions dealing with recent developments in lens design techniques, instruments, components, processes, materials, thin film, systems, design, or topics in an optical engineering subject area at any wavelength belong here, including demonstration of how optical engineering can help move photonic devices, IoT, and solid-state lighting (SSL) technologies forward. The following is a listing of topics of interest to be considered this year:

THEORY AND APPLICATIONS

- lens design methodology and innovative lens designs
- aberration theory and image analysis
- advances in techniques for system design, modeling, and global optimization
- optics in consumer, medical, industrial, or space applications
- optics in art, artwork conservation, forensics, archaeology
- advances in microscopy, lithographic optics, cameras, visual systems, telescopes
- freeform surfaces
- metasurfaces in lens design/optical engineering
- bio-inspired design
- optics in harsh and hostile environments
- lensless and computational imaging
- modeling of optical fibers and couplers
- AI, deep learning (DNN) in optical engineering and lens design.

INTEGRATION OF OPTICAL DESIGNS INTO COMPLETE INSTRUMENTS

- interaction of optics with mechanics and electronics
- integrated modeling
- fabrication, tolerancing, alignment, stray light considerations
- incorporation of system metrics into optical design
- vision and physiological optics considerations
- optics for visual and infrared searchlights.

DEVELOPMENTS IN OPTICAL COMPONENTS, TECHNIQUES, AND MATERIALS

- diffractive optics, micro-optics, gradient index, metasurfaces, special optical surfaces
- optical fabrication techniques, novel materials, and processes
- optical designs enabled by new techniques and materials
- innovative testing methodologies and instrumentation.

THIN-FILM OPTICAL COATINGS

- design of multilayer films and coatings and performance prediction
- novel optical coating and thin-film materials
- substrate preparation, deposition, and pre- and post-processing manufacturing methods
- characterization, monitoring, and measurement
- innovative applications of optical coatings and thin-films from x-ray to the far IR.

APPLICATIONS FOR SOLID-STATE LIGHTING

- lighting for smart cities
- energy-efficient lighting systems
- LEDs for optical communication
- outdoor lighting
- residential lighting
- quality of light
- smart lighting systems
- architectural lighting
- marine lighting
- stadium lighting
- automotive and street lighting
- integrated solar lighting
- agricultural lighting.

SYSTEM-LEVEL ILLUMINATION DESIGN AND OPTIMIZATION

- micro-LEDs and display technologies
- fixture designs
- LED lamp, engine, and luminaire designs
- optical design, simulations, and evaluations
- LED light-source modeling
- vision, human factors, and lighting user interfaces.

DEVICE-LEVEL PACKAGING FOR SOLID-STATE LIGHTING

- lasers in lighting applications
- light extraction from LEDs
- lighting phosphor technology (YAG, tricolor, etc.)
- nanostructured LEDs.

TESTING, RELIABILITY, AND STANDARDS FOR LEDS AND SOLID-STATE LIGHTING

- CIE and chromaticity measurements
- LED and SSL luminous flux and color maintenance
- LED and SSL testing, modeling, and evaluation
- optical materials.

Laser Beam Shaping XXIV (OP314)

Conference Chairs: **Angela Dudley,** Univ. of the Witwatersrand, Johannesburg (South Africa); **Alexander V. Laskin,** AdlOptica Optical Systems GmbH (Germany)

Program Committee: **Fred M. Dickey,** FMD Consulting LLC (United States); **Andrew Forbes,** Univ. of the Witwatersrand, Johannesburg (South Africa); **Patrick Gretzki,** Pulsar Photonics GmbH (Germany); **Raul I. Hernandez-Aranda,** Tecnológico de Monterrey (Mexico); **Alexis V. Kudryashov,** Institute of Dynamics of Geospheres RAS (Russian Federation); **Todd E. Lizotte,** BOLD Laser Automation (United States); **Dorilian Lopez-Mago,** Tecnológico de Monterrey (Mexico); **Daryl Preece,** Beckman Laser Institute and Medical Clinic (United States); **Gediminas Račiukaitis,** Ctr. for Physical Sciences and Technology (Lithuania); **Carmelo Rosales-Guzmán,** Centro de Investigaciones en Óptica, A.C. (Mexico); **Mateusz Michal Szatkowski,** Wroclaw Univ. of Science and Technology (Poland)

Many scientific experiments and industrial and medical applications require the shaping of the spatial and temporal profiles of laser beams. The previous Laser Beam Shaping conferences have been excellent venues to integrate the various facets of beam shaping theory, design, and application. Interest in laser beam shaping techniques and applications continues to grow.

The purpose of this conference is to continue to provide a forum for the interaction of engineers and scientists interested in the various aspects of laser beam shaping. Papers on all forms of laser beam shaping theory, design, and application are solicited. Papers presenting data on proven systems and real application examples are especially encouraged. In addition, the conference will consider papers involving the shaping of the radiation patterns of non-laser sources.

General laser beam shaping topics include, but are not limited to:

THEORY AND DESIGN

Geometric and physical optics, geometrical beam shapes, vector diffraction theory, vortex and vector beams, optical orbital angular momentum, non-diffracting fields, structured light, mathematical & computational techniques, optimization-based design, intra-cavity beam shaping, diffractive and refractive beam shaping, multispot beam shaping, broadband beam shaping, pulse compression and pulse chirping, spatial and temporal beam profile shaping of short pulses, acousto-optics, spatial and temporal beam shaping, stokes polarimetry, beam shaping methods of image enhancement, interference lithography and high power beam shaping.

FABRICATION AND TESTING

Refractive, diffractive, reflective and hybrid elements, digital holography, spatial light modulators (SLMs), digital micro-mirror devices (DMDs), micro-electro-mechanical systems (MEMS), and micro-opto-electro-mechanical systems (MOEMS), grayscale lithography, thin film optics, and chemical etching technologies.

Application topics for laser beam shaping include but are not limited to:

INDUSTRIAL AND COMMERCIAL APPLICATIONS

Material processing, high-power beam shaping involving fiber coupled multimode lasers, laser displays, illumination applications, surface modification, microscopy, interferometry, holography, optical data storage, fiber injection systems, single and multimode fibers, photonic crystal fibers, and lidar.

MICRO-OPTICS AND MICRO MANIPULATION APPLICATIONS

Beam shaping achieved via MOEMS/MEMS, and beam-shaping applications in optical tweezing and trapping.

MILITARY APPLICATIONS

Laser ranging, laser targeting, laser weapons and laser counter measurements (dazzling).

MEDICAL AND BIOMEDICAL APPLICATION

Dermatology, surgery, ophthalmology, fiber optic delivery methods, photodynamic therapy, dentistry, UV sterilization, and industrial and biomedical sterilization.

QUANTUM OPTICS APPLICATIONS

Beam shaping applied in quantum optics such as quantum key distribution (QKD), quantum walks, ghost imaging, hyper-entanglement and higher-dimensional entanglement systems.

OPTICAL COMMUNICATION APPLICATIONS

Beam shaping applied in laser communications and sensors/ detection techniques and applications, spatial division multiplexing and de-multiplexing, high-bandwidth communication, free-space and fiber based communication systems.

ADAPTIVE OPTICS APPLICATIONS

Adaptive optics, spatial light modulators (SLM), digital micro-mirror devices (DMD), acousto-optical modulators, computer generated holograms, liquid lens technology, and propagation through turbulence.

Nonimaging Optics: Efficient Design for Illumination and Concentration XIX (OP315)

Conference Chairs: **Roland Winston,** Univ. of California, Merced (United States); **Lun Jiang,** Richardson Electronics, Ltd. (United States)

Conference Co-Chairs: **Håkon Jarand Dugstad Johnsen,** Norwegian Univ. of Science and Technology (Norway); **Thomas A. Cooper,** York Univ. (Canada)

Program Committee: **William J. Cassarly,** Synopsys, Inc. (United States); **Ángel García-Botella,** Univ. Politécnica de Madrid (Spain); **Lien Smeesters,** Vrije Univ. Brussel (Belgium); **Eli Yablonovitch,** Univ. of California, Berkeley (United States)

This conference will address the theory of nonimaging optics and its application to the design and experimental realization of illumination and concentration systems, tailored freeform optics, display backlighting, condenser optics, high-flux solar and infrared concentration, daylighting, LED optical systems, laser pumping, and luminaires.

Many important optical subsystems are concerned with power transfer and brightness rather than with image fidelity. Nonimaging optics is a design approach that departs from the methods of traditional optical design to develop techniques for maximizing the collecting power of concentrator and illuminator systems.

Nonimaging devices substantially outperform conventional imaging lenses and mirrors in these applications, approaching the theoretical (thermodynamic) limit. Nonimaging design methods usually involve solving ordinary or partial differential equations, calculating the flow lines of the ray bundles, coupling the edge rays of extended sources and targets or optimizing a multi-parameter merit function computed by ray-tracing techniques. While geometrically based, the design fundamentals have been extended to the diffraction limited and even sub-wavelength domain. Therefore applicability exists in near-field optical microscopy and nanometer scale optics.

There are considerable continuous work for nonimaging optics in solar energy concentration for both photovoltaic and thermal applications, much of which includes nonimaging concentration, which serves as a pillar for this conference.

The use of nonimaging optics promises higher efficiency, relaxed physical tolerances, improved optical uniformity, and reduced manufacturing costs. We encourage submissions ranging from fundamentals to critical design issues and practical applications.

Paper submissions are solicited in the following and related areas:

- radiative transfer near the étendue limit
- concentrator optics
- illumination and irradiation optics
- solar photovoltaic and solar thermal concentration
- the optical science of light trapping
- luminescent concentrators such as Stokes shift concentrators
- electro-luminescent refrigeration
- thermo-photovoltaic electricity generation
- fiber-optic and light-pipe optical systems
- radiometry
- daylighting
- characterization of light-transfer devices
- freeform optics
- optical furnaces and radiative heating
- infrared detection
- LED application of nonimaging optics
- laser pumping
- condenser optics
- ultra-compact concentrator systems
- luminaires
- experimental demonstration of nonimaging devices
- Cerenkov detectors for astronomy.

The Nonimaging Optics conference committee will issue a "Best Student and Postdoc Presentation Award" to the best oral presentation held by a student or postdoc.

New Concepts in Solar and Thermal Radiation Conversion VI (OP316)

Conference Chairs: **Peter Bermel,** Purdue Univ. (United States); **Jeremy N. Munday,** Univ. of California, Davis (United States)

Program Committee: **Fiona Beck,** The Australian National Univ. (Australia); **Roberto Russo,** Consiglio Nazionale delle Ricerche (Italy); **Wilfried G. J. H. M. van Sark,** Utrecht Univ. (Netherlands); **Zongfu Yu,** Univ. of Wisconsin-Madison (United States); **Bo Zhao,** Univ. of Houston (United States); **Linxiao Zhu,** The Pennsylvania State Univ. (United States)

This conference centers on discovering and exploring novel concepts in optics, photonics, and plasmonics with significant potential to improve the performance of solar and thermal energy conversion devices, as well as larger systems with significant sustainable energy components. Recent developments in material science, nanophotonics, plasmonics, and metasurfaces make this a uniquely promising time to develop corresponding new capabilities. These can then have direct applications in a range of fields, including but not limited to solar photovoltaics, sustainable energy systems, energy-efficient lighting, and thermophotovoltaic generation of electricity from heat.

Topics of relevance in thermophotovoltaics include design of advanced photonic crystals effective in high-temperature environments, management of excess heat in the photovoltaic cell, enhancement of the low-bandgap photovoltaic cells, incorporation of near-field enhancements in heat transfer, and incorporation into high-performance systems. Another key area requiring control of thermal radiation is radiative cooling, whether for terrestrial or space-based applications. Radiative cooling allows both for daytime passive cooling above and beyond standard convective processes, as well as below-ambient cooling for low-temperature systems and efficient power generation; it can also be combined with existing cooling techniques such as convection and evaporation for greater cooling power and functionality. Optics and photonics-related research significantly impacting other parts of energy conversion systems is also of interest.

This conference will primarily cover the following areas:

- nanophotonic and nanoplasmonic materials and structures for photovoltaics, such as transition metal dichalcogenides, nanosheets, and nanotube-based designs
- photonic and/or multi-probe characterization of aging in photovoltaics
- advanced solar conversion mechanisms, such as tandem or multijunction structures, intermediate bands, hot carrier effects, and multi-exciton generation
- novel photonic concepts to cool solar devices (e.g., radiative cooling)
- spectral conversion mechanisms, such as up- and down conversion
- wearable devices for photovoltaic power generation
- sustainable systems for solar power generation and storage
- selective solar absorbers for generating solar thermal heat energy generation and storage
- selective thermal emitters for tailoring the wavelengths, angles, and polarizations of thermal radiation, particularly at elevated temperatures
- thermophotovoltaics for efficiently converting medium- to high-temperature heat into electricity
- radiative cooling to increase the ability of systems near room temperature to reach ambient or below ambient temperatures via long-wavelength infrared thermal emission
- incorporation into emerging applications, such as building-integrated photonics, unmanned aerial vehicles, and sustainable energy systems.

Polymer Optics and Molded Glass Optics: Design, Fabrication, and Materials 2024 (OP317)

Conference Chairs: **Alan Symmons,** Vital Materials Co., Ltd. (United States); **Nelson E. Claytor,** Fresnel Technologies Inc. (United States)

Program Committee: **Hossein Alisafaee,** Rose-Hulman Institute of Technology (United States); **John P. Deegan,** Rochester Precision Optics, LLC (United States); **Rick Fitzpatrick,** Extrude To Fill, LLC (United States); **Marcel Friedrichs,** Fraunhofer-Institut für Produktionstechnologie IPT (Germany); **Ulf Geyer,** Auer Lighting GmbH (Germany); **Koji Handa,** Panasonic Production Engineering Co., Ltd. (United States); **Sai K. Kode,** Micro-LAM, Inc. (United States); **Oscar M. Lechuga,** Fresnel Technologies Inc. (United States); **Chris Morgan,** Moore Nanotechnology Systems, LLC (United States); **Tomofumi Morishita,** Panasonic Production Engineering Co., Ltd. (Japan); **J. David Musgraves,** Musgraves Consulting (United States); **Jim Olson,** Syntec Optics (United States); **Michael P. Schaub,** Meta (United States); **Ulrike Schulz,** Fraunhofer-Institut für Angewandte Optik und Feinmechanik IOF (Germany); **Hamilton Shepard III,** Waymo, LLC (United States); **Jan-Helge Staasmeyer,** Leica Camera AG (Germany)

This conference will address three areas:

- polymer optics
- molded glass optics
- design and manufacturing discriminators between plastic and glass optical systems.

