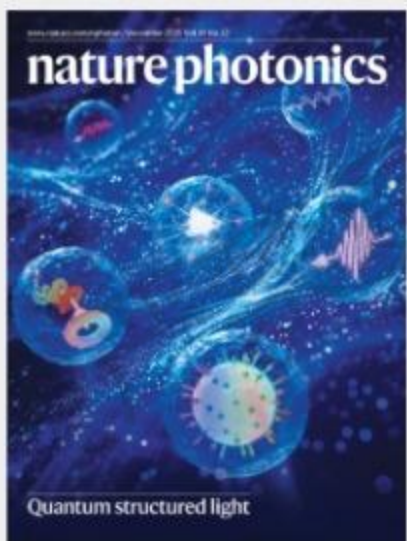


Volume 19 Issue 12, December 2025

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Quantum structured light

Quantum light can be tailored in many degrees of freedom, giving access to richly textured Hilbert spaces in high dimensions. Such quantum structured light harnesses entanglement in space and time, pushing the frontiers of quantum science.

See [Forbes et al](#)

Image: University of the Witwatersrand. Cover design: Bethany Vukomanovic

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News & Views

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02 Dec 2025

Improving electron microscopy with light

Shining intense laser pulses on an electron beam in an electron microscope corrects electron-optical spherical aberration, paving the way to using light to improve electron microscopy imaging.

Peter Hommelhoff
- 

Advertisement
- News & Views

02 Dec 2025

New photodiodes ready to bridge optical and sub-THz communications

Simultaneous high-bandwidth and high-optoelectronic conversion efficiency in photodiodes is difficult to achieve. Now, researchers have demonstrated waveguide-integrated photodiodes with over 200 GHz bandwidth, 0.81 A/W responsivity and a bandwidth–efficiency product of 133.5 GHz, thus enabling amplifier-free 120 Gbps wireless transmission over 54 m.

Emilien Peytavit
- News & Views

02 Dec 2025

A light-actuated microfluidic playground

Structured light and photothermal conversion are used to create reconfigurable thermal barriers in a microfluidic device. These virtual barriers can be used to dynamically control fluid flow and microparticle trajectories.

Jonathan Ericson & Moran Bercovici
- News & Views

02 Dec 2025

Polymer dots for nanoscale live-cell imaging

Vitrification of polymer solutions yields ultrasmall fluorescent polymer dots that combine dye-like size with nanoparticle brightness, enabling nanometre-precision live-cell tracking on standard microscopes.

Philip Tinnefeld & Samrat Basak
- News & Views

02 Dec 2025

Entering the vacuum ultraviolet

Oliver Graydon
- News & Views

02 Dec 2025

An optical conveyor belt for 3,000 qubits

Giampaolo Pitruzzello

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Meeting Reports

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02 Dec 2025

Photonics based cooling outpaces policy

500,000 heat-related deaths occur each year, according to the World Health Organization. Passive and active photonic-based cooling strategies were discussed at a recent Sydney Radiative Cooling Workshop.

David Pile

Advertisement Feature

Entangled photons travel from chip to satellite in quantum tests

From silicon defects to satellite beams, Canada’s researchers are shaping quantum computing with networks of light.

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Review Articles

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21 Nov 2025

Progress in quantum structured light

This Review provides an overview of the progress in quantum structured light, both as single and entangled photon states, with an emphasis on prospective applications in quantum information science such as quantum communication and quantum imaging.

Andrew Forbes, Fazilah Nothlawala & Adam Vallés

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Articles

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10 Nov 2025

Modified uni-travelling-carrier photodiodes with 206 GHz bandwidth and 0.81 A W^{−1} external responsivity

A uni-travelling-carrier photodiode with 206-GHz bandwidth, bandwidth–efficiency product surpassing 130 GHz and external responsivity of 0.81 A W^{−1} is demonstrated. Radio-frequency power exceeding −5 dBm and single-line 120-Gbps wireless transmission across 54 m were achieved, without low-noise amplifiers.

Linze Li, Tianyu Long ... Baile Chen
- Article

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23 Sept 2025

Light-based electron aberration corrector

Irradiation with a pulsed Laguerre–Gaussian laser beam of charge one enables correcting the third-order spherical aberration of an electron beam.

