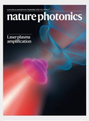
Volume 20 Issue 9, September 2026

← Previous issue | Volume 20



Subscribe

Laser plasma amplification

An artistic illustration of plasma-based laser amplification, which circumvents the fundamental material damage thresholds currently limiting solid-state lasers. The process uses a plasma wave to transfer energy from a longer, more energetic pump laser to a shorter seed laser.

See Shaw et al.

Image: Heather Palmer/Laboratory for Laser Energetics illustration. Cover design: Bethany Vukomanovic

Table of Contents

Q&A

Q&A
28 Aug 2026

The state and prospects of the European photonics sector

At the centre of Europe's rich photonics ecosystem, the European Photonics Industry Consortium (EPIC) connects stakeholders and promotes collective actions and advocacy. *Nature Photonics* spoke to its Director General Carlos Lee about recent trends, strengths and challenges facing Europe.

Anastasiia Vasylchenkova

Top of page ↗

News & Views

News & Views
28 Aug 2026

Plasma mirror self-focusing boosts gamma-ray generation

One approach to generate high-energy X-rays and γ-rays is inverse Compton scattering, where a high-energy electron beam collides with an intense laser pulse. However, this process is notoriously difficult because the electron and laser beams must be precisely aligned in space and time. Now, a coated plasma mirror is shown to dramatically increase the efficiency and energy of the generation.

Masaki Kando

News & Views
28 Aug 2026

A milestone toward exawatt plasma optics by Raman amplification

Exawatt-to-zettawatt lasers are essential in the quest for an ultimate understanding of nature, but they are held back by the damage limits of conventional optics. A recent experiment of Raman pulse compression to terawatt power revitalizes the prospect of plasma-based optics for next-generation ultraintense lasers.

Min Sup Hur

News & Views
28 Aug 2026

Optical hydrogen sensing across scales

An optofluidic microcavity combined with an adaptive laser-locking scheme makes it possible to monitor hydrogen from individual molecules to per cent-level concentrations with a compact device.

Monika Janik

News & Views
28 Aug 2026

Doped germanium keeps pace with the light field

Attosecond transient reflection spectroscopy reveals that doped germanium can retain a light-field-driven sub-cycle optical response, with impurity doping shifting and reshaping electron dynamics on attosecond timescales.

Christian Heide

News & Views
28 Aug 2026

Mechanochromic tactile sensing

Giampaolo Pitruzzello

Top of page ↗

Meeting Reports

Meeting Report
28 Aug 2026

Time to embrace new platforms

With silicon-based integrated photonics having reached commercial-level maturity, the research community is directing its efforts towards heterogeneous designs and alternative material platforms with new functionalities.

Anastasiia Vasylchenkova

Top of page ↗

Review Articles

Review Article
01 Aug 2026

Methods, trade-offs and opportunities in high-speed optical microscopy for neural voltage imaging

The Review discusses recent advances in neural voltage imaging, with an emphasis on relevant microscopy techniques and outstanding challenges in the field.

Zhaoqiang Wang, Ruth R. Sims ... Liang Gao

Top of page ↗

Articles

Article
23 Jul 2026

Enhanced inverse Compton scattering via spontaneous focusing induced by a coated plasma mirror

It has been proposed that coated plasma mirrors could spontaneously form a focusing structure that strengthens the reflected laser intensity to enhance the efficiency of inverse Compton scattering. Now it is demonstrated that the efficiency can reach 10^{-3} with photon energies extending to hundreds of megaelectronvolts at a laser power of 400 TW.

Xichen Hu, Mingyang Zhu ... Liming Chen

Article
Open Access
12 Jun 2026

Attosecond tuning of coherent electron dynamics in doped semiconductors

Attosecond light-field control in doped germanium is demonstrated, reporting sub-cycle manipulation in conductive semiconductors, establishing doping as a route towards petahertz electronics and lightwave information processing.

Giacomo Inzani, Amir Eskandari-asl ... Matteo Lucchini

Article
Open Access
12 Jun 2026

A super-inert near-infrared fluorescent rotaxane dye for surgical navigation

A threaded α-cyclodextrin rotaxane near-infrared (NIR) dye offers superior photostability, high solubility, negligible non-specific binding and complete renal clearance, enabling ureter imaging in mice and pigs via NIR-II imaging and clinical NIR-I laparoscopes.

Zi-Gang Lu, Haoran Liu ... Hongjie Dai

Article
08 Jun 2026

Spontaneous photoblinking upconversion microscopy

Spontaneous photoblinking in Yb^{3+}/Ho^{3+}-codoped upconversion nanoparticles enables super-resolution imaging of biological cells with a spatial resolution down to 30 nm at excitation power densities of about 6 kW cm^{-2}.