Papers involving any of these areas will be considered for presentation.

Polymer optics and molded glass optics can be found in many aspects of our daily lives. Modern applications are vast and include camera phones, near-to-eye displays, microprojection, panoramic capture systems, biometrics, endoscopy, automotive, and many others.

Polymer optics have become increasingly prevalent due to continuously improving manufacturing tolerances, their ability to incorporate mechanical features directly into the optical parts, their ability to scale to high volumes, their low cost relative to that of other technologies and their low mass relative to glass.

Molded glass optics has advanced greatly in the last decade, both to improve quality and to adopt the low-cost manufacturability that had previously been conceded to injection molded polymer optics.

This conference will be dedicated to both polymer optics and molded glass optics, including plastic/glass hybrid optics, with special emphasis on recent developments in the field.

We welcome papers describing advances in any aspect of polymer optics and molded glass optics, particularly within the following areas:

- developments that exemplify the strengths of polymer optics, such as extreme asphericity, low cost, low weight, high volume production, integration of functional mechanical features, tolerance to impact and strain, etc.
- developments that highlight the strengths of molded glass optics, such as thermal tolerance, CTE, birefringence, high compressive strength, range of optical properties, etc.
- developments that challenge the traditional roadblocks for polymer optics, such as thermal instability, structural instability, birefringence, haze, difficulty in broad spectrum color correction, etc.
- developments that challenge the traditional limitations for molded glass optics, such as cost, manufacturing throughput, weight, size, shapes, etc.
- advances in ultra-precision diamond turning or grinding, molding, coating, or assembly
- advances in polymer optics materials or moldable glass types
- novel applications of polymer optics or molded glass optics
- business/market trends for polymer optics and molded glass optics
- advances in new mold materials and processes
- advances in metrology (surface, part, or system)
- advances/applications of unique surface geometries (i.e., aspheres, toroids, freeform optics, microstructures, etc.).

Additionally, we plan sessions to look at material choices for specific designs when deciding between glass and polymer materials. The material discriminators may be manufacturability, cost, performance or other. Such designs may include:

- plastics vs. glass for precision optics and refractive optics
- plastics vs. glass for transmissive and large-areas, including architectural and automotive applications
- plastics vs. glass for solar applications.

3D Printing for Lighting II (OP318)

Conference Chairs: **Nadarajah Narendran,** Rensselaer Polytechnic Institute (United States); **Govi Rao,** Phase Change Solutions (United States)

Conference Co-Chairs: **Samuel T. Mills,** Eaton Corp. (United States)

Program Committee: **Hugo da Silva,** Stratasys Ltd. (Netherlands); **Marco de Visser,** 3DPrinting. Lighting (Netherlands); **Jean Paul Freyssinier,** Rensselaer Polytechnic Institute (United States); **Groot Gregory,** Synopsys, Inc. (United States); **Alejandro Guerrero,** Amerlux LLC (United States); **Dustin Kloempken,** HP, Inc. (United States); **Brienne Willcock,** Illuminating Engineering Society of North America (United States); **Indika U. Perera,** Rensselaer Polytechnic Institute (United States); **Meghan Rock,** Desktop Metal, Inc. (United States); **Jesse Roitenberg,** Stratasys Ltd. (United States); **George M. Williams Jr.,** NanoVox (United States)

Additive manufacturing or 3D printing is the layer-by-layer production of objects from a digital model. A number of manufacturing industries are now seizing the opportunities that 3D printing can provide in terms of novel designs, manufacturing versatility, and cost-effectiveness. In lighting, manufacturers have long used 3D printing for prototyping, but recent technology advancements in printers and materials have made it more feasible to use 3D printing to manufacture certain components for light fixtures. 3D printing offers the opportunity to design custom lighting components and fixtures on site and on demand to suit the needs of the application and installation space, increasing satisfaction with the product.

Realizing the benefits of 3D printing for lighting requires new, dynamic research that will identify the best methods and materials to produce high quality, reliable custom lighting that is superior to traditionally made products. The thrust of this research must consider the thermal, optical, electrical, and mechanical needs of lighting systems and components, as well as testing and evaluation, in order to overcome current challenges and enable on-demand production at a reasonable cost. Examples of current issues for additively manufactured lighting include: investigation of materials with custom properties to print components that can serve end-use applications; understanding how dissimilar materials used in the same printer produce components with unique capabilities; and how printed components behave over time in lighting applications.

This conference encompasses the wide range of topics related to the additive manufacturing of lighting. Technical and scientific papers related to the additive manufacturing of lighting components and systems, as well as overviews of the state-of-the-art are solicited. Research from different disciplines is encouraged. Topics include:

3D-PRINTED OPTICAL COMPONENTS, DESIGN, MANUFACTURING TECHNIQUES, AND MATERIALS
- Refractive, reflective, diffractive optics, micro-optics, gradient index optics
- Optical fabrication techniques, novel materials, and printing processes
- Pre- and post-processing, finishing techniques, methods, processes
- Testing methodologies and instrumentation
- Photometric and colorimetric analysis of 3D-printed optical components.

3D-PRINTED THERMAL AND THERMO-OPTICAL COMPONENTS AND SUBSYSTEMS
- Non-optical energy dissipation from organic and inorganic LEDs
- Thermal management characterization of 3D-printed thermal and thermo-optical components
- Phase change materials for thermal management of lighting systems.

3D-PRINTED ELECTRICAL AND ELECTRONIC COMPONENTS AND SUBSYSTEMS
- Electrical interconnects and electronic devices
- Materials for 3D-printed electrical and electronic components
- Characterization of 3D-printed electrical components.

DEVICE AND SYSTEM LEVEL DESIGN AND PACKAGING OF 3D-PRINTED SOLID STATE LIGHTING SYSTEMS
- 3D-printed LED module, engine, and lamp designs
- 3D-printed lighting fixture design and performance characterization
- 3D-printed display lighting systems
- 3D-printed OLED lighting systems
- Down conversion materials incorporated into 3D-printed optics
- Nano materials incorporated into optical, mechanical, and electrical 3D-printed components.

LONG-TERM PERFORMANCE
- Testing methodologies and characterizations of long-term performance of 3D-printed optical, mechanical, and electrical/electronic components.

3D-PRINTED LIGHTING SYSTEM APPLICATIONS
- Indoor and outdoor illumination
- Specialty and decorative lighting
- Automotive lighting.

TESTING AND PERFORMANCE STANDARDS FOR 3D-PRINTED SOLID-STATE LIGHTING
- Photometry and colorimetry characterization of 3D-printed lighting systems
- Validation and certification of 3D printable materials for lighting applications
- Safety and best practices.

Advances in Solar Energy: Heliostat Systems Design, Implementation, and Operation II (OP319)

Conference Chairs: **Guangdong Zhu,** National Renewable Energy Lab. (United States); **Marc Röger,** German Aerospace Center (DLR) (Germany); **Zhifeng Wang,** Institute of Electrical Engineering, Chinese Academy of Sciences (China)

Conference Co-Chairs: **Ali M. Khounsary,** Illinois Institute of Technology (United States); **Rebecca Mitchell,** National Renewable Energy Lab. (United States)

Program Committee: **Roger Angel,** Steward Observatory (United States); **Margaret Gordon,** Sandia National Labs. (United States); **David Haas,** U.S. Dept. of Energy (United States); **Kevin G. Harding,** Optical Metrology Solutions LLC (United States); **Daewook Kim,** Wyant College of Optical Sciences (United States); **Paul François Ndione,** National Renewable Energy Lab. (United States); **Andru J. Prescod,** ManTech International Corp. (United States), U.S. Dept. of Energy (United States)

Heliostat-based concentrating solar power (CSP) systems typically employ a great number of large-aperture reflectors that intercept sunlight and reflect it onto a small receiver aperture at the top of a receiver tower. The absorbed high-temperature power is transported away and is used for electric power generation, chemicals, solar fuel production, or process heat. The commercial viability of heliostat-based CSP systems depends on the capital and operating costs. Significant improvements in their design and operation aimed at reducing these costs are essential for their widespread deployment. Despite their ability to dispatch continuous thermal energy using thermal storage, these reductions are necessary to successfully compete with other renewable energy sources undergoing rapid price decline..

With these in mind, this conference is organized to broadly address heliostat-based solar plants including architecture, component design, optics, metrology, optical performance, receiver types, thermal management, and plant control, operation, and maintenance. New and novel concepts in heliostat design, manufacturing and operation aimed at improved performance and reduced cost are particularly emphasized.

Presentations on the following and related topics are solicited:

- Current and forthcoming heliostat-based CSP plants
- Heliostat optics selection, design, and manufacturing
- Mirror mounting, alignment, and deployment
- Site selection, characterization, environmental impact
- Manufacturing and field deployment
- Field optimization, operation and maintenance, performance
- Standards and guidelines for design, operation, and maintenance
- Economic drivers and competitiveness of heliostat with other renewable soruces
- Plant and components life cycle, degradation, mitigations
- New materials and plant/parts manufacturing
- Receiver design and performance

Optical System Alignment, Tolerancing, and Verification XV (OP321)

Conference Chairs: **José Sasián,** Wyant College of Optical Sciences (United States); **Kenneth R. Castle,** Ruda Optical (United States)

Program Committee: **Brandon D. Chalifoux,** Wyant College of Optical Sciences (United States); **James A. Corsetti,** NASA Goddard Space Flight Ctr. (United States); **Laura E. Coyle,** Ball Aerospace (United States); **Blake G. Crowther,** Synopsys, Inc. (United States); **Matthew B. Dubin,** Wyant College of Optical Sciences (United States); **Jonathan D. Ellis,** Micro-LAM, Inc. (United States); **Ulrike Fuchs,** asphericon GmbH (Germany); **Sen Han,** Univ. of Shanghai for Science and Technology (China); **William P. Kuhn,** Opt-E (United States); **Chao-Wen Liang,** National Central Univ. (Taiwan); **Robert M. Malone,** Mission Support and Test Services LLC (United States); **Raymond G. Ohl IV,** NASA Goddard Space Flight Ctr. (United States); **Craig W. Pansing,** Synopsys, Inc. (United States); **Robert E. Parks,** Optical Perspectives Group, LLC (United States); **Brian C. Primeau,** Anduril Industries, Inc. (United States); **Dmitry Reshidko,** Microsoft Corp. (United States); **Martha Rosete-Aguilar,** Univ. Nacional Autónoma de México (Mexico); **Peng Su,** ASML US, Inc. (United States); **Mary G. Turner,** Edmund Optics Inc. (United States); **Will Zhou,** MLOPTIC Corp. (United States)

The topics of tolerancing, alignment, and verification are crucial in the development of successful optical systems. The effective assembly of optical systems requires alignment of different system components. The precision level of the alignment depends on the assigned tolerance error budget, and so alignment and tolerances are interrelated. Verification involves validating optical system performance, including assurance of performance under a variety of operating conditions.

This conference seeks to further the state-of-the-art in alignment and tolerancing, including verification of subsystems and at the system level, by providing a forum where these essential topics can be discussed. The conference also seeks to provide the audience with past and current useful insights in these topics. Climate change optical instrumentation requires alignment; this conference pursues sustainability in related alignment topics. We expect the 2024 conference to continue offering substantial valuable technical information and networking to both authors and audience. Prospective authors and attendees are invited to gauge the breadth and depth of the conference by perusing the fourteen previous volumes of the conference proceedings available through SPIE.

1. ALIGNMENT OF SYSTEMS AND COMPONENTS

- Theories of alignment and tolerancing
- Pupil alignment in concatenated systems
- Alignment techniques, equipment, and tools
- Development of algorithms for alignment
- Alignment in traditional lens systems and telescopes
- Alignment of coherent and high-power optical systems
- Optical alignment of fiber optics, micro-optics and nanostructures
- Optomechnical alignment
- Alignment and tolerancing of aspheres and freeforms
- Active optical system alignment
- Optical tooling.

2. TOLERANCING OF SYSTEMS

- Approaches to tolerancing and error budgets
- Lens desensitization
- Manufacturing error distributions.

3. VERIFICATION OF SYSTEMS

- Algorithms for alignment and system verification
- System verification approaches
- Tools and techniques for verification.

4. MODELING AND CASE STUDIES

- Tutorials on alignment, tolerancing, and/or verification
- Case studies
- Alignment pitfalls.

Optical Manufacturing and Testing 2024 (OP322)

Conference Chairs: **Daewook Kim,** Wyant College of Optical Sciences (United States); **Heejoo Choi,** Wyant College of Optical Sciences (United States), Large Binocular Telescope Observatory (United States); **Heidi Ottevaere,** Vrije Univ. Brussel (Belgium)

Program Committee: **Nelson E. Claytor,** Fresnel Technologies Inc. (United States); **Peter J. de Groot,** Zygo Corporation (United States); **Oliver W. Fähnle,** OST – Ostschweizer Fachhochschule (Switzerland); **Gerald Fütterer,** Technische Hochschule Deggendorf (Germany); **Wei Gao,** Tohoku Univ. (Japan); **Roland Geyl,** GEYL Optical Consulting (France); **James P. Hamilton,** Photonic Cleaning Technologies (United States), Univ. of Wisconsin-Platteville (United States); **Mourad Idir,** Brookhaven National Lab. (United States); **Jonghan Jin,** Korea Research Institute of Standards and Science (Republic of Korea), Korea National Univ. of Science and Technology (Korea, Republic of); **Stephen E. Kendrick,** Kendrick Aerospace Consulting LLC (United States); **Huang Lei,** Tsinghua Univ. (China); **Jessica DeGroote Nelson,** Edmund Optics Inc. (United States); **Robert E. Parks,** Optical Perspectives Group, LLC (United States); **Michael P. Schaub,** Meta (United States); **Ray Williamson,** Ray Williamson Consulting (United States); **Kazuto Yamauchi,** Osaka Univ. (Japan); **Xiangchao Zhang,** Fudan Univ. (China)

This conference is dedicated to the technologies for manufacturing and testing optical surfaces and components. Papers should show developments in processes, technologies, or equipment used for optical fabrication or measurement. Contributions that share lessons learned from recent projects are particularly desired.

Papers are specifically requested on:

CURRENT AND FUTURE APPLICATION REQUIREMENTS

- optics for lithography
- space and cryogenic optics
- freeform, steep, and conformal optics
- telescopes and large optics
- renewable energy optics
- light-weight and flexible substrates
- deformable and active mirrors
- micro-optics
- high-power optics
- x-ray and synchrotron optics
- polarization optics.

