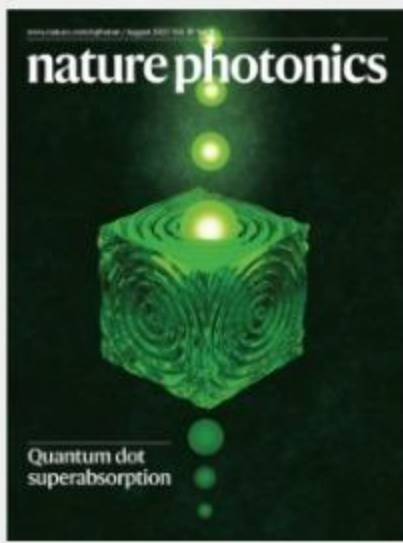


Volume 19 Issue 8, August 2025

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Quantum dot superabsorption

Enhanced 'superabsorption' of single photons by large CsPbBr₃ perovskite quantum dots is observed at cryogenic temperatures. The effect, attributed to a giant oscillator strength through spatially extended coherent oscillations of the electron polarization, opens the way to more efficient light-matter interactions.

See [Boehme et al.](#)

Image: Viktoriia Morad, ETH Zürich and Empa. Cover design: Bethany Vukomanovic

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News & Views
01 Aug 2025

Imaging single ion channels via their Rayleigh scattering

The fast and convenient study of ion channels in cells continues to pose challenges. Interferometric scattering microscopy delivers robust signals from single channels, paving the way for label-free investigation of their function in live cells.

Vahid Sandoghdar

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News & Views
01 Aug 2025

Synthetic aperture enhances virtual reality displays

The clever combination of waveguide optics and AI-driven algorithms delivers a much greater eyebox volume and vivid holographic 3D scenes.

Hyeonseung Yu, Minwook Kim & YongKeun Park

News & Views
01 Aug 2025

van der Waals materials for waveguide OED

Guiding light is an essential task in optics, from optical fibres to compact nanoscale systems. Here, a few-atoms-thin MoTe₂ layer embedded into a planar waveguide emits photons into waveguide modes that propagate coherently, paving the way for waveguide quantum electrodynamics with van der Waals materials.

Alexander Poddubny

News & Views
01 Aug 2025

Single-shot spatio-temporal characterization of petawatt laser pulses

A spectrally and polarization-resolved wavefront detector can measure the spatio-temporal vector electric field of ultrashort laser pulses in a single shot.

Cord L. Arnold, Chen Guo & Miguel Miranda

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Mapping earthquakes with light

David Pile

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Review Articles

Review Article
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Nanophotonics with multilayer van der Waals materials

This Review reports the recent progress in utilizing van der Waals layered materials in various nanophotonics applications and provides an overview of their future developments in hybrid and tunable nanophotonics, 3D photonic structures, optical trapping, polariton devices and van der Waals integrated nanophotonic circuits.

Panaiot G. Zotev, Paul Bouteyre ... Alexander I. Tartakovskii

Review Article
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Theory, innovations and applications of stimulated Raman scattering microscopy

This Review provides an overview of the theoretical foundations, recent advances and promising applications of Raman scattering microscopy.

Wei Min, Ji-Xin Cheng & Yasuyuki Ozeki

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11 Jun 2025

Extreme-ultraviolet spatiotemporal vortices via high harmonic generation

The generation of spatiotemporal optical vortices in the extreme-ultraviolet regime is demonstrated via high harmonic generation. Topologically coupled at the nanometre and attosecond domains, these light beams are attractive for exploring electronic dynamics in magnetic materials, chiral media and nanostructures.

Rodrigo Martín-Hernández, Guan Gui ... Carlos Hernández-García

Article
Open Access
26 May 2025

Atomic-layer assembly of ultrathin optical cavities in van der Waals heterostructure metasurfaces

Ultrathin multilayer van der Waals material stacks are shaped into precisely engineered resonant nanostructures, giving strong nonlinearities at ultralow fluences of <1 nJ cm⁻², more than three orders of magnitude smaller than in previous two-dimensional-material-based cavity systems.

Luca Sortino, Jonas Biechteler ... Andreas Tittl

Article
03 Jun 2025

Van der Waals waveguide quantum electrodynamics probed by infrared nano-photoluminescence

A nano-optical probe of the Purcell effect in a van der Waals waveguide is demonstrated, exploiting its highly confined infrared waveguide modes and the capacity for infrared emission in the monolayer limit of atomically layered van der Waals materials.

S. L. Moore, H. Y. Lee ... D. N. Basov

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Chirality-induced quantum non-reciprocity

Chirality-induced quantum non-reciprocity of cross-channel correlations is demonstrated in a rubidium vapour system by flipping the flow direction of one of the circularly polarized laser beams. It can be extended to multicolour sidebands with Floquet engineering.

Zimo Zhang, Zhongxiao Xu ... Heng Shen

Article
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01 Jul 2025

Resolving the phase of Fano resonance wave packets with photoelectron frequency-resolved optical gating

The researchers demonstrate direct measurement and complete characterization of structured electronic wave packets created within a prototypical Fano resonance. The method may be broadly applicable to the study of ultrafast processes, especially electronic ones, in complex systems, as well as coherent control of such systems on their fundamental timescales.

Pengju Zhang, Hao Liang ... Hans Jakob Wörner

Article
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28 Jul 2025

Synthetic aperture waveguide holography for compact mixed-reality displays with large étendue

An ultra-thin mixed-reality (MR) display design that is based on a unique combination of waveguide holography and artificial intelligence-driven holography algorithms is demonstrated, creating visually comfortable and perceptually realistic 3D VR experiences in a compact wearable device.

Suyeon Choi, Changwon Jang ... Gordon Wetzstein

Article
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21 May 2025

Single-photon superabsorption in CsPbBr₃ perovskite quantum dots

Greatly enhanced light absorption is reported in large perovskite quantum dots by realizing a transition with a giant oscillator strength at the optical bandgap.

Simon C. Boehme, Tan P. T. Nguyen ... Gabriele Rainò

Article
05 Jun 2025

Electrochemically modulated interferometric scattering microscopy for imaging ion channel activity in live cells

Electrochemical modulation enables iSCAT microscopy to detect the electrical activity of live cells by localizing and identifying different types of ion channels down to the single-channel level and imaging frame rates up to 1.5 kHz.

Qing-Yue Li, Pin-Tian Lyu ... Jing-Juan Xu

Article
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Stimulated Brillouin scattering microscopy with a high-peak-power 780-nm pulsed laser system

A high-peak-power low-duty-cycle pulsed fibre laser enables stimulated Brillouin scattering microscopy with pixel dwell times as low as 0.2 ms and spatial resolution as low as 500 nm and 2 µm in the lateral and axial directions, respectively.

Yun Qi, Shuai Yao ... Fan Yang

Article
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05 Jun 2025

Structured detection for simultaneous super-resolution and optical sectioning in laser scanning microscopy

A reconstruction method for image scanning microscopy exploits all the information encoded in the four-dimensional image scanning microscopy dataset to achieve optical sectioning and maintain super-resolution and high-signal-to-noise-ratio imaging.

Alessandro Zunino, Giacomo Garrè ... Giuseppe Vicidomini

Article
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26 Jun 2025

Single-shot spatiotemporal vector field measurements of petawatt laser pulses

A single-shot full-vector-field measurement technique for intense, ultrashort laser pulses is studied, demonstrating the approach on systems ranging from high-repetition-rate oscillators to petawatt-class lasers.

Sunny Howard, Jannik Esslinger ... Andreas Döpp

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