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EOSAM 2023

Guest editors: Patricia Segonds, Guy Millot and Bertrand Kibler

EDITORIAL

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## Editorial: European Optical Society Annual Meeting (EOSAM) 2023

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The European Optical Society Annual Meeting, EOSAM, covers all aspects of optics and photonics within several topical meetings and sessions. The 11th EOSAM was organized by EOS and SFO onsite in Dijon, France, at the Dijon Exhibition and Convention Center, 11–15 September 2023. It was attended by over 500 researchers, key leaders, students, and industry experts from over 34 different countries all over the world. The event provided a comprehensive overview of cutting-edge research in optics and photonics, from fundamental to applied, and of industrial developments through more than 420 presentations in 10 thematic sessions highlighting the most innovative and emerging research, including: silicon photonics and integrated optics, adaptive and freeform optics, biophotonics, nanophotonics, optical materials, nonlinear and quantum optics, optical frequency combs, ultrafast optics, optoelectronic nanotechnologies and microsystems, and optics applications. Four focused sessions completed the panorama: specialty optical fibers, structured light, chiroptical phenomena, machine-learning for optics and photonic computing for Artificial Intelligence (AI). This annual international congress highlighted the richness and vigor of all the optics sectors in France, Europe and the rest of the world. An industrial session dedicated to technological innovations was complemented by an exhibition area for the photonics industry at the heart of the conference. A round table discussion was organized with the European Photonics Industry Consortium (EPIC), the world's leading industry association promoting the sustainable development of photonics organizations in Europe. The symposium demonstrated that research and technological advances in optics and photonics are formidable drivers of economic growth and cultural vitality, while respecting the environment.

Following the 11th EOSAM, the current special issue of *Journal of the European Optical Society – Rapid Publications* (JEOS-RP) gathers thirteen papers devoted to distinct topics of the conference, such as optical materials, nanophotonics, nonlinear optics, optical frequency combs, structured light, machine learning for optics, and various optical applications. This collection of eleven original research papers, one short communication and one review article is presented below, highlighting some of the latest advances in the studies presented at the conference.

Optical materials are essential for a wide range of current and future industrial applications, and generate important research with major scientific and technological challenges. The correlation between the optical characteristics of the material and its structure and composition is of great importance. With regard to this topic, Bravo et al. present a 3D diffusion modeling of photopolymers as a recording media for complex diffractive optical elements [1]. In another paper, Mohand Ousaid et al. report a more accurate Sellmeier equation derived from quasi-phase matching curves obtained from the investigation of optical parametric generation in 1-D periodically poled LiTaO<sub>3</sub> crystals with varying periods [2]. The design of nanostructures is of crucial importance to enhance light-matter interactions and to control field distributions at subwavelength scales. In this topic, Shelling Neto et al. introduce a new bispectral optical cavity concept for which they design twin pairs of highly reflective, ultra-low noise metamirrors [3].

Light structuring has emerged as a powerful tool for controlling the propagation dynamics of pulsed beams. The ability to manipulate and generate spatiotemporal light distributions has been enhanced in recent years, enabling us to envisage applications across the entire spectrum of optics. Nabadda et al. present a complete Mueller matrix imaging polarimeter that uses three liquid-crystal retarders and a pixelated polarization camera. This device is then tested experimentally by analyzing well-known samples for structured light applications [4]. In another paper, Klingmann et al. demonstrate the parallel generation of arbitrary arrays of Gaussian and Laguerre-Gaussian laser foci suitable for super-resolution microscopy by means of acousto-optic spatial light modulation [5]. As in most of scientific areas, AI techniques have opened up new horizons for photonics research in recent years. Numerical modeling using AI can achieve high efficiency and accuracy for photonics systems. In this topical issue, by using deep neural networks into digital holographic microscopy, Cuenat et al. propose a hybrid approach utilizing an adapted version of the GedankenNet model, coupled with a UNet-like model, for the purpose of accessing micro-objects 3D pose measurements [6]. Nonlinear effects in optical systems are playing a promi-

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ment role in many fundamental physics discoveries as well as emerging technologies. Here, Guezennec et al. demonstrate the generation of broadband tunable and synchronized pulses exceeding the micro-joule level using the new concept of fiber optical parametric chirped-pulse oscillation [7]. In another paper, Deroh et al. report the generation of multi-wavelength light sources in the 1.55  $\mu\text{m}$  telecommunication C band and then in the 2- $\mu\text{m}$  waveband, through enhanced four wave-mixing processes, by using a straightforward and adaptable dual-frequency Brillouin fiber laser [8].

The fields of optics and photonics are now considered as key enabling technologies across many different industries. Applications-centered research in optics/photonics encompass any demonstration and application of optical technologies and instrumentation to address problems in various fields. To this regard, López-Bautista et al. build an optical setup with a hexagonal design that allowed a large number of *Drosophila melanogaster* cultures to be irradiated homogeneously with blue light simultaneously, thus opening potentially their investigation at genetic, behavioral and neuronal levels [9]. Bouquet et al. develop a real-time optical measurement system based on a customized microscope and an automatic system for non-contact measurement of airborne fungal spores in protected crops such as strawberries, tomatoes, and cucumbers [10]. In another paper, Bernabeu et al. investigate the role of absorption mechanism on the optimization of processing commercial polymers under high repetition rate femtosecond laser irradiation [11]. Next, Sirvent-Verdù et al. analyze the viability of a novel recording geometry to produce reflection holographic couplers in photopolymers without prisms [12]. Finally, Fritzsche et al. propose a design approach for an advanced multi-channel pyrometer for bulk oven processes [13].

In conclusion, this topical issue on EOSAM 2023 contains thirteen articles devoted to the multifaceted development of ongoing studies in the broad areas of optics and photonics. We strongly hope that this issue will lead to research inspiration and significant advances, which will be benefiting a wide range of theoretical and applied scientists.

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