ADVANCES IN MANUFACTURING MATERIALS, ABRASIVES, TOOLS, MACHINES, AND PROCESSES

- new materials for optics
- computer controlled processes, CCOS-computer controlled optical surfacing
- diamond turning
- ion/plasma/water-jet removal
- precision machining of optics
- mass production of optical components and systems grinding and polishing
- molding for glass or plastic, from mass production to high precision
- renewable energy optics manufacturing
- technologies for replicating optical surfaces
- additive manufacturing, 3D printing and material deposition
- coating
- assembling optical systems
- optical contacting/advanced bond methods
- advanced surfacing and finishing technologies
- IoT in optics production.

NEW DEVELOPMENTS AND TOPICS IN OPTICAL TESTING OF FIGURE/WAVEFRONT AND FINISH

- applied interferometry, holography, and speckle
- applications: phase-measuring, spatial heterodyne, and static fringe analysis
- absolute calibration: flats, spheres, windows, etc.
- measurement of aspheres and freeforms
- metrology for renewable energy optics
- diffractive null correctors
- geometric-ray tests
- wavefront sensors
- MTF and encircled energy
- figure, ripple, and roughness - power spectral density
- mid-spatial-frequency errors on surfaces: detection, characterization, effects, and mitigation
- high spatial resolution methods
- testing in adverse environments: vibration, atmosphere, cryogenic, vacuum, etc.
- subsurface damage: detection, characterization, effects, and mitigation
- surface profilometry: optical and scanning probe
- scatter and BRDF (bidirectional reflectance distribution function)
- metrology for digital optics for applications such as AR/VR/MR
- AI and machine learning for optical metrology.

Interferometry and Structured Light 2024

(OP323)

Conference Chairs: **Michael B. North-Morris,** 4D Technology Corp. (United States); **Katherine Creath,** Optineering (United States), The Univ. of Arizona (United States); **Song Zhang,** Purdue Univ. (United States)

Conference Co-Chairs: **Rosario Porras-Aguilar,** The Univ. of North Carolina at Charlotte (United States); **Maciej Trusiak,** Warsaw Univ. of Technology (Poland)

Program Committee: **Astrid Aksnes,** Norwegian Univ. of Science and Technology (Norway); **Armando Albertazzi Gonçalves Jr.,** Univ. Federal de Santa Catarina (Brazil); **Gastón A. Ayubi,** Stanford Univ. School of Medicine (United States); **Brent C. Bergner,** Onto Innovation Inc. (United States); **Jan Burke,** Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Romita Chaudhuri,** ASML (United States); **James H. Clark III,** U.S. Naval Research Lab. (United States); **Peter J. de Groot,** Zygo Corporation (United States); **Nicholas Devaney,** Univ. of Galway (Ireland); **Konstantinos Falaggis,** The Univ. of North Carolina at Charlotte (United States); **Marc P. Georges,** Liège Univ. (Belgium); **Goldie L. Goldstein,** Nikon Research Corp. of America (United States); **Ulf Griesmann,** National Institute of Standards and Technology (United States); **Daewook Kim,** Wyant College of Optical Sciences (United States); **Beiwen Li,** Iowa State Univ. of Science and Technology (United States); **Amalia Martínez-García,** Centro de Investigaciones en Óptica, A.C. (Mexico); **Kate Medicus,** Ruda-Cardinal, Inc. (United States); **Daniel B. Millstone,** 4D Technology Corp. (United States); **Artur G. Olszak,** Apre Instruments, Inc. (United States); **Yukitoshi Otani,** Utsunomiya Univ. (Japan); **Joanna Schmit,** 4D Technology Corp. (United States); **Adam R. Styk,** Warsaw Univ. of Technology (Poland); **James D. Trolinger,** MetroLaser, Inc. (United States); **Christopher C. Wilcox,** Air Force Research Lab. (United States)

This long standing and well-attended conference features interferometry, structured light, and and optical metrology techniques and applications. The techniques enable non-contact inspection of a wide range of objects from macro-scale to nano-scale, and surface finishes from super-polished to structured or randomly rough. Applications in research laboratories, industrial manufacturing, and standardization institutes that rely on the precision, reliability, and flexibility of these techniques steer the industry toward new horizons. For example, applications in new technologies such as creating sustainable product using new materials, MEMS/MOEMS, biomedical devices and light weighted segmented mirrors have pushed the field toward ever more challenging new solutions. These new developments have greatly impacted the science of optical measurements and instruments.

Authors with topics related to interferometry, structured light, and optical metrology are encouraged to submit contributions to this conference. This conference is expected to receive 40-60 papers covering the latest advances in areas relating to techniques and applications of interferometry and fringe analysis methods. Recent progress and next-generation developments will be highlighted. Invited talks will be included with regular conference talks and poster presentations. The meeting will encompass 2-3 days and avoid parallel sessions. In addition, sufficient time will be allotted for visiting the poster sessions and exhibits.

Submission Instructions:

This conference gives acceptance priority to authors who submit an extended abstract of their work.

This extended abstract must be submitted as a supplemental file during the abstract submission process. This file must be a PDF using the SPIE template of 2-3 pages. It should clarify the novelty of the work being presented and may include figures, test results, and references.

We expect all presenters to prepare more extended proceedings manuscripts by the manuscript deadline as a requirement to present an oral presentation at the meeting. All manuscripts will be peer reviewed. Exceptions will be considered on a case-by-case basis.

Manuscript guidelines:
https://spie.org/OP/Manuscript-Submission-Guidelines

Papers are solicited on the following and related topics:

1. ADVANCED MEASUREMENT TECHNIQUES:
- Active and real-time measurement systems
- Atom interferometry
- Calibration and standardization methods
- Digital holography and speckle techniques
- Fringe analysis techniques
- Grating and grid (moiré) methods
- Interferometric fiber optic sensors
- Phase measurement techniques
- Polarization and geometric-phase techniques
- Shearing interferometry and other gradient methods
- White light interferometry and optical coherence tomography

2. INDUSTRIAL METROLOGY AND QUALITY CONTROL:

- Automotive, aerospace, and other industrial applications
- Automated measurements
- Freeform, mid-spatial frequency, and roughness measurement
- High-speed 3D metrology
- MEMS/MOEMS reliability analysis, assembly, and packaging testing
- Nondestructive testing and failure analysis
- Stress and strain analysis
- Surface profiling
- Thin-film metrology
- X-ray and high-energy optics characterization

3. BIOMEDICAL AND LIFE SCIENCES APPLICATIONS:

- Bio-interferometry to measure and image cells and tissues
- Biological and pharmaceutical applications
- Nano-metrology
- Optical projection tomography techniques

4. ASTRONOMY AND SPACE OPTICS:

- Astronomical and adaptive optics through micro optics testing
- Gravitational wave interferometry
- Terahertz techniques and applications

5. CROSS-SCALE MEASUREMENTS AND INTEGRATION:

- Distance and shape measurements across multiple scales
- Interaction between modeling, simulation, and experiments
- Integrated optical interferometry
- Materials, structural analysis, and testing
- Semiconductor wafer inspection, photolithography mask metrology, and inspection

6. EMERGING INTERDISCIPLINARY AREAS:

- High-speed 3D metrology
- Intelligent metrology systems
- Sustainable product metrology
- Machine Learning
- Materials, structural analysis, and testing
- Tunable wavelength, spectral interferometry, and wavelength-dependent methods
- to 1/∞ and beyond.

We will have a “Fringe Art” Competition: Bring your favorite fringe pattern to display.

Space Systems Contamination: Prediction, Control, and Performance 2024 (OP324)

Conference Chairs: **Carlos E. Soares,** Jet Propulsion Lab. (United States); **Eve M. Wooldridge,** NASA Goddard Space Flight Ctr. (United States); **Bruce A. Matheson,** Ball Aerospace (United States)

Conference Co-Chairs: **Jillian Stack,** NASA Goddard Space Flight Ctr. (United States)

Program Committee: **William A. Hoey,** Jet Propulsion Lab. (United States); **Alvin Y. Huang,** The Boeing Co. (United States); **Matthew Macias,** Northrop Grumman Corp. (United States); **Riccardo Rampini,** European Space Research and Technology Ctr. (Netherlands); **Jean-Francois Roussel,** ONERA (France); **Antonio Saverino,** Thales Alenia Space (Italy); **Elaine E. Seasly,** NASA (United States)

This conference addresses how molecular and particulate contamination affects space systems performance, mission science objectives, science data results, science instruments and spacecraft design. This conference also addresses contamination science and the combined effects of space environments on the generation, transport and effects of contamination on space systems and science instruments (e.g. combined effects of high-energy radiation, ultraviolet radiation, atomic oxygen with the spacecraft induced contamination environment).

Contaminants on the surface of optical elements and in the field-of-view of sensors degrade optical system performance. Contaminant-induced surface scatter can reduce off-axis rejection capability. Absorption by surface deposits can reduce optical throughput and contaminants in the field-of-view can attenuate signals and increase sensor background. Surface contaminants can also degrade the optical properties of radiative thermal control surfaces.

While the primary emphasis is on molecular and particulate contamination of spaceborne instruments and spacecraft, contamination also affects the performance of optical systems, nanodevices, and biomedical or electronic devices.

The scope of the conference includes contamination modeling and analysis, thruster plume contamination and erosion effects, optical calibration, on-orbit instrument calibration, performance and characterization, launch venting, space environmental effects, molecular and particulate transport, thermo-optical property degradation, surface science (e.g., outgassing, diffusion, desorption and adsorption of molecular contaminants), molecular adsorbers, and methods to control contamination. Papers concerning contamination issues for spacecraft, spaceborne instruments, nanodevices, semiconductors, high-energy lasers, and astronomical observatories are of particular interest. Papers addressing on-orbit measurements and performance of launched spacecraft and instruments are also encouraged.

With the current and upcoming Mars, Europa, Enceladus, Titan, asteroid, comet and other planetary/icy moon missions, topics associated with planetary protection will also be addressed.

In addition to the general areas mentioned above, papers are solicited in following areas:

- contamination effects in optical systems, mass spectrometers, nanodevices, and lasers
- use of nanotechnology to remove or detect contaminants
- characterization of molecular and particulate contaminant generation, transport, deposition, and interactions with surfaces
- measurement and modeling of condensable outgassing rates (in vacuum and in planetary atmospheres/exospheres)
- high-energy radiation effects on contaminant sources, transport and deposition (e.g., Jovian environment)
- modeling and experimental characterization of particulate adhesion, transport, deposition and removal during all phases of a mission (e.g., integration & testing; assembly, test and launch operations; launch; entry/descent/landing, surface operations)
- project and mission contamination control planning, testing results, and on-orbit performance results
- system sensitivity to contaminants
- models for predicting system degradation due to contamination
- thruster plume effects, measurements, modeling
- multi-phase vacuum venting and its effects
- contamination effects on scatter or stray light
- methods for monitoring and controlling contamination
- methods for cleaning or removing contaminants from surfaces
- in-flight and on-ground data on the effect of contamination on system performance
- physical, chemical, and optical (absorption or scatter) phenomena created by contamination
- contamination control standards and specifications
- contamination-resistant, dust-resistant, and protective coatings particulate contamination including effects of lunar, Martian, and other planetary dust on surfaces
- development of thermal and specialty coatings
- development, characterization and application of molecular adsorbers (e.g., getters)

- protection and cleaning of coatings and thin-film deposition
- low surface energy coatings
- advancements in conductive and non-conductive paints and coatings for use in optical systems
- planetary protection challenges for icy moons, asteroids, comets, Mars, Titan and other planetary missions
- development of Planetary Protection requirements, control methods, and databases
- launch site processing and launch vehicle particulate/molecular cleanliness.

Optics and Photonics for Information Processing XVIII (OP331)

Conference Chairs: **Khan M. Iftekharuddin,** Old Dominion Univ. (United States); **Abdul A. S. Awwal,** Lawrence Livermore National Lab. (United States); **Victor Hugo Diaz-Ramirez,** Ctr. de Investigación y Desarrollo de Tecnología Digital (Mexico)

Conference Co-Chair: **Andrés Márquez,** Univ. de Alicante (Spain)

Program Committee: **Juan Campos,** Univ. Autònoma de Barcelona (Spain); **Liangcai Cao,** Tsinghua Univ. (China); **Rigoberto Juarez-Salazar,** Ctr. de Investigación y Desarrollo de Tecnología Digital (Mexico); **Richard R. Leach Jr.,** Lawrence Livermore National Lab. (United States); **Mohammad A. Matin,** Univ. of Denver (United States); **Nasser M. Nasrabadi,** West Virginia Univ. (United States); **Adriana Nava-Vega,** Univ. Autónoma de Baja California (Mexico); **Volker J. Sorger,** Univ. of Florida (United States); **Toyohiko Yatagai,** Utsunomiya Univ. Ctr. for Optical Research & Education (Japan); **María J. Yzuel,** Univ. Autònoma de Barcelona (Spain)

This conference is intended to provide a forum for interchange on various algorithms, systems, sensors, and architectures for novel applications in optics and photonics in information processing. Original unpublished contributions reporting recent advances in analog and hybrid optical information systems and techniques are solicited. In addition, papers related to curriculum development, review papers, and teaching in a cross-disciplinary setting in any of the following topics are welcome. All abstracts will be reviewed by the program committee for originality and merit. Topics of interest include, but are not limited to, the following:

ALGORITHMS
- optical pattern recognition, devices, optical correlation hardware, nonlinear techniques for pattern recognition
- optical image processing algorithms
- optical encryption, information security, security of digitally stored medium
- neural networks including deep learning networks
- transforms for optical imaging systems, including Fourier and wavelets transforms
- algorithms for quantum computing, large scale data (Big Data) processing and deep learning
- algorithms for robot vision and autonomous vehicle navigation
- adaptive algorithms for optical image restoration and enhancement
- algorithms for optical metrology, camera calibration, and 3D object digitization.

NEW ARCHITECTURE AND SYSTEMS
- quantum computing, cyber-physical systems and IoTs for optical information processing
- spatial light modulators (SLMs), photorefractive materials for optical information systems
- holographic techniques in information processing, and information display systems
- optical storage/memory systems for information processing
- optical systems for 3D pattern recognition, 3D imaging, and Big Data image processing
- applications of novel optical materials for information processing
- novel diffractive optics structures and devices
- nano photonics for optical computing
- metasurfaces
- calibration of optical systems.