Maojiang Ren, Jialing Hu ... Qian Liu

Article
Open Access
19 Jun 2026

Overcoming the fill-factor limit of organic solar cells

The fill factor of organic solar cells is limited by field-dependent charge generation due to exciton/charge-transfer coupling. Modelling coupled with a new guest–host design enables prolonged exciton lifetime, simultaneously raising the fill factor and open-circuit voltage in organic solar cells.

Huotian Zhang, Jun Yuan ... Feng Gao

Article
07 Jul 2026

Electro-optic comb-empowered measurement of the dynamic frequency of a laser

Using integrated lithium niobate electro-optic frequency combs with slightly different repetition rates, accurate tracking of the frequency variation in a frequency-modulated laser enables stable and high-precision 3D scene ranging.

Weiwei Yang, Xingyu Jia ... Guanhao Wu

Article
19 Aug 2026

Ultrafast electron diffraction with MeV electron source from a laser wakefield accelerator

Researchers demonstrate that a laser wakefield accelerator-based device with a miniaturized permanent magnet beamline can generate and manipulate electron beams suitable for ultrafast electron diffraction.

Yu Fang, Fei Li ... Wei Lu

Article
Open Access
21 Jul 2026

Real-time optical signal equalization with a silicon photonic spatially distributed reservoir computer

Researchers experimentally demonstrate the real-time equalization of fibre distortions using a silicon photonics chip. The team equalizes a 28-Gbps on–off keying signal and obtains bit error rates as low as 4×10^{-7}.

Ruben Van Assche, Sarah Masaad ... Peter Bienstman

Article
Open Access
01 Aug 2026

Laser–plasma amplification of an ultrabroadband laser pulse to 0.3 TW

The researchers demonstrate amplification of an ultrabroadband pulse in a laser–plasma Raman amplifier, achieving efficiencies of up to 8.7%, final powers of up to 0.3 TW, and final pulse durations of 44 fs.

J. L. Shaw, M. V. Ambat ... D. H. Froula

Article
21 Jul 2026

Adaptive laser-tagging optofluidic microcavity for single-molecule hydrogen detection across a nine-decade concentration span

Laser tagging in an optofluidic microcavity enables precise hydrogen concentration detection across a broad dynamic range. Using thermal phonon transfer and dynamic resonance tracking, this spectrometry method achieves high sensitivity, low noise and effective selectivity.

Yan-Hong Guo, Teng Tan ... Bai-Cheng Yao

Article
31 Jul 2026

Stable low-dimensional perovskitoids for high-performance all-perovskite tandem solar cells

The introduction of trimethylphosphonium cations results in the formation of one-dimensional perovskitoid structures, enabling all-perovskite tandem solar cells with a power conversion efficiency of 30.17%, 90% of which is retained after 2,000 h of operation.

Guang Li, Wei Ai ... Weijun Ke

Article
Open Access
01 Aug 2026

Correlated electrons extend X-ray high-harmonic generation beyond the single-electron limit

The researchers experimentally demonstrate that correlated electrons can propel high-harmonic emission beyond the single-active-electron limit, markedly increasing the generated photon energies. The team observes a weak secondary plateau that extends the conventional cutoff beyond 120 eV up to the water window at 280 eV.

Siyang Wang, Jieyu Yan ... Tenio Popmintchev

Article
20 Aug 2026

In situ dry repair and passivation unlocks size-independent performance in III-nitride micro-LEDs

An in situ dry repair and passivation technique is developed to overcome plasma-induced sidewall damage in nitride-based micro-light-emitting diodes (micro-LEDs), leading to external quantum efficiencies of 64.7% and 55.1% for 2-μm-sized blue and green micro-LEDs, respectively.

Jinjian Yan, Jinchai Li ... Rong Zhang

Article
Open Access
13 Aug 2026

Integrated optical isolators for broadband multi-laser operation

Radio-frequency electro-optic modulation enables a broadband integrated optical isolator that is magnet-free.

Kyunghun Han, Yiliang Bao ... Vladimir Aksyuk

Top of page ↗

Amendments & Corrections

Author Correction
22 Jul 2026

Author Correction: Ternary self-assembled molecular contact for ambient-processed perovskite/silicon tandem solar cells

Geebu Kim, Adi Prasetio ... Sang Il Seok

Top of page ↗

Nature Photonics (Nat. Photon.) ISSN 1749-4893 (online) ISSN 1749-4885 (print)