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Browse Top-Cited Articles on Quantum Information from *Optica*

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Quantum-enhanced plasmonic sensing

Mohammadjavad Dowran, Ashok Kumar, Benjamin J. Lawrie, Raphael C. Pooser, and Alberto M. Marino

Optica **5**(5), 628-633 (2018) **View:** HTML | PDF [Suppl. Mat. (1)]

By exploiting the reduced noise property of quantum states of light, the authors were able to enhance the sensitivity of state-of-the art plasmonic sensors beyond the quantum noise limit. Given the broad applicability of plasmonic sensors, these results could facilitate improved sensing limits in high precision biomedical and biochemical detection schemes.

Near-deterministic activation of room-temperature quantum emitters in hexagonal boron nitride

Nicholas V. Proscia, Zav Shotan, Harishankar Jayakumar, Prithvi Reddy, Charles Cohen, Michael Dollar, Audrius Alkauskas, Marcus Doherty, Carlos A. Meriles, and Vinod M. Menon

Optica **5**(9), 1128-1134 (2018) **View:** HTML | PDF [Suppl. Mat. (1)]

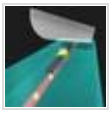
This article reports the realization of an array of single photon emitters that operate at room temperature – a key building block for next-generation quantum technologies. The researchers use nanoscale strain engineering to activate color centers in atomically thin hexagonal boron nitride resulting in single photon emission. The two-dimensional nature and on-demand character of these quantum emitters means they can be easily integrated with conventional silicon photonic circuitry.

High-selectivity quantum pulse gating of photonic temporal modes using all-optical Ramsey interferometry

Dileep V. Reddy and Michael G. Raymer

Optica **5**(4), 423-428 (2018) **View:** HTML | PDF [Suppl. Mat. (1)]

Separating and combining optical pulses of different temporal shapes with high efficiency and low cross-contamination is a long-standing problem. The authors demonstrated a means of overcoming the efficiency—crosstalk trade-off limit by interferometrically multipassing the temporal modes of weak light through a frequency-conversion crystal driven by custom-shaped, strong laser pulses.



Transfer-printed single-photon sources coupled to wire waveguides

Ryota Katsumi, Yasutomo Ota, Masahiro Kakuda, Satoshi Iwamoto, and Yasuhiko Arakawa

Optica **5**(6), 691-694 (2018) **View:** HTML | PDF [Suppl. Mat. (1)] [Suppl. Mat. (1)]

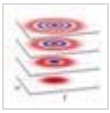
Using a pick-and-place assembly technique based on transfer printing, the authors integrated solid-state quantum emitters into photonic waveguides. This approach is applicable regardless of material choice and could therefore accelerate the fusion of diverse quantum emitters into modern photonic integrated circuits, which are often realized using different material platforms.

Independent high-purity photons created in domain-engineered crystals

Francesco Graffitti, Peter Barrow, Massimiliano Proietti, Dmytro Kundys, and Alessandro Fedrizzi

Optica **5**(5), 514-517 (2018) **View:** HTML | PDF [Suppl. Mat. (1)]

Perfect two-photon interference — critical for scalable quantum photonics — occurs when the interfering photons are in a pure quantum state. By engineering the poling pattern of a nonlinear crystal, the authors realize a significant enhancement of the spectral purity of photons created in parametric down-conversion at telecom wavelengths, achieving high photon-source quality without spectral filters.



Tailoring nonlinear processes for quantum optics with pulsed temporal-mode encodings

Vahid Ansari, John M. Donohue, Benjamin Brecht, and Christine Silberhorn

Optica **5**(5), 534-550 (2018) **View:** HTML | PDF

Quantum light pulses in well-defined temporal modes with broad, complex spectra provide an appealing basis for high-dimensional photonic quantum information. In this mini-review, the authors explore recent conceptual and technological developments in group-velocity-engineered nonlinear processes, which enable the controlled generation, manipulation, and detection of complex ultrafast pulse shapes and the entangled time-frequency structure of photon sources.