OPTICAL SWITCHING AND INTERCONNECTS
- optical interconnects and supercomputing
- waveguide, optical-fiber-based, polarization, and intensity switching, optical limit switches, optical multiplexing
- implementation of interconnects
- optical back bones for conventional computers, optical/hybrid interconnects for electronic computers.

DIGITAL OPTICAL PROCESSING AND ARCHITECTURE
- high-speed opto-electronics computation
- signed-digit based computing, multi-valued logic, linear algebra processor, system demonstrations, fault-tolerant computing, optical logic and memory.

WAVEFRONT-BASED COMPUTATION
- holographic memory-based computing, integrated optics, and soliton-based and semiconductor devices for optical computing
- modeling of holographic elements, joint optimization
- digital holography applications.

APPLICATIONS IN BIOPHOTONICS
- optical processing for biophotonics
- applications of optical systems to information security
- optical systems for biometrics sensing and recognition.

IMAGE FORMING AND PROCESSING APPLICATIONS

- imaging: 2D, 3D, integral, holographic, optical, digital, polarimetric
- novel x-ray-based image processing, algorithms and systems, noise processing, applications in medical, EUV, modeling, etc.
- image processing of optical images for large scale systems such as laser fusion facilities, applications in optical alignment, optics inspection, off-normal detection
- optical systems and algorithms for Big Data SAR/IR/visible/medical image processing and recognition
- computational sensing, computational imaging for Big Data processing
- 3D printing for optics.

OPTICAL INFORMATION PROCESSING AROUND THE GLOBE

- review of optical information processing research over decades in different countries around the globe.

OPTICS AND PHOTONICS WITH A FOCUS ON SUSTAINABILITY

- algorithms and photonics systems for efficient energy management of information processing
- application of novel sustainable materials for photonics systems.

Applications of Digital Image Processing XLVII (OP332)

Conference Chairs: **Andrew G. Tescher,** AGT Associates (United States); **Touradj Ebrahimi,** Ecole Polytechnique Fédérale de Lausanne (Switzerland)

Program Committee: **Vasudev Bhaskaran,** Qualcomm Inc. (United States); **Antonin Descampe,** Univ. Catholique de Louvain (Belgium); **Dan Grois,** Comcast Corp. (Israel); **Ofer Hadar,** Ben-Gurion Univ. of the Negev (Israel); **Ioannis Katsavounidis,** Meta (United States); **C.-C. Jay Kuo,** The Univ. of Southern California (United States); **Shan Liu,** Tencent America, LLC (United States); **Andre J. Oosterlinck,** KU Leuven Association (Belgium); **Fernando Pereira,** Instituto de Telecomunicações (Portugal); **Yuriy A. Reznik,** Brightcove, Inc. (United States); **Thomas Richter,** Fraunhofer-Institut für Integrierte Schaltungen IIS (Germany); **John A. Saghri,** California Polytechnic State Univ., San Luis Obispo (United States); **Gary J. Sullivan,** Dolby Labs., Inc. (United States); **David S. Taubman,** The Univ. of New South Wales (Australia); **Pankaj Topiwala,** FastVDO Inc. (United States)

SUBMISSIONS TO THE CONFERENCE SHOULD HAVE ABSTRACT TEXT LENGTHS OF 1,000 WORDS OR LESS.

The field of digital image processing has experienced continuous and significant expansion in recent years. The usefulness of this technology is apparent in many different disciplines covering entertainment through remote sensing. The advances and wide availability of image processing hardware along with advanced algorithms have further enhanced the usefulness of image processing. The Application of Digital Image Processing conference welcomes contributions of new results and novel techniques from this important technology.

Papers are solicited in the broad areas of digital image processing applications, including:

APPLICATION AREAS
- image processing in sustainability applications
- image processing in medical applications
- image processing in remote sensing
- image processing in space
- image processing in automotive applications
- image processing in entertainment
- image processing in digital cinema
- image processing in gaming
- image processing in video surveillance
- image processing in drones
- image processing in multimedia applications
- image processing in telepresence
- image processing in visual search
- image processing in real time applications
- blockchain and distributed ledge technologies in imaging.

NEW IMAGING MODALITIES AND THEIR PROCESSING
- high dynamic range
- wide color gamut
- high frame rate
- ultra-high definition (4K, 8K, and beyond)
- holographic content
- light field content
- point cloud content
- plenoptic content
- multidimensional content
- multimodal content.

IMMERSIVE IMAGING
- imaging in virtual reality
- imaging in augmented reality
- imaging in mixed reality
- omnidirectional imaging
- 360-degree imaging.

IMAGE AND VIDEO PROCESSING AND ANALYSIS
- image and video enhancement
- image and video restoration
- image registration techniques
- robot and machine vision
- pattern recognition
- feature extraction and tracking
- computational imaging
- image and video annotation
- image and video indexing
- image and video management
- search and retrieval.

NEW STANDARDS IN IMAGE AND VIDEO APPLICATIONS
- JPEG
- MPEG
- VCEG
- SMPTE
- AOM
- other standards.

SECURITY IN IMAGING
- ownership protection
- integrity verification
- conditional access
- privacy protection
- biometrics
- forensics
- deepfakes
- disinformation, misinformation, malinformation.

IMAGING REQUIREMENTS AND FEATURES
- low latency
- low power
- low complexity
- real-time
- scalability

- error resiliency
- random access
- new requirements and features.

IMAGING SYSTEMS
- new image processing architectures
- implementation considerations
- complexity considerations
- power consumption considerations
- optimization considerations
- performance metrics.

COMPRESSION
- image compression
- video compression
- perceptual compression
- lossless compression
- transcoding
- new methods for image compression
- new methods for video compression.

HUMAN VISUAL SYSTEM AND PERCEPTUAL IMAGING
- image quality assessment and metrics
- video quality assessment and metrics
- perceptually motivated image processing
- Quality of Service (QoS) issues in imaging
- Quality of Experience (QoE) issues in imaging.

ARTIFICIAL INTELLIGENCE IN IMAGING
- machine learning applied to imaging
- deep learning applied to imaging
- assessment of Data Quality (DQ) in imaging
- imaging using Generative Adversarial Network (GAN)
- generative AI in imaging
- reinforcement learning applied to imaging
- image compression based on artificial intelligence
- video compression based on artificial intelligence
- new machine learning approaches in imaging.

NOVEL AND EMERGING METHODS IN IMAGING
- new and emerging applications in imaging
- new and emerging approaches in imaging.

Applications of Machine Learning 2024 (OP333)

Conference Chairs: **Michael E. Zelinski,** Lawrence Livermore National Lab. (United States); **Tarek M. Taha,** Univ. of Dayton (United States); **Barath Narayanan,** Univ. of Dayton (United States)

Conference Co-Chairs: **Abdul A. S. Awwal,** Lawrence Livermore National Lab. (United States); **Khan M. Iftekharuddin,** Old Dominion Univ. (United States)

Program Committee: **Redha Ali,** Univ. of Dayton (United States); **Md. Zahangir Alom,** St. Jude Children's Research Hospital (United States); **Brent D. Bartlett,** BeamIO (United States); **Cindy Gonzales,** Lawrence Livermore National Lab. (United States); **James Henrikson,** Lawrence Livermore National Lab. (United States); **Alan D. Kaplan,** Lawrence Livermore National Lab. (United States); **Page King,** Lockheed Martin Corp. (United States); **Sachin Malhotra,** Etsy, Inc. (United States); **Nathan Mundhenk,** Lawrence Livermore National Lab. (United States); **Karl Song-Jeng Ni,** Etsy, Inc. (United States); **Artem Poliszczuk,** Kavli Institute for Particle Astrophysics & Cosmology (KIPAC) (United States); **Oscar H. Ramírez-Agudelo,** Deutsches Zentrum für Luft- und Raumfahrt e. V. (Germany); **Priyadip Ray,** Lawrence Livermore National Lab. (United States); **Manar D. Samad,** Tennessee State Univ. (United States); **Ergun Simsek,** Univ. of Maryland, Baltimore County (United States); **Amanda K. Ziemann,** Los Alamos National Lab. (United States)

This conference provides a technical forum for members of both industry and academia to present their latest applications of machine learning. Machine learning has been applied to a broad domain of image/vision systems from medical imaging to consumer cameras. Learned tasks such as image recognition, noise reduction, or natural language processing, are currently being applied in many common devices in consumer and industrial settings. Training datasets and training methods for machine learning are critical for the success of a system. Studies demonstrating the deployment and benchmarking of machine learning algorithms on specialized computer hardware is highly valuable to many groups in this field. Sensor hardware design or selection as it pertains to machine learning tasks; for example, an analysis of different camera designs and how each pertains to the performance of an image recognition task such as object detection, is of interest. Analysis of full systems that include the sensor technology, data processing hardware, and results are welcome as each area is critical for the successful application of machine learning.

Papers or tutorials reviewing the topics covered by this section are welcome. All abstracts will be reviewed by the program committee for originality and merit. Topics of interest include, but are not limited to, the following:

ALGORITHMS
- application or adaptation of known neural network and deep learning architectures
- neural networks, deep learning, reinforcement learning, evolutionary, and spiking algorithms
- computational intelligence, graphical models
- optimization methods which better enable application of machine learning algorithms (mixed or lower precision, pruning, grouped convolutions, node fusion, etc.)
- analysis and comparison of computational complexity, utility, speed, green AI
- full system analysis of image sensor data, computer hardware, machine learning task, and results
- training methods, such as transfer learning, meta learning, few shot learning, low shot learning, weakly supervised, unsupervised, recurrent and self-supervised learning
- data augmentation techniques
- application of AR, VR, or MR to ML tasks
- explainable AI, uncertainty quantification, salient image studies.

CONSUMER APPLICATION
- application of ML algorithms to specific datasets, tasks, or hardware
- image classification, detection, localization, segmentation
- interpolation, denoising, dehazing, clustering, super-resolution, image quality
- hyperspectral target detection
- biometrics
- voice recognition, natural language processing
- human/machine smart interface
- tracking (global and local), generative models, and RF applications (classification, detection, spoofing, etc.).

INDUSTRIAL APPLICATION
- remote sensing
- predictive and preventative maintenance
- automotive safety
- self-driving cars
- machine inspection of industrial parts
- agricultural, food safety
- surveillance
- optical manufacturing
- additive manufacturing
- cognitive agents and decision making
- robotics.

SECURITY
- biometrics
- face recognition
- bias in security application.
- Protection Maritime and Terrestrial Infrastructures.

MEDICINE
- medical diagnostic and evaluation
- drug/viral antibody design.

BIG DATA
- real-time processing of data using machine learning algorithms
- Big Data applications of machine learning
- medical data (tumor, cancer, longitudinal studies)
- training datasets for machine learning
- multi-sensor data and data fusion (radio frequency, EO, hyperspectral, IR)
- meteorological
- remote sensing data.
- Synthetic data (virtual engines).

HARDWARE
- application of machine learning algorithms on low SWaP computer hardware
- sensor modalities (mobile phone, consumer camera, machine vision systems, automotive imaging systems, micro-pulse radar, x-ray, OCT, CAT, MRI, hyperspectral, image satellites, airborne imaging systems, astronomical observing telescopes)
- image system or general sensor design and its relationship to machine learning tasks, methodologies for system characterization using machine learning tasks
- selection of image system parameters and their relationship to machine learning tasks
- real-time applications of machine learning.

BIG EXPERIMENTAL FACILITIES
- controlling multiparameter physics experiments
- optical damage evaluation
- big physics data
- optical component manufacturing
- boutique and large scale manufacturing
- high energy physics facilities such as NIF and others
- multiparameter optimization in large physics-based simulations.

Ultrafast Nonlinear Imaging and Spectroscopy XII (OP410)

Conference Chairs: **Zhiwen Liu,** The Pennsylvania State Univ. (United States); **Demetri Psaltis,** Ecole Polytechnique Fédérale de Lausanne (Switzerland); **Kebin Shi,** Peking Univ. (China)

Program Committee: **Randy A. Bartels,** Morgridge Institute for Research (United States), Colorado State Univ. (United States); **Martin Centurion,** Univ. of Nebraska-Lincoln (United States); **Jason M. Eichenholz,** Luminar Technologies, Inc. (United States); **Kenan Gundogdu,** North Carolina State Univ. (United States); **Hans D. Hallen,** North Carolina State Univ. (United States); **Iam Choon Khoo,** The Pennsylvania State Univ. (United States); **Michelle Y. Sander,** Boston Univ. (United States); **Jigang Wang,** Iowa State Univ. of Science and Technology (United States)

The main theme of this conference is focused on exploiting ultrafast and nonlinear optical techniques for imaging and spectroscopy applications. The merging of ultrafast nonlinear optics and imaging has created exciting opportunities to explore nonlinear susceptibility as contrast mechanisms for label-free imaging. For instance, second harmonic generation (SHG) imaging relies on the difference in second order nonlinear susceptibility to form an image and can be used to probe molecules or structures without inversion symmetry. The introduction of the multi-photon nonlinear excitation technique using femtosecond pulses to fluorescence microcopy has allowed for the use of longer excitation wavelengths hence deeper penetration depth in scattering media, reduced photo-toxicity, and natural optical sectioning capability. By combining nonlinear molecular vibrational spectroscopy (such as coherent anti-Stokes Raman spectroscopy – CARS, and stimulated Raman scattering – SRS) with imaging, coherent Raman microscopy possesses the unique chemical selective imaging capability. Last but not the least, various novel sources generated by ultrafast nonlinear processes (e.g., supercontinuum) also have significant impact on the field of imaging and spectroscopy.

This conference provides an excellent opportunity for researchers working on the field of ultrafast nonlinear imaging and spectroscopy to present their most recent progress. Papers on all related areas are solicited, including novel ultrafast nonlinear optical imaging and spectroscopy techniques, nonlinear imaging contrast mechanisms, applications of ultrafast nonlinear imaging and spectroscopy, nonlinear optical sources, and computational techniques related to ultrafast nonlinear imaging and spectroscopy. The following are a list of exemplary topical areas:

- sum frequency generation (SFG) spectroscopy, SFG and SHG (second harmonic generation) microscopy
- multi-photon excitation fluorescence microscopy
- third harmonic generation (THG) microscopy
- four wave mixing spectroscopy and imaging, coherent Raman spectroscopy and microscopy (e.g., CARS, SRS)
- ultrafast nanoscale nonlinear imaging and spectroscopy
- ultrafast electron diffraction and imaging
- multispectral imaging
- multidimensional spectroscopy
- Brillouin imaging
- holographic nonlinear imaging
- stimulated emission depletion microscopy (STED)
- structured illumination imaging
- nonlinear sources (e.g., supercontinuum, THz) for imaging and spectroscopy
- novel ultrafast and nonlinear imaging and spectroscopy techniques
- computational nonlinear imaging and spectroscopy
- application of machine learning to ultrafast/nonlinear imaging/spectroscopy and photonic systems
- biological and chemical imaging and sensing applications.