Marius Constantin Chirita Mihaila, Petr Koutenský ... Martin Kozák
- Article

17 Oct 2025

Single-shot phase diversity wavefront sensing in deep turbulence via metasurface optics

With free-space optical communications in mind, researchers used a nanostructured birefringent metasurface to achieve a 16-fold increase in the corrected beam signal in mid-to-high-turbulence conditions. Benefits of the noise-tolerant approach to wavefront reconstruction with high resolution are demonstrated.

Arturo Martin Jimenez, Marc Baltés ... Zachary J. Coppens
- Article

26 Sept 2025

A miniaturized cascaded-diode-array spectral imager

A miniaturized ultraviolet spectral imager based on a cascaded AlGaIn/GaN photodiode with a compositionally graded active region enables spectral imaging in the 250–365 nm range. The device allows the classification of different types of organics, such as oils and milk, in a single-shot imaging modality.

Huabin Yu, Muhammad Hunain Memon ... Haiding Sun
- Article

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14 Oct 2025

Frequency-modulated high-power photonic-crystal surface-emitting lasers for long-distance coherent free-space optical communications

Researchers realize watt-class frequency modulation using compact coherent optical transmitters based on frequency-modulated photonic-crystal surface-emitting lasers. The system has implications for long-distance free-space optical communications.

Takuya Inoue, Ryohei Morita ... Susumu Noda
- Article

03 Oct 2025

Single-chain ultrasmall fluorescent polymer dots enable nanometre-resolution cellular imaging and single protein tracking

Single-chain polymer dots used as ultrasmall fluorescent probes enable nanometre-resolution imaging and are capable of tracking kinesin-1 stepwise motion in living cells using a standard spinning-disk confocal microscope.

Hongwei Yang, Zequan Yan ... Xiaohong Fang
- Article

21 Oct 2025

Fully thermally evaporated perovskite solar cells based on reverse layer-by-layer deposition

A layer-by-layer thermal evaporation strategy enables thermally evaporated inverted perovskite solar cells with a power conversion efficiency of 25.19%, maintaining about 95% of their initial efficiency after 1,000 h of operation.

Yutian Xu, Kui Xu ... Wei Huang
- Article

07 Nov 2025

Room-temperature spin-layer locking of exciton–polariton nonlinearities in a WS₂ microcavity

A room-temperature double-layer WS₂ microcavity is used to explore spin anisotropy and tune it with interlayer spacing.

Jiaxin Zhao, Antonio Fieramosca ... Timothy C. H. Liew
- Article

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26 Nov 2025

Electrical control of photon spin angular momentum in organic electroluminescent materials

Electrical tuning of the recombination zone in circularly polarized (CP) OLEDs enables switching the CP generation mechanism between normal and anomalous CP electroluminescence. This is exploited to electrically control the handedness of emitted CP light from the same device with the same enantiomer material.

Francesco Furlan, Michal Šámal ... Matthew J. Fuchter
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27 Oct 2025

Perturbation-resilient integer arithmetic using optical skyrmions

Optical skyrmions offer new opportunities for noise-resistant mathematical operations using light.

An Aloysius Wang, Yifei Ma ... Chao He
- Article

27 Oct 2025

3R-stacked transition metal dichalcogenide non-local metasurface for efficient second-harmonic generation

Exploiting non-local optical resonances on 3R-MoS₂ flakes, researchers demonstrate single-pass second-harmonic conversion efficiencies of ~10^{−4} over only 160-nm-thick van der Waals nonlinear metastructures at telecom wavelengths.

Zhi Hao Peng, Michele Cotrufo ... Chiara Trovattello
- Article

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08 Aug 2025

Three-dimensional optofluidic control using reconfigurable thermal barriers

A fluidic system with spatially reconfigurable hot spots generated by optical pumping of plasmonic nanorods is demonstrated, creating virtual barriers by generating local heating via photothermal conversion, for potential applications in chemical synthesis, lab-on-chip devices and microbiology.

Falko Schmidt, Carlos David González-Gómez ... Romain Quidant

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24 Nov 2025

Author Correction: Light-based electron aberration corrector

Marius Constantin Chirita Mihaila, Petr Koutenský ... Martin Kozák

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