Quantum interference and correlation control of frequency-bin qubits

Hsuan-Hao Lu, Joseph M. Lukens, Nicholas A. Peters, Brian P. Williams, Andrew M. Weiner, and Pavel Lougovski

Optica **5**(11), 1455-1460 (2018) **View:** HTML | PDF [Suppl. Mat. (1)]

Quantum information processing with the frequency degree of freedom is well-matched to classical optical communications, but quantum operations on frequency-bin photons are extremely challenging. These authors implement a telecom-compatible approach and apply distinct quantum gates to frequency-bin qubits in parallel—a valuable

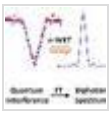
capability in the development of fiber-optic quantum networks.

Quantum nonlinear light emission in metamaterials: broadband Purcell enhancement of parametric downconversion

Artur Davoyan and Harry Atwater

Optica **5**(5), 608-611 (2018) **View:** HTML | PDF [Suppl. Mat. (1)]

Nonlinear optics offers a robust platform for quantum light generation with the potential to transform computing and communication technologies. However, material properties and frequency bandwidth limit today's nonlinear systems. The authors show that by using metamaterials to engineer optical properties, they can augment quantum nonlinear effects and create highly miniaturized and versatile sources of entangled light.



Extended Wiener–Khinchin theorem for quantum spectral analysis

Rui-Bo Jin and Ryosuke Shimizu

Optica **5**(2), 93-98 (2018) **View:** HTML | PDF [Suppl. Mat. (1)]

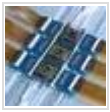
The conventional Wiener-Khinchin theorem provides the spectral intensity distribution of classical light from an interferometric measurement. Extending this theorem into the quantum regime, the authors were able to reconstruct the intensity spectrum of nonclasscial light from the quantum interference patterns. This technique could enable quantum interferometry as a spectroscopic tool.

Remote preparation of continuous-variable qubits using loss-tolerant hybrid entanglement of light

H. Le Jeannic, A. Cavaillès, J. Raskop, K. Huang, and J. Laurat

Optica **5**(8), 1012-1015 (2018) **View:** HTML | PDF

The authors use hybrid entanglement of light as a shared resource in a quantum network and report the remote preparation of continuous-variable qubits by measurement of the distant discrete-encoded node. The method holds promise for heterogeneous networks where the traditionally separated discrete- and continuous-variable encodings could be efficiently combined.



Modular linear optical circuits

Paolo L. Mennea, William R. Clements, Devin H. Smith, James C. Gates, Benjamin J. Metcalf, Rex H. S. Bannerman, Roel Burgwal, Jelmer J. Renema, W. Steven Kolthammer, Ian A. Walmsley, and Peter G. R. Smith

Optica **5**(9), 1087-1090 (2018) **View:** HTML | PDF [Suppl. Mat. (1)]

Integrated linear optical circuits can be used to interfere a large number of optical channels together on chip-scale devices. The authors demonstrate a modular architecture for creating these circuits that facilitates their fabrication and characterization, and use their device to implement a wide range of optical transformations.

Universal multimode waveguide crossing based on transformation optics

Shuyi Li, Yangyang Zhou, Jianji Dong, Xinliang Zhang, Eric Cassan, Jin Hou, Chunyong Yang, Shaoping Chen, Dingshan Gao, and Huanyang Chen

Optica **5**(12), 1549-1556 (2018) **View:** HTML | PDF [Suppl. Mat. (1)]

A multimode waveguide crossing is a key component for constructing large scale on-chip multimode routing systems. So far, however, reported multimode waveguide crossings can support only two waveguide modes or two crossing channels. The authors designed and fabricated a universal multimode waveguide crossing based on transformation optics, which can handle, in principle, any number of waveguide modes and crossing channels throughout an ultrabroad wavelength range of ~400nm.

Resurgence of Rayleigh's curse in the presence of partial coherence

Walker Larson and Bahaa E. A. Saleh

Optica **5**(11), 1382-1389 (2018) **View:** HTML | PDF [Suppl. Mat. (1)]

The separation between two points of an incoherent object imaged through an optical system cannot be estimated accurately as the points approach each other – an effect known as Rayleigh's curse. However, it is possible to mitigate the curse by executing certain optimized measurements on the optical field. The authors show that in the presence of the tiniest correlation between the light waves emitted by the two points, the curse resurges, making it impossible to resolve small separations.

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