Photonic Fiber and Crystal Devices: Advances in Materials and Innovations in Device Applications XVIII (OP411)

Conference Chairs: **Shizhuo Yin,** The Pennsylvania State Univ. (United States); **Ruyan Guo,** The Univ. of Texas at San Antonio (United States)

Program Committee: **Partha P. Banerjee,** Univ. of Dayton (United States); **Liangcai Cao,** Tsinghua Univ. (China); **Amol Choudhary,** Indian Institute of Technology Delhi (India); **Abdalla M. Darwish,** Dillard Univ. (United States); **Ken-Yuh Hsu,** National Yang Ming Chiao Tung Univ. (Taiwan); **Carl M. Liebig,** Air Force Research Lab. (United States); **Paul B. Ruffin,** Alabama A&M Univ. (United States); **Narsingh B. Singh,** Univ. of Maryland, Baltimore County (United States); **Wei-Hung Su,** National Sun Yat-sen Univ. (Taiwan); **Ching-Cherng Sun,** National Central Univ. (Taiwan); **Jun Zhang,** DEVCOM Army Research Lab. (United States)

The Photonic Fibers and Crystal Devices Conference aims to establish a well-defined forum with focus on innovations of photonic, optoelectronic, and optical devices that depend essentially on advancement in materials processing, optical and photonic property, wave mixing, and photorefractive phenomena. This conference is a continuation of the successful SPIE conferences on Photorefractive Fiber and Crystal Devices with strengthened topics on crystal growth of nonlinear optic materials. The scope of applications this conference encompasses covers a broad range from components to systems architectures in optical signal processing, optical storage, optical networks and communications, and advanced material-based novel photonic devices. The objective of this conference is to promote scientific interaction that bridges advancement in photonic fibers and crystal materials with innovations in photonic technology and device development.

Sessions will focus on the latest achievements on both photonic materials and device technologies that can lead to further advances in the communication, sensing, data storage, display, biomedical, and defense applications. The status and future challenges in these areas also will be reviewed by invited speakers.

Authors are encouraged to submit papers addressing the following session topics:

PHOTONIC FIBERS AND CRYSTAL MATERIALS

- novel photorefractive, electro-optic, and nonlinear optical fibers and crystals including glasses, semiconductors, ferroelectrics, polymeric, chalcogenide, and magneto-optic materials
- crystal growth, defect and doping control, quasi phase matching and domain manipulation, polarization maintaining photonic crystal fiber designs and applications
- photonic fibers, 2- and 3-dimensionally engineered photonic crystal, and photonic bandgap materials
- photosensitivity and spectral responses, physical and optical characterizations
- experiments and theory that elucidate correlations between materials doping and defect-structure with photonic properties
- progress in high peak power capable photonic fibers
- advances in software, database, and machine learning for the design, simulation, and fabrication of photonic fibers and photonic devices
- additive manufacturing of photonic devices, photonic integrated circuits, and hybrid photonic systems.

PHOTONIC DEVICES AND APPLICATIONS

- components for optical communication, sensing, and data storage, including transmission, amplification, modulation, detection, dispersion management, switching, data handling, and packaging
- integrated optical components, nonlinear frequency converters, diffractive devices, three-dimensional optical memory, and dynamic memories
- dynamic sensing for chemical, harsh environment, biophotonic, and defense applications
- adaptive optical devices utilizing coupled effects such as electro-optic, elasto-optics, photostriction, magneto-optics, and pyro-optics
- novel free-space and waveguiding optical components, devices and subsystems including supercontinuum lasers for photonic computing, optomechanics, interconnects, switching, and packaging of photonic processors
- phonic bandgap switches and modulation-based switching devices
- photonic devices for energy conversion and harvesting
- electromagnetics (nonlinear phenomena and propagation of light in nonlinear crystals/ optical media)
- crystalline fiber lasers.

SPECIAL SESSION: VOLUME HOLOGRAPHIC OPTICAL ELEMENTS (HOES) AND APPLICATIONS TO VR/AR/MR

This special session will include topics encompassing analog and digital holographic data storage, the holographic miniaturization of functional mapping, holographic image amplification, volume holographic imaging, 3D imaging and processing, and 3D displays. Especially, papers are invited that explore advancements and challenges in Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR) applications. Topics of interest include the multiplexing ability of volume Holographic Optical Elements (HOEs), polarization holography, active switching of HOEs, device fabrication, integration with micro-LEDs, and the design of metasurfaces, etc.

(This special session will be co-chaired by **Ching-Cherng Sun** and **Partha Banerjee**).

Terahertz Emitters, Receivers, and Applications XV (OP412)

Conference Chairs: **Manijeh Razeghi,** Northwestern Univ. (United States); **Mona Jarrahi,** UCLA Samueli School of Engineering (United States)

Program Committee: **Shaghik Atakaramians,** The Univ. of New South Wales (Australia); **Igal Brener,** Sandia National Labs. (United States); **David Burghoff,** The Univ. of Texas at Austin (United States); **Enrique Castro-Camus,** Philipps-Univ. Marburg (Germany); **Tyler L. Cocker,** Michigan State Univ. (United States); **Sukhdeep S. Dhillon,** Lab. de Physique de l'Ecole Normale Supérieure (France); **Jean-Paul Guillet,** Lab. d'Intégration du Matériau au Système (France); **Pernille Klarskov,** Aarhus Univ. (Denmark); **Quanyong Lu,** Beijing Academy of Quantum Information Sciences (China); **Hiroaki Minamide,** RIKEN (Japan); **Oleg Mitrofanov,** Univ. College London (United Kingdom); **Taiichi Otsuji,** Tohoku Univ. (Japan); **Sascha Preu,** Technische Univ. Darmstadt (Germany); **Marco Rahm,** Rheinland-Pfälzische Technische Univ. Kaiserslautern-Landau (Germany); **Clara J. Saraceno,** Ruhr-Univ. Bochum (Germany); **Andreas Stöhr,** Univ. Duisburg-Essen (Germany); **Feihu Wang,** Southern Univ. of Science and Technology (China); **Jigang Wang,** Iowa State Univ. of Science and Technology (United States); **Stephan F. Winnerl,** Helmholtz-Zentrum Dresden-Rossendorf e. V. (Germany); **Withawat Withayachumnankul,** The Univ. of Adelaide (Australia); **Shang Hua Yang,** National Tsing Hua Univ. (Taiwan)

The THz domain extending approximately from 1 to 30 THz can be considered as a link between electronics and photonics. Since the beginning of the 1990s this field was growing first with the development of time-domain spectroscopy and now is becoming more and more attractive with the emergence of new technologies: quantum cascade lasers, nano-transistors, photo mixing, mixers, frequency multipliers and material systems like novel semiconductor heterostructures exploiting nitride, zinc oxide based heterostructures, 2D nanostructures and van der Walls layered heterostructures. These materials and devices have already found many applications in different systems exploiting unique properties of the THz region of the electromagnetic spectrum. The optical excitation and control of spins in magnetic materials and structures opens new prospects for merging of spin-based devices and ultrafast photonic processing whereas terahertz spectroscopy presents an ideal tool for the study of spin dynamics in magnetic materials. Furthermore, novel optical and photonic systems recently emerged to further extend the THz research field to the investigations of phenomena at the nanoscale. Among the new trends in the THz technology there also are tunable, compact THz gas lasers, THz optical components manufactured with 3d printing, chip-level THz signal generation, THz imaging with a single pixel camera, etc.

The conference is intended to provide a forum for scientists, engineers, and researchers from a diverse set of disciplines who are interested in presenting their last achievements in this field. The scope of the conference includes sources and detectors of THz radiation, optical components, optical and photonic systems, near field microscopy as well as different applications exploiting this technology.
Papers are solicited in the following areas:

FUNDAMENTALS OF GENERATION, DETECTION, AND PROPAGATION OF THZ WAVES
- modeling of THz sources and detectors
- performance limitations
- photonic crystal devices and applications
- single element antennas
- phased array antennas
- photonically driven antennas
- photonic phase locked loops
- MMICs.

SOURCES OF THZ AND FAR-INFRARED RADIATION
- THz semiconductor laser diodes
- quantum cascade lasers
- difference frequency THz generation
- frequency comb generators
- frequency mixers
- frequency multipliers
- FET and HEMT sources
- resonant tunneling diodes
- parametric oscillators
- solid-state sources
- electron beam sources
- vacuum electronics sources
- p-germanium sources
- photoconductive sources
- single frequency and broad band sources
- tunable sources
- high power sources.

THZ DETECTORS
- THz semiconductor photodiodes
- quantum detectors
- Schottky and other mixers
- bolometers and other thermal detectors
- THz focal plane arrays
- antenna integrated detectors
- heterodyne detection techniques.

THZ COMMUNICATIONS
- THz communications
- THz for free space communication
- Semiconductor THz laser diodes and photodiodes for communication
- Interfaces and protocols for high speed wireless communications.

IMAGING
- active and passive THz imaging systems
- THz security systems
- image treatment
- substance identification.

SPECTROSCOPY
- spectral measurement techniques
- spectroscopic approaches and techniques
- identification of organic and inorganic materials using THz spectroscopy.

ULTRAFAST SPINTRONICS
- ultrafast spin dynamics
- spintronic THz emitters
- THz spectroscopy of magnetic materials and structures
- spin-based THz applications.

THZ OPTICS
- optical components and systems
- waveguides, couplers, gratings
- materials for THz optics.

THZ MICROSCOPY
- scattering near field optical microscopy
- aperture near field optical microscopy
- ultrafast THz nanoscopy
- STM microscopy.

BIOMEDICAL APPLICATIONS
- DNA identification, cell abnormalities, medical imaging
- identification of biological and chemical species
- burn and water content analysis, tissue abnormality identification, cancer identification and screening
- pharmaceutics, dentistry, other medical and clinical applications.

NEW TRENDS IN THZ DEVICES
- new concepts, experimental procedures, and implementations
- new fabrication processes
- novel applications
- integrated THz photonic devices
- tunable, compact THz gas lasers
- THz optical components manufactured with 3d printing
- chip-level THz signal generation
- THz imaging with a single pixel camera.

MATERIALS FOR THZ DEVICES
- photonic crystal structures and metamaterials
- nonlinear optical materials and devices
- THz plasmonics
- organic materials for THz components and devices
- nanostructures
- graphene
- non-conventional materials for THz QCLs and other sources.

ODS 2024: Industrial Optical Devices and Systems (OP413)

Conference Chairs: **Ryuichi Katayama,** Fukuoka Institute of Technology (Japan); **Yuzuru Takashima,** Wyant College of Optical Sciences (United States)

Program Committee: **Pierre-Alexandre J. Blanche,** Independent Contractor (United States); **Min Gu,** Univ. of Shanghai for Science and Technology (China); **Thomas D. Milster,** Wyant College of Optical Sciences (United States); **Kimihiro Saito,** Kindai Univ. Technical College (Japan); **Xiaodi Tan,** Fujian Normal Univ. (China); **Din Ping Tsai,** City Univ. of Hong Kong (Hong Kong, China); **Kazuyoshi Yamazaki,** Hitachi, Ltd. (Japan)

The ODS special conference offers an excellent forum for exchanging information on the status, advances, and future directions in the field of industrial optical devices and systems. Formerly, the main topic of this conference was optical data storage. However, competition with hard disk drives and solid state drives, as well as the growth of storage in the cloud, made it unclear what the future optical data storage system might look like. Therefore, the scope of the conference was extended to “Industrial Optical Devices and Systems” in 2018, and the new scope was brought to the forefront in 2019. To further activate the ODS conference, the new scope will be continuously highlighted in 2024.

Currently, optics research and development community in industry is seeking for new applications of the technologies developed for optical data storage in the past. The possibility of applications of optical technologies to emerging industrial domains such as automotive, IoT and AI, big data, biomedical and healthcare, security, sustainability, quantum, etc. will be the main focus at this conference. A variety of optical technologies such as intelligent lighting and display (e.g., VR/AR/MR), advanced imaging and sensing (e.g., LiDARs), etc. are involved in the above applications. Of course, new developments in technologies for future optical data storage systems such as holographic data storage, nano-photonics, etc. will also be discussed. Contributions in a variety of areas within the new scope of ODS are strongly encouraged.

Papers are solicited in the following and related areas:

- intelligent lighting and display (e.g., VR/AR/MR)
- advanced imaging and sensing (e.g., LiDARs)
- optical technologies for:
  - automotive
  - IoT and AI
  - big data
  - biomedical and healthcare
  - security
  - sustainability
  - quantum
- other industrial optical devices or systems
- holographic data storage
- nano-photonics for optical data storage
- other optical data storage technologies.

Earth Observing Systems XXIX (OP420)

Conference Chairs: **Xiaoxiong (Jack) Xiong,** NASA Goddard Space Flight Ctr. (United States); **Xingfa Gu,** Institute of Remote Sensing and Digital Earth, CAS (China); **Jeffrey S. Czapla-Myers,** Wyant College of Optical Sciences (United States)

Program Committee: **Amit Angal,** Science Systems and Applications, Inc. (United States); **Julia A. Barsi,** NASA Goddard Space Flight Ctr. (United States); **Armin Doerry,** Sandia National Labs. (United States); **Christopher N. Durell,** Labsphere, Inc. (United States); **Bertrand Fougnie,** EUMETSAT (Germany); **Joel McCorkel,** NASA Goddard Space Flight Ctr. (United States); **Vijay Murgai,** Raytheon (United States); **Thomas S. Pagano,** Jet Propulsion Lab. (United States); **Jeffery J. Puschell,** Northrop Grumman Corp. (United States)

Despite the continuing challenges of a global pandemic in recent years, the Earth Observing Systems XXVIII conference was successfully held in August 2023 in an in-person format; and the Earth observing missions continued to be launched, are awaiting launch or are in development. For example, missions recently launched include but are not limited to the NASA/NOAA Joint Polar Satellite System-2 (JPSS-2) on November 10, 2022, the ESA/EUMETSAT Meteosat Third Generation – Imager 1 (MTG-I1) on December 13, 2022, the NASA/CNES/Canadian Space Agency (CSA)/UK Space Agency Surface Water and Ocean Topography (SWOT) mission on December 16, 2022, the NASA Tropospheric Emissions: Monitoring of Pollution (TEMPO) on April 7, 2023, the China Meteorological Administration (CMA) Fengyun 3G (FY-3G) satellite on April 16, 2023 and 3F (FY-3F) satellite on August 4, 2023. Earth remote sensing missions projected for launch in late 2023-2025 timeframe include: the ESA/EUMETSAT Meteosat Third Generation Sounder (MTG-S1) satellite (2024 launch) and Sentinel-3C (2024 launch), the ESA BIOMASS satellite (2024 launch) and the FLuorescence EXplorer (FLEX) satellite (2025 launch), the CMA Fengyun 3H (FY-3H) satellite (2025 launch) and 4C (FY-4C) satellite (2025 launch), the JAXA Global Observing SATellite for Greenhouse gases and Water cycle (GOSAT-GW) (2024 launch) and Advanced Land Observing Satellite-4 (ALOS-4) (2024 launch), the ESA/JAXA Earth Cloud, Aerosol, and Radiation Explorer (EarthCARE) mission (2024 launch), the NOAA GOES-U satellite (2024 launch), the NASA Plankton, Aerosol, Cloud, Ocean Ecosystem (PACE) satellite (2024 launch), the CLARREO Pathfinder (CPF) instrument (2024 launch), the Total and Spectral Solar Irradiance Sensor-2 (TSIS-2) (2025 launch), and the NASA/Indian Space Research Organisation (ISRO) NISAR (2024 launch).

On an international scale, these missions have or will join the impressive number of Earth observing satellite systems currently operating on-orbit with active and passive instruments producing remote sensing data—from the ultraviolet through the radar/microwave wavelength region. This proliferation of satellite instruments requires calibration and validation of the quality of the data they produce through a combination of careful pre-launch testing, on-orbit monitoring, and on-orbit inter-instrument comparisons of measurements made by other on-orbit assets and by airborne, balloon-borne, and ground-based remote sensing instrumentation.

Advances in electro-optic technologies and data acquisition and analysis techniques by commercial, academic, and governmental research institutions have promoted the successful on-orbit operation of hyperspectral Earth remote sensing instruments and enabled the development of lower-cost, miniature satellite sensors with specific areas of performance equal to or better than those of traditional systems.

Lastly, space agencies continue to formulate and/or refine their long-term mission plans. For example, the 2017-2027 U.S. National Research Council's Decadal Survey on Earth Science and Applications from Space continues to serve as the guide for the science and application objectives of future US space-based observations of Earth in terms of instruments and missions. NASA continues its development of its Earth Venture missions. ESA and EUMETSAT continue instrument formulation and launch planning for their future Earth Explorers, follow-on Copernicus Sentinel Missions, Meteosat Third Generation (MTG), and Polar System-Second Generation (EPS-SG) programs.

In summary, the Earth Observing Systems XXIX conference welcomes the submission of papers over a wide range of remote sensing topics. Papers are solicited in the following general areas:

- Earth-observing mission studies including new system requirements and plans
- commercial system designs
- electro-optical sensor designs and sensitivity studies
- ultraviolet through thermal infrared, microwave, radar, and lidar remote sensing systems
- hyperspectral remote sensing instruments and methodologies
- instrument sub-system and system level pre-launch and on-orbit calibration and characterization
- vicarious calibration techniques and results
- satellite instrument airborne simulators
- techniques for enhancing data processing, reprocessing, archival, dissemination, and utilization
- conversion from research to operational systems
- on-orbit instrument inter-comparison techniques and results
- enabling technologies (optics, antennas, electronics, calibration techniques, detectors, and models)
- sensor calibration traceability, uncertainty, and pre-launch to on-orbit performance assessments
- lunar radiometry and photometry
- remote sensing data acquisition and analysis.

Infrared Remote Sensing and Instrumentation XXXII (OP421)

Conference Chairs: **Marija Strojnik,** Centro de Investigaciones en Óptica, A.C. (Mexico); **Jörn Helbert,** Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany)

Program Committee: **Gabriele E. Arnold,** Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); **Guillermo García-Torales,** Univ. de Guadalajara (Mexico); **Sarath D. Gunapala,** Jet Propulsion Lab. (United States); **Sven Höfling,** Julius-Maximilians-Univ. Würzburg (Germany)

A great deal of knowledge about the Earth's environment and about space (including outer space) has recently been acquired using infrared remote sensing and astronomical techniques. In this conference we plan to bring together scientists and engineers involved with the design, engineering, and data analysis of existing and future infrared remote sensing instruments, including scientific returns obtained from remotely collected data.

Areas of interest include:

- scientific objectives for future missions
- scientific results for those missions that have flown
- instrument design requirements to meet mission objectives and the resultant design and implementation experiences
- sensor technology challenges in meeting instrument requirements
- instrument and sensor integration challenges and experiences
- planned and required enabling technologies.

Papers are solicited on the following and related topics:

REMOTE SENSING FUNDAMENTALS

- radiometry and energy throughput
- imaging
- fundamental limits to IR imaging, including detector quantum noise and background limit
- stray light considerations, including analysis, signal-to-noise, and instrument performance limitations
- instrument calibration, comparison of predicted and measured results
- space environment and radiation effects
- calibration and testing
- data analysis
- standards and characterization of components and materials
- IR/electro-optical system modeling and simulations
- non-contact and non-invasive technique.

INSTRUMENT OBSERVATIONAL FACILITIES

- Planck Observatory
- James Webb Space Telescope.

INSTRUMENTS AND THEIR SCIENTIFIC RETURNS

- bolometers
- spectrometers
- imaging cameras
- photometers (multiband)
- radiometers
- imaging and nonimaging interferometers
- microcameras
- interferometers.

REMOTE SENSING

- Earth resource mapping
- atmosphere and weather prediction
- space exploration
- exploration of planets and comets within our solar system
- generation of light noise and ground temperature increase in urban and populated environments
- remote diagnostics and monitoring in human-unfriendly and disaster environments (nuclear power plants, earthquake, tsunami and mines)
- contamination of natural sources of sweet water and their reclamation
- monitoring of forests, their diseases, fuel accumulation and fire occurrences
- monitoring of volcanic activities
- natural and human-made fires and their propagation
- remote monitoring of humans and animals in quarantine and controlled access environment
- remote calibration
- Moon reconnaissance
- compact satellites
- satellite security and monitoring.

ENABLING TECHNOLOGIES

- sensor design
- cold read-out electronics
- data processing
- infrared materials.

INFRARED TELESCOPES FOR EARTH REMOTE SENSING, FOCAL PLANE TECHNOLOGY, AND DETECTION SCHEMES

- near-IR detectors
- IR detectors
- mid-IR detectors and sources
- far-IR detectors
- sub-mm detectors
- focal plane layout and architecture.

Infrared Sensors, Devices, and Applications XIV (OP422)

Conference Chairs: **Priyalal Wijewarnasuriya,** Teledyne Imaging Sensors (United States); **Arvind I. D'Souza,** Leonardo DRS (United States); **Ashok K. Sood,** Magnolia Optical Technologies, Inc. (United States)

Program Committee: **Sachidananda R. Babu,** NASA Earth Science Technology Office (United States); **Vincent M. Cowan,** Air Force Research Lab. (United States); **Nibir K. Dhar,** Virginia Commonwealth Univ. (United States); **Martin Gerken,** HENSOLDT Optronics GmbH (Germany); **Sarath D. Gunapala,** Jet Propulsion Lab. (United States); **Vaikunth Khalap,** Leonardo DRS (United States); **Sushant Sonde,** EPIR, Inc. (United States); **Athanasios J. Syllaios,** Univ. of North Texas (United States); **Gananath Wijeratne,** HRL Labs., LLC (United States)

The detection of infrared radiation has proven to be a viable tool in environmental studies, homeland security, astronomy, meteorological satellites and in medical, automotive, and military applications. This conference will provide a venue for papers ranging from basic device physics to novel applications. Improvements in infrared sensing & imaging relating to reduced feature size for the read-out integrated circuit (ROIC) fabrication, and compositional and doping control for the detector layer, have led to new opportunities for meeting the needs of the terrestrial, air, and space user communities. Unique IR device structures have been shown to evolve from new capabilities in the nanotechnology realm. Recent developments in novel detector materials, including those for strained superlattice and barrier architectures, promise significant technological advances. Room temperature infrared detectors for terrestrial use also benefit from these advancements. Various read-out circuit architectures allow functionality for higher-sensitivity cooled IR focal plane arrays, and also permit increased capabilities. We are also seeking papers that expand the state-of-the-art and affordability of sensors, with novel pixel readout approaches and improved signal processing, including the digital flow of data off the FPA in the form of LVDS, for example.

The conference is a high-level forum bringing together scientists and engineers involved in the research, design, and development of infrared sensors and focal plane arrays. A special session titled "Infrared Technology to address Global Climate Change" is in the planning stage for this conference.

Papers are solicited for infrared technology, including the following topics:

NOVEL DETECTOR MATERIALS AND ARCHITECTURES

- SWIR, MWIR, LWIR, and VLWIR detectors
- materials (e.g., InSb, HgCdTe, InAsSb)
- nanotechnology-based EO/IR detectors/arrays
- nano-/microbolometers
- HgCdTe (MCT) technology
- HgCdTe detector growth on alternative substrates
- III-V strained-layer superlattice detector technology
- higher-operating temperature infrared detectors
- high sensitivity at low photon flux detectors/applications
- UV, visible and IR avalanche photodiodes
- quantum dot detector technology.

MODELING OF IR OPTOELECTRONIC DEVICES AND MATERIALS

- carrier transport models for novel IR materials
- carrier transport models for super lattices and quantum devices
- transport properties in non-crystalline materials
- simulation techniques for detector arrays
- optical and electrical simulation models for crosstalk, modulation transfer functions and photon recycling
- models for point and extended defects and their impact on device performance
- novel numerical approaches for large scale IR detector and array simulation.

FOCAL PLANE ARRAYS, READ-OUT INTEGRATED CIRCUITS, AND COMPONENTS

- FPA signal and data processing, both on- and off-Chip
- digital FPAs
- electronic readout image intensifier devices
- smart focal planes
- diffractive optics on the FPA
- advanced microchannel plates
- photon-counting technology
- image intensification
- improved photocathodes
- plasmonics.

APPLICATIONS OF IR TECHNOLOGY

- terrestrial, air, and space sensors
- multispectral sensors
- imaging spectrometer applications
- imaging polarimeter applications
- infrared imaging for next generation smart phones
- space-based sensing applications
- astronomical applications
- climate monitoring and change sensing technologies
- industrial and structural applications
- automotive applications
- Bio-medical applications
- cameras for low light levels
- unmanned autonomous vehicle cameras.

ADVANCED CHARACTERIZATION TECHNIQUES

- energetic particle radiation effects
- anomalous noise sources
- responsivity and frequency response
- cryogenic and ultra-low noise.

Imaging Spectrometry XXVII: Applications, Sensors, and Processing (OP423)

Conference Chairs: **Emmett J. Ientilucci,** Rochester Institute of Technology (United States); **Christine L. Bradley,** Jet Propulsion Lab. (United States)

Program Committee: **Robert Arlen,** Spectral Solutions LLC (United States); **Robert D. Fiete,** L3Harris Technologies, Inc. (United States); **Ronald B. Lockwood,** MIT Lincoln Lab. (United States); **Torbjørn Skauli,** Univ. of Oslo (Norway); **Robert Sundberg,** Spectral Sciences, Inc. (United States); **Melina Maria Zempila,** STFC Rutherford Appleton Lab. (United Kingdom)

The newest scientific and commercial imaging spectrometers collect high signal-to-noise ratio (SNR) data with simultaneously high spectral and spatial resolution. The design of these systems and the availability of high information-rich data pose unique challenges to system designers and data analysts. These challenges include: opto-mechanical sensor designs, system trade-offs, calibration, on-board processing, compression, data exploitation, and atmospheric correction or compensation. Equally important is the understanding of hyperspectral imaging (HSI), phenomenology and its translation into useful exploitation tools for the scientific community along with the development and application of high-resolution imaging spectrometers ($\Delta\lambda$ < 1 nm) for Greenhouse gas measurements. We also understand the emergence of low-cost and easy-to-use Unmanned Aerial Systems (UAS), coupled with newly designed compact spectral sensors and near real-time processing, has led to an explosion of imaging spectrometry in multiple applications and use cases such as geospatial, industry and laboratory use cases along with application such as precision agriculture, food safety, law enforcement, search and rescue, infrastructure inspection, and many others.

For 2024 we are soliciting submissions for a **Joint Session with the "Applications of Machine Learning"** Conference

We recognize the recent developments of machine learning in the area of imaging spectrometry. To this end, we are soliciting papers that utilize machine learning or deep learning-based approaches coupled with spectral processing tasks such as:

- Classification, anomaly detection, de-noising, bad pixel interpolation, feature extraction, unmixing, dimension reduction, compression, etc.

Papers are solicited in all areas of Imaging Spectrometry, including:

PHENOMENOLOGY AND APPLICATIONS
- machine learning coupled to spectral applications
- unmanned aerial systems (UAS) and spectroscopy (hardware and applications)
- emergency response, disaster recovery, and remediation
- geology and mineralogy for earth and planetary applications
- ocean, coastal ocean, and inland waters
- vegetation monitoring and health assessment
- homeland security, defense, and cartography
- atmospheric temperature and water vapor sounding
- chemistry and air pollution
- meso- and micro-scale applications: in-situ, process control, biology, medicine, microscopy, forensics
- spectro-polarimetry.

SENSOR DESIGN AND IMPLEMENTATION
- active and passive spectrometer design and development for all spectral regions from the UV to the thermal IR, for space, airborne, UAV/UAS, and ground-based systems
- verification and calibration methods and techniques
- simulation techniques in sensor design and characterization
- sensor artifact assessment and suppression
- novel architectures and spectrometer designs
- enabling technologies
- high-resolution imaging spectrometers (i.e., greenhouse gas measurements).

DATA PROCESSING AND EXPLOITATION
- real-time and off-line data processing and exploitation methods and algorithms
- spectral signature libraries and databases
- laboratory and field measurement data-collection techniques
- physics-based spectral phenomenology understanding and modeling
- atmospheric compensation or correction techniques
- radiative transfer modeling
- advances in detection, classification, and characterization
- sensor and data fusion
- deep learning or machine learning based approaches for spectral processing task such as classification, anomaly detection, de-noising, bad pixel interpolation, etc.

Invited speakers will highlight major developments and survey the state-of-the-art in their fields.

CubeSats, SmallSats, and Hosted Payloads for Remote Sensing VIII (OP424)

Conference Chairs: **Sachidananda R. Babu,** NASA Earth Science Technology Office (United States); **Thomas S. Pagano,** Jet Propulsion Lab. (United States); **Jeffery J. Puschell,** Northrop Grumman Corp. (United States)

Program Committee: **William J. Blackwell,** MIT Lincoln Lab. (United States); **Pamela E. Clark,** Morehead State Univ. (United States); **Marco Esposito,** cosine Remote Sensing B.V. (Netherlands); **Martin Kaufmann,** Forschungszentrum Jülich GmbH (Germany); **Young H. Lee,** Jet Propulsion Lab. (United States); **Charles D. Norton,** Jet Propulsion Lab. (United States); **Steven C. Reising,** Colorado State Univ. (United States)

Advances in electro-optic remote sensing technologies now enable measurements to be made in a fraction of the size once required in earlier systems. Miniaturization of critical instrument technologies including optical systems, electronics, mechanisms, cryocoolers and sensors as well as increases in the density of semiconductor electronics and detector arrays now enable instruments to be made significantly smaller while achieving the same or better performance. Additionally, spacecraft technologies including navigation, C&DH, communications, power systems, and structures can be made in a fraction of the size enabling the entire satellite and instrument to be housed in "CubeSats" (where a single "U" is 10x10x10cm), and "SmallSats" where satellites are significantly smaller than traditional but not necessarily in the "U" form factor. Hosted payloads offer an opportunity to fly small instruments at reduced costs and schedule, leveraging off unused resources provided by the host spacecraft. These technologies lead to a significant reduction in instrument, spacecraft and launch costs, building robustness into current remote sensing programs and enabling new measurements to be made through more opportunity and through constellations of satellites to improve revisit time. Numerous challenges remain, including achieving legacy performance in a small package, power and data rate limitations, and mission reliability.

This conference is intended to explore all aspects of remote sensing with CubeSats and SmallSats including:

PAYLOAD TECHNOLOGIES

- instrument systems to support remote sensing of Earth, moon, planets, comets, asteroids
- optics: including telescopes, spectrometers, imagers, freeform optics, etc.
- sensors: UV, visible, infrared, microwave, radar, lidar, fields and particles
- calibration and validation: methods, innovative techniques and results of calibration and validation of payloads
- telecom: satellite-to-satellite, satellite-to-ground communications, high data rate solutions
- electronics: in-flight demonstrations of novel electronic designs, on-board processing, and payload electronic architectures
- mechanical systems: packaging approaches enabling smaller instruments.

SPACECRAFT TECHNOLOGIES

- power management: batteries, solar panels
- communications: transmitters, receivers
- navigation and pointing control: star trackers, GPS, propulsion
- de-orbit strategies and technologies
- flight computers and on-board signal processing
- mechanical aspects: bus structure, materials, packaging, vibration and thermal control.

Laser Communication and Propagation through the Atmosphere and Oceans XIII (OP430)

Conference Chairs: **Jaime A. Anguita,** Univ. de los Andes (Chile); **Jeremy P. Bos,** Michigan Technological Univ. (United States); **David T. Wayne,** Naval Information Warfare Ctr. Pacific (United States)

Program Committee: **Melissa Beason,** Air Force Research Lab. (United States); **Nathaniel A. Ferlic,** Naval Air Warfare Ctr. Aircraft Div. (United States); **Szymon Gladysz,** Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Stephen Hammel,** Naval Information Warfare Ctr. Pacific (United States); **Vladimir B. Markov,** Advanced Systems & Technologies, Inc. (United States); **Andreas Muschinski,** NorthWest Research Associates (United States); **Darío G. Pérez,** Pontificia Univ. Católica de Valparaíso (Chile); **Matthew B. Salfer-Hobbs,** Univ. of Central Florida (United States); **Karin Stein,** Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Alexander M. J. van Eijk,** TNO Defence, Security and Safety (Netherlands); **Miranda van Iersel,** Univ. of Dayton (United States)

The effects of the atmosphere and oceans on optical propagation can often be the limiting performance factor in many optical systems. The primary factors in beam degradation are absorption and scattering, large-scale refractive effects, and optical turbulence. For many applications, it is necessary to predict and model these effects to mitigate them. Some environments are notoriously difficult to model. These environments include long horizontal paths. These paths can have significant differences in turbulence and extinction depending on if they are over the land or the ocean. Coastal areas, mountains, and urban islands are hard to model because they are inhomogeneous. The underwater propagation environment in blue water, open ocean, is also challenging and the effects of a changing climate on temperature, salinity, and the effects on optical propagation are still unknown.

High data rate Free-Space Optical (FSO) communication remains an emerging technology with many technical challenges. Challenges involve signal detection, pointing, tracking, steering, scintillation, laser speckle, coupling with fiber, system design, and information processing. As FSO improves to 100Gbps and beyond, systems will move from intensity modulation to coherent modulation. Single-photon free-space communication systems used for secure quantum-key-distribution face the same atmospheric and system challenges as described above. Novel beams including Orbital Angular Momentum (OAM) states also have applications here. Each combination of transmitter and receiver stationed in either space, underwater, on the water or ground faces a unique set of challenges.

Imaging is equally affected by the effects of distributed random media and the interfaces between media. Over long imaging paths forward models of atmospheric and oceanic effects as linear and shift-invariant break down. While this brings up a unique set of challenges it also presents the opportunity to exploit the shift-variance to characterize the medium. Participation from those exploring imaging through and characterization of the atmosphere, ocean, and across their boundaries is highly encouraged.

We encourage submissions that address:

- novel approaches to modeling or characterizing the atmosphere over land and water, oceans, and their interfaces, especially those using state of the art Artificial Intelligence (AI) techniques
- modeling or experiments of the atmospheric interaction and propagation involving novel sources including ultra-short pulse and supercontinuum lasers
- modeling and detection of beams featuring Orbital Angular Momentum (OAM) for FSO applications in relevant propagation environments
- modeling and experiments of the atmospheric effects on coherent FSO systems, such as phase ambiguity, depolarization, channel capacity and fiber-coupling
- experimental demonstrations or system modeling of quantum FSO communications in the atmosphere or underwater
- modeling or experiments involving imaging at the air-water interface, underwater, and other highly anisoplanatic conditions
- the effect of atmospheric and oceanic degradation on the performance of AI-based object detection and classification algorithms
- Sustainability and growth in FSO—challenges and solutions around manufacturing, supply chain, stateside suppliers, demand signal of scientists, engineers and technicians.

Papers are solicited in the following and related areas:

- measurement and modeling of the effects of turbulence, aerosols, precipitation and particulates on laser beam propagation and imaging systems
- coherent modulation and mode-division multiplexing for FSO communications
- underwater FSO communications, imaging, and propagation in oceans
- single-photon FSO communication and QKD systems over atmospheric paths

- experimental results of FSO links from space-to-ground or space-to-air
- design and implementation of optical ground stations to manage turbulence effects for FSO links between ground and space
- mitigation techniques for FSO and imaging systems, particularly those addressing anisoplanatism and contrast reduction
- novel technologies and optical components for use in FSO systems
- Implementations of photonic integrated circuits (PIC) to mitigate optical turbulence effects
- use of broadband laser sources to simultaneously characterize absorption, scattering, and turbulence over a range of wavelengths
- LIDAR and application other remote sensing for characterizing atmospheric and oceanic propagation paths
- outdoor experiments with lasers longer than 2 microns.

Quantum Communications and Quantum Imaging XXII (OP431)

Conference Chairs: **Keith S. Deacon,** DEVCOM Army Research Lab. (United States); **Ronald E. Meyers,** DEVCOM Army Research Lab. (United States)

Program Committee: **Stefania A. Castelletto,** RMIT Univ. (Australia); **Milena D'Angelo,** Univ. degli Studi di Bari Aldo Moro (Italy); **Mark T. Gruneisen,** Air Force Research Lab. (United States); **Richard J. Hughes,** Los Alamos National Lab. (Retired) (United States); **Yoon-Ho Kim,** Pohang Univ. of Science and Technology (Republic of Korea); **William J. Munro,** Okinawa Institute of Science and Technology Graduate Univ. (Japan); **Kae Nemoto,** National Institute of Informatics (Japan); **Barry C. Sanders,** Univ. of Calgary (Canada); **Alexander V. Sergienko,** Boston Univ. (United States); **Oliver Slattery,** National Institute of Standards and Technology (United States); **Dmitry V. Strekalov,** Jet Propulsion Lab. (United States); **Shigeki Takeuchi,** Kyoto Univ. (Japan)

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
  - photon frequency conversion
  - loop-hole-free quantum teleportation.

QUANTUM IMAGING AND QUANTUM SENSING

- quantum ghost imaging, ghost imaging
  - quantum imaging with entangled photons
  - quantum imaging with thermal light
  - incoherent light and solar light quantum imaging
  - quantum imaging in turbulence and obscurants
  - quantum imaging and satellites
  - color and multispectral quantum imaging
  - quantum imaging at diverse wavelengths

  - quantum imaging and quantum lithography: bi-photon photo resist
  - bi-photon and n-photon quantum imaging
  - quantum holography and quantum identification
  - quantum imaging resolution and superresolution
  - quantum imaging with sparsity constraints
  - quantum imaging noise reduction
  - quantum imaging for medical applications
  - quantum imaging using fluorescence
  - temporal and spatial quantum / ghost imaging
  - plenoptic quantum imaging
- nonlocal quantum imaging physics
  - quantum versus classical imaging physics
  - quantum imaging versus speckle imaging
  - uncertainty principle in quantum imaging
  - quantum interference; multiphoton interference
  - squeezed states
- quantum remote sensing; quantum sensors; quantum sources
  - quantum two-photon sensing and detection
  - single-photon and multiphoton detectors
  - quantum measurements using cameras
  - fast, sensitive cameras for quantum technology
  - quantum lidar and quantum ladar
  - new ways to make entangled photon and pseudo thermal sources for quantum imaging
  - quantum illumination
- quantum relativity, GPS, and metrology
  - quantum clock synchronization
  - quantum clocks in quantum coincidence measurements.

Unconventional Imaging, Sensing, and Adaptive Optics 2024 (OP432)

Conference Chairs: **Jean J. Dolne,** The Boeing Co. (United States); **Santasri R. Bose-Pillai,** Air Force Institute of Technology (United States); **Matthew Kalensky,** Naval Surface Warfare Ctr. Dahlgren Div. (United States)

Program Committee: **James R. Fienup,** The Institute of Optics, Univ. of Rochester (United States); **Victor L. Gamiz,** Zimagine Innovations LLC (United States); **Stanislav V. Gordeyev,** Univ. of Notre Dame (United States); **Brett H. Hokr,** EO Solutions LLC (United States); **Kenneth J. Jerkatis,** Ball Aerospace (United States); **Matthew Kemnetz,** Air Force Research Lab. (United States); **Svetlana L. Lachinova,** Coherent Corp. (United States); **Casey J. Pellizzari,** U.S. Air Force Academy (United States); **Cameron J. Radosevich,** Sandia National Labs. (United States); **Mark F. Spencer,** Joint Directed Energy Transition Office (United States); **Jonathan Wells,** Naval Information Warfare Ctr. Atlantic (United States); **Steven M. Zuraski,** Air Force Research Lab. (United States)

The objective of this conference is to bring together researchers interested in the development of unconventional imaging, sensing, and adaptive-optics technology. Therefore, we seek papers that:

- use unconventional means of data collection, data processing, and interpretation;
- address laboratory-, space-, airborne-, sea-, and ground-based systems;
- deal with distributed-volume aberrations, high-speed aberrations, scattering media, speckle phenomena, etc.;
- seek to design effective and efficient algorithms for processing different kinds of available data; and
- obtain solutions to many kinds of imaging, sensing, and adaptive-optics applications.

Papers from industry, academia, government, and other research organizations are welcome on the following and related areas:

IMAGING
- 3D imaging
- applications in remote sensing, medicine, biology, geophysics, defense, etc.
- biological and molecular imaging
- coded-aperture imaging
- computational imaging
- computationally efficient imaging algorithms
- experimental results or hardware related to the implementation of unconventional imaging systems
- imaging approaches using artificial intelligence, such as machine learning and deep learning.
- imaging from active or passive illumination
- imaging from diversity measurements, including phase diversity, polarization diversity, aperture diversity, wavelength diversity, etc.
- imaging from image-plane measurements, pupil-plane measurements, or both
- imaging from synthetic aperture ladar and inverse synthetic aperture ladar systems
- imaging of or through turbulent, refracting, or highly scattering media
- imaging using ultrafast pulses
- imaging using unconventional optical design
- information-theoretic limits for image recovery and synthesis
- inverse problems using probabilistic and Bayesian methods
- low-light imaging
- mm wave imaging
- multispectral and hyperspectral imaging
- nanoimaging
- non line of sight imaging
- phase retrieval, super resolution, and deconvolution
- profile inversion
- radar, lidar, and sonar imaging
- synthetic aperture imaging
- system modeling and regularization
- wavefield propagation.

SENSING
- advances in autonomous vehicle sensing
- advances in coherent-detection approaches
- advances in compressive sensing
- advances in computer vision
- advances in digital holography
- advances in direct-detection approaches
- advances in event-based cameras
- advances in Geiger-mode cameras
- advances in gradient, curvature, and interferometric wavefront sensors
- advances in plenoptic cameras
- advances in ptychography
- advances in tomography
- applications in remote sensing, medicine, biology, geophysics, defense, etc.
- characterization of aero effects
- characterization of compressible and chemically reacting flows
- characterization of extinction
- characterization of jitter
- characterization of turbulence
- characterization of wind
- chemical and biological sensing
- coded-aperture sensing
- computational sensing
- computationally efficient sensing algorithms
- experimental results or hardware related to the implementation of unconventional sensing systems

- information-theoretic limits for sensing recovery and synthesis
- low-light sensing
- sensing approaches using artificial intelligence, such as machine learning and deep learning.
- sensing from active and passive approaches
- sensing using ultrashort pulses
- wavefront sensing.

ADAPTIVE OPTICS

- active and passive tracking
- adaptive-optics approaches using artificial intelligence, such as machine learning and deep learning.
- advances in active and passive flow control
- advances in deformable mirrors, fast-steering mirrors, phase modulators, spatial-light modulators, etc.
- advances in non-mechanical beam steering
- advances in phased arrays and tiled arrays
- applications such as long-range imaging, retinal imaging, confocal microscopy, ultrashort pulse shaping, fiber coupling, laser communications, laser designation, astronomy, power beaming, beam cleanup, laser cavities, etc.
- compensation of aero effects
- compensation of deep turbulence
- compensation of jitter
- computational adaptive optics
- developments in adaptive-predictive control theory and simulations
- developments in scaling-law and wave-optics theory and simulations
- extended-beacon approaches
- multi-conjugate approaches
- ophthalmological approaches
- reconfigurable diffractive optical systems
- wavefront reconstruction
- woofer-tweeter approaches.

Advances in X-Ray/EUV Optics and Components XIX (OP500)

Conference Chairs: **Christian Morawe,** ESRF - The European Synchrotron (France); **Hidekazu Mimura,** The Univ. of Tokyo (Japan);
Ali M. Khounsary, Illinois Institute of Technology (United States)

Program Committee: **Bernhard W. Adams,** Research Instruments Corp. (United States); **Lahsen Assoufid,** Argonne National Lab. (United States); **Roman Chernikov,** Canadian Light Source Inc. (Canada); **Fredrik Eriksson,** Linköping Univ. (Sweden); **Yoshio Ichii,** SLAC National Accelerator Lab. (United States); **Jangwoo Kim,** Pohang Accelerator Lab. (Republic of Korea); **Satoshi Matsuyama,** Nagoya Univ. (Japan); **Bernd C. Meyer,** Ctr. Nacional de Pesquisa em Energia e Materiais (Brazil); **Haruhiko Ohashi,** RIKEN SPring-8 Ctr. (Japan); **Markus Osterhoff,** Georg-August-Univ. Göttingen (Germany); **Phakkhananan Pakawanit,** Synchrotron Light Research Institute (Thailand); **Ladislav Pína,** Czech Technical Univ. in Prague (Czech Republic); **Yuriy Y. Platonov,** Rigaku Innovative Technologies, Inc. (United States); **Kazuto Yamauchi,** Osaka Univ. (Japan); **Lin Zhang,** SLAC National Accelerator Lab. (United States)

This conference focuses on the advances, challenges, emerging needs, and applications of x-ray and EUV sources, and related optics and instrumentation.

The aim is to provide an opportunity for the developers and users of the systems to share the progress and challenges in each of these and related areas.

Presentations on emerging needs, progress reports, and topical reviews covering the following and related topics are solicited:

- synchrotron X-ray / EUV and XFEL sources and facilities
- laboratory-based X-ray / EUV sources and applications
- diffractive, reflective, and refractive optics design, analysis, fabrication, and applications
- focusing optics developments and applications
- component implementation and integration into optical systems
- calibration, alignment, stability, and damage of optical elements
- adaptive optics and applications
- at wavelength and optical metrology techniques
- applications of machine learning and artificial intelligence in data analysis
- computational methods for X-ray optics.

Advances in Metrology for X-Ray and EUV Optics XI (OP501)

Conference Chairs: **Lahsen Assoufid,** Argonne National Lab. (United States); **Haruhiko Ohashi,** Japan Synchrotron Radiation Research Institute (Japan); **Frank Siewert,** Helmholtz-Zentrum Berlin für Materialien und Energie GmbH (Germany)

Program Committee: **Simon G. Alcock,** Diamond Light Source Ltd. (United Kingdom); **Raymond Barrett,** ESRF - The European Synchrotron (France); **Roman Chernikov,** Canadian Light Source Inc. (Canada); **Uwe Flechsig,** Paul Scherrer Institut (Switzerland); **Ralf D. Geckeler,** Physikalisch-Technische Bundesanstalt (Germany); **Lei Huang,** Brookhaven National Lab. (United States); **Mourad Idir,** Brookhaven National Lab. (United States); **Jangwoo Kim,** Pohang Accelerator Lab. (Republic of Korea); **Bernard Kozioziemski,** Lawrence Livermore National Lab. (United States); **Bernd C. Meyer,** Ctr. Nacional de Pesquisa em Energia e Materiais (Brazil); **Hidekazu Mimura,** The Univ. of Tokyo (Japan); **May Ling Ng,** SLAC National Accelerator Lab. (United States); **Josep Nicolas,** ALBA Synchrotron (Spain); **Kawal Sawhney,** Diamond Light Source Ltd. (United Kingdom); **Frank Scholze,** Physikalisch-Technische Bundesanstalt (Germany); **Peter Z. Takacs,** Brookhaven National Lab. (United States); **Kazuto Yamauchi,** Osaka Univ. (Japan); **Valeriy V. Yashchuk,** Lawrence Berkeley National Lab. (United States)

This conference will address the broad issues in the growing and very demanding field of surface metrology and characterization of optics for X-ray and EUV sources, including diffraction-limited synchrotron and free-electron laser sources that promise to provide photon beams with increasingly lower emittance and higher spatial coherence. For demanding experimental techniques, preserving the pristine quality of these beams during transport from source to sample requires mirrors with surface shape and slope errors in the nanoscale regime. Continuous efforts to develop adequate metrology tools and calibration methods are critical for accurately fabricating and characterizing the required extreme-quality mirrors. This conference provides a unique platform for presenting the latest developments in the field and for relevant discussions and information exchange on future needs.

Presentation abstracts are solicited on the following and related topics:

- Sub-nanometer and nanoradian surface metrology instruments, including 1-D and 2-D profilometry and interferometry methods
- Wavefront sensing and characterization
- At-wavelength metrology
- Metrology data analysis software and automation
- Bendable deformable mirrors and adaptive optics: automation of metrology, alignment, and control
- X-ray optical elements performance simulation, tolerancing, and specification using metrology data
- Instrument calibration tools, methods, and procedures
- Surface figure and finish measurement and data analysis procedures, including measurement error analysis and compensation.

Hard X-Ray, Gamma-Ray, and Neutron Detector Physics XXVI (OP503)

Conference Chairs: **Nerine J. Cherepy,** Lawrence Livermore National Lab. (United States); **Michael Fiederle,** FMF - Freiburger Materialforschungszentrum (Germany); **Ralph B. James,** Savannah River National Lab. (United States)

Program Committee: **Toru Aoki,** Shizuoka Univ. (Japan); **Gerard Ariño-Estrada,** Univ. of California, Davis (United States); **Jim E. Baciak Jr.,** Univ. of Florida (United States); **Aleksey E. Bolotnikov,** Brookhaven National Lab. (United States); **Arnold Burger,** Fisk Univ. (United States); **Lei Raymond Cao,** The Ohio State Univ. (United States); **Henry Chen,** Consulting LLC (United States); **Petro Fochuk,** Chernivtsi National Univ. Y. Fedkovich (Ukraine); **Larry Franks,** Consultant (United States); **Volodymyr A. Gnatyuk,** V. E. Lashkaryov Institute of Semiconductor Physics NASU (Ukraine); **Amber L. Guckes,** Nevada National Security Site (United States); **Zhong He,** Univ. of Michigan (United States); **Keitaro Hitomi,** Tohoku Univ. (Japan); **Mercouri Kanatzidis,** Northwestern Univ. (United States); **Alireza Kargar,** Radiation Monitoring Devices, Inc. (United States); **KiHyun Kim,** Korea Univ. (Republic of Korea); **Krishna C. Mandal,** Univ. of South Carolina (United States); **Sanjoy Mukhopadhyay,** Nevada National Security Site (United States); **Madan Niraula,** Nagoya Institute of Technology (Japan); **Stephen A. Payne,** Lawrence Livermore National Lab. (United States); **Utpal N. Roy,** Savannah River National Lab. (United States); **Arie Ruzin,** Tel Aviv Univ. (Israel); **Sergey E. Ulin,** National Research Nuclear Univ. MEPhI (Russian Federation); **Richard S. Woolf,** U.S. Naval Research Lab. (United States); **Ge Yang,** North Carolina State Univ. (United States); **Ren-Yuan Zhu,** Caltech (United States); **Mariya Zhuravleva,** The Univ. of Tennessee Knoxville (United States)

Advances continue to be made in hard x-ray, gamma-ray, and neutron detectors and associated technologies for spectroscopy and imaging of these energetic photons and particles. Many types of position and energy sensitive detectors are actively being developed, including semiconductor detectors and arrays, high-density noble gas detectors, scintillators, thin film transistor arrays, charge-coupled devices, microchannel plates, and calorimetric detectors. These detectors are being employed singly, or in conjunction with optical components and x-ray/gamma-ray sources to produce systems having important applications ranging from medical diagnostics and treatment to astronomical research. Important examples include nuclear medicine, astrophysics, dental imaging, dosimetry, industrial radiography, nondestructive testing, heavy metals analysis, cargo inspection, nuclear safeguards and surveillance, treaty verification, explosives detection, and environmental monitoring. This conference will provide rapid dissemination of the latest results from the forefront of research on hard x-ray, gamma-ray and neutron detector physics through seminal invited papers and qualified contributed papers from academic, government, and industry researchers.

Important new results are solicited concerning, but not limited to, the following general areas:

- theory of hard x-ray and gamma-ray detector operation
- design, fabrication, and testing of detectors for spectroscopy and/or imaging
- advanced room-temperature semiconductor and scintillator materials and characterization
- scintillator physics, scintillator/PM tube devices, scintillating fiber optics, phosphors
- microchannel plate detectors and calorimeters
- gaseous and liquid medium detectors
- advanced readout electronics
- radiation damage, aging, and environmental effects
- spatial, energy, and timing sensitivity and resolution
- strip and pixel arrays and discrete detectors
- machine learning and artificial intelligence tools
- detector applications.

Developments in X-Ray Tomography XV (OP504)

Conference Chairs: **Bert Müller,** Univ. Basel (Switzerland); **Ge Wang,** Rensselaer Polytechnic Institute (United States)

Program Committee: **Felix Beckmann,** Helmholtz-Zentrum Hereon GmbH (Germany); **Graham R. Davis,** Queen Mary, Univ. of London (United Kingdom); **Francesco De Carlo,** Argonne National Lab. (United States); **Julia Herzen,** Technische Univ. München (Germany); **Atsushi Momose,** Tohoku Univ. (Japan); **Stuart R. Stock,** Northwestern Univ. (United States); **Marie-Christine A. Zdora,** Monash Univ. (Australia)

This conference is a platform for researchers active in the field of X-ray-based three-dimensional imaging to exchange on the latest progresses in instrumentation, algorithms, and applications. Thousands of X-ray computed tomography systems are currently operated in clinics, industry, and academia. While conventional attenuation-based imaging is still dominant, alternative and complementary contrast mechanisms are being actively developed and applied. The generated big datasets require state-of-the-art methods for image reconstruction and analysis. Several technical advancements are enabling or pushing applications of tomography in pathology, tissue engineering, anthropology, etc. It is increasingly common to produce impressive imagery of unique objects and derive relevant features of the underlying structures and dynamics. Multi-modal imaging, which includes synergistic and reciprocal information, has started playing an important role. The conference encourages interdisciplinary discussions and collaborations. Researchers and users are openly invited from medicine/dentistry, biology, earth and materials science, crystallography, solid-state and soft-matter physics, chemistry, computer science, engineering, and applied mathematics to present results on system and component developments, algorithmic design and optimization, performance evaluation and validation, as well as tomographic experiments and workflows. Papers are solicited on the following and related topics:

DEVELOPMENT OF X-RAY SOURCE TECHNOLOGY

- Structured emission sources
- Multi-component anodes
- Liquid metal and compact light sources
- Next-generation synchrotron radiation facilities

X-RAY OPTICS FOR NANO-TOMOGRAPHY

- X-ray optics for magnification
- Combination of refractive and diffractive lenses with reduced chromatic aberration

RECENT ADVANCES IN X-RAY DETECTOR TECHNOLOGY

- Photon-counting spectral detectors
- Virtual mono-energy imaging
- Radiation dose reduction

ALGORITHMS FOR RECONSTRUCTION, ARTEFACT CORRECTION, AND IMAGE ANALYSIS

- Image reconstruction; artifact correction
- Automatic segmentation
- Dual-energy and spectral CT
- Phase retrieval
- Density measurements including biominerals

DEEP LEARNING FOR RECONSTRUCTION AND IMAGE ANALYSIS

- Image reconstruction from noisy, incomplete and inconsistent data
- Three-dimensional image analysis
- Detection, classification, and quantification of porous media
- Management and mining of big data

MODELING AND SIMULATION FOR X-RAY-BASED TOMOGRAPHY

- Optimization of imaging protocols
- Predictions on contrast and spatial resolution
- Modeling of photon energy and photon statistics

NON-DESTRUCTIVE CHARACTERIZATION OF UNIQUE OBJECTS

- Paleontology
- Museum science
- Anthropology
- Insects and plants, and niche applications
- Implementation of temperature control and mechanical loading to samples

MICRO- AND NANO-TOMOGRAPHY IN BIOMEDICINE

- Brain imaging
- Imaging in regenerative medicine
- Characterization of soft and hard tissues in health and disease

ADDED VALUE OF COMBINING X-RAY TOMOGRAPHY WITH OTHER METHODS

- Multi-modal imaging
- Registration-based segmentation of dynamic processes
- Hierarchical imaging and interior tomography

OPEN SCIENCE AND SUSTAINABILITY

- Meta-data
- Data repositories
- Standards
- Energy-efficient strategies for big data management and large model implementation

The Developments in X-ray Tomography conference series warmly welcomes doctoral students and postdoctoral fellows in the field. To support their career advancement, the Program Committee members will again recognize and award the best poster presented by a PhD student as the first author, the best oral presentation, and the best proceedings paper using cash prizes sponsored by industry.

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Abstracts due	7 February 2024
Registration opens	April 2024
Authors notified and program posts online	29 April 2024
Submission system opens for manuscripts and poster PDFs*	17 June 2024
Poster PDFs due for spie.org preview and publication	24 July 2024
Manuscripts due	31 July 2024
Advance upload deadline for oral presentation slides**	16 August 2024

**Contact author or speaker must register prior to uploading*

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What you will need to submit

- Title
- Author(s) information
- Speaker biography (1000-character max including spaces)
- Abstract for technical review (200-300 words; text only)
- Summary of abstract for display in the program (50-150 words; text only)
- Keywords used in search for your paper (optional)
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- Obtain funding for registration fees, travel, and accommodations
- Attend the meeting
- Present at the scheduled time

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