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Competition in protein condensation

The protein fused in sarcoma is implicated in neurodegeneration, and the growth of amyloid fibres is indicative of this. In the cover image, dense protein condensates (shown in green) undergo glass-like ageing as their interiors progressively solidify. At the same time, the fibres associated with neurodegeneration (shown in grey) grow into the surrounding medium through a distinct, competing pathway.

See Liru Feng et al.

Image: Liru Feng, Leiden University. Cover design: Laoise Mac Gabhann

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Nobel neutrinos

The Nobel Prize in Physics 2026 has been awarded to Francis Halzen "for decisive contributions to the IceCube Neutrino Observatory and the discovery of high-energy neutrinos of astrophysical origin".

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World View

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SESAME could unlock more opportunities

Higher education institutions in the Middle East are not yet making the most of the synchrotron light source in Jordan.

Maher Attal

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Plasma promise for electric spacecraft

Experimental electric thruster technology could enable extended space missions from small satellites to interplanetary spacecraft.

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Fusion digital twins from imperfect models

Digital twins could transform how fusion plasmas are predicted, designed and controlled. We argue that realizing this promise requires multi-fidelity frameworks that systematically combine imperfect models and data while quantifying uncertainty.

Ionuț-Gabriel Farcaș & Frank Jenko

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The cost of easy answers

Mark Buchanan

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Just publish it

James Wilsdon

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News & Views

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An intense superthermal muonium beam

Conventional sources of muonium — a bound state of a positively charged muon and an electron — produce diffuse thermal beams. Now an intense, superthermal muonium beam with a velocity distribution far narrower than existing sources has been achieved.

Jian Tang & Shihan Zhao

News & Views
27 Oct 2026

Order in a quantum chaotic sea

Experiments with a superconducting quantum processor revealed an island of regular motion within otherwise chaotic quantum many-body dynamics and used feedback to steer the dynamics towards it.

Shiyu Wang

News & Views
26 Oct 2026

A simple twist to altermagnetism

Two-dimensional altermagnets hold promise for next-generation spintronics but remain difficult to synthesize. Now, altermagnetism has been observed in an orthogonally twisted van der Waals homostructure, opening possibilities for ultrathin devices.

Yingying Zhang & Cheng Song

News & Views
22 Oct 2026

Wigner crystals get dressed

When repulsion overcomes their tendency to move freely, electrons can arrange into a crystal. Two experiments have now identified Wigner polarons, quasiparticles whose optical signatures reveal the collective response of the electron lattice.

Mauro Brotons-Gisbert & Brian D. Gerardot

News & Views
07 Oct 2026

Clarity on carbon under extreme compression

Carbon's high-pressure phase diagram has long been debated. Now shock experiments have tracked diamond through its melting curve, providing a resolution. The findings also serve as a benchmark for first-principles theory.

Felipe González-Cataldo

News & Views
23 Oct 2026

Particle collisions on a quantum computer

Elementary particle physics rests on the discovery of particles produced in high-energy collider experiments. Now, a model collision above the threshold for particle production has been simulated on a quantum computer.

Torsten V. Zache

News & Views
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A dynamic ruler for positional memory in regeneration

Zebrafish can determine the amount of tissue to regrow after appendage amputation. Now, a study shows that a signal gradient that scales with the amount of tissue left to regenerate ensures that an amputated tailfin regrows to the correct length.

Keng-hui Lin

News & Views
16 Oct 2026

Chaos control with broken symmetries

By breaking both material and cavity symmetries, waves can be funnelled into robust closed-loop patterns. This dual-symmetry-breaking approach enables the development of a new class of devices for wave-based signal processing and sensing.

Jairo Velasco Jr

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Research Briefings

Research Briefing
07 Oct 2026

A long-sought phase in CuGeO$_3$ traces the full evolution of spin fractionalization

Neutron spectroscopy measurements combined with tensor network simulations have placed the long-studied quantum spin-chain compound CuGeO$_3$ in a spontaneously dimerized phase predicted in 1982. In this system, fractionalized excitations evolve from nearly free spinons to tightly bound triplons across energy scales within a single spectrum.

Research Briefing
08 Oct 2026

Picosecond current pulses probe intrinsic limit for dissipationless transport in superconductors

Picosecond current pulses can propagate with zero resistance far above the conventionally defined critical current values in type-II superconductors. Such pulses have now revealed the onset of resistive transport at a higher current threshold in the *s*-wave superconductor NbN, associated with Cooper-pair depairing. By contrast, a gradual suppression of superconductivity is observed in YBa$_2$Cu$_3$O$_7$, reflecting the *d*-wave nature of its superconducting state.

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Review Articles

Review Article
02 Nov 2026

Recent progress in the computational study of supercooled and glassy water

This Review discusses recent advances in the computational exploration of the properties of supercooled and glassy water.

Pablo M. Piaggi, Nicolas Giovambattista ... Pablo G. Debenedetti

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Articles

Article
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14 Sept 2026

Generation of a high-intensity, superthermal muonium beam for gravity and laser spectroscopy experiments

A high-intensity, superthermal beam is generated by extracting muonium from a thin layer of superfluid helium. This beam can be used for tests of gravity and laser spectroscopy.

J. Zhang, A. Antognini ... A. Soter

Article
Open Access
23 Sept 2026

Quantum many-body mixed phase space revealed by hybrid feedback control

Regular and chaotic trajectories can coexist in classical systems, but identifying an equivalent in quantum many-body dynamics is difficult. A feedback protocol on a superconducting processor now reveals and stabilizes such mixed dynamics.

Hang Dong, Jie Ren ... Zlatko Papić

Article
Open Access
24 Sept 2026

An information-theoretic proof of the Planckian bound for thermalization

Studies of many-body physics have indicated that thermalization processes are bounded by a timescale determined by Planck's constant. Such a bound has now been proved to apply in general using techniques from quantum information theory.

Paolo Abiuso, Alberto Rolandi ... Martí Perarnau-Llobet

Article
02 Sept 2026

Altermagnetism in twisted van der Waals homostructures

Altermagnetic states hold promise for spintronic applications but are yet to be observed in twisted van der Waals materials. Now an orthogonally twisted CrPS$_4$ homostructure is shown to exhibit signatures of altermagnetism.

Junying Chen, Xing Xie ... Yanping Liu

Article
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11 Aug 2026

Spectroscopy of Wigner crystal polarons in an atomically thin semiconductor

Electron Wigner crystals have been observed in atomically thin transition metal dichalcogenides, but their collective excitations have not been shown. Now the signatures of these excitations are revealed in the optical spectra of a charge-tunable monolayer semiconductor.

L. Wang, F. Menzel ... T. Smoleński

Article
11 Aug 2026

Wigner polarons probe the dynamics of a Wigner crystal in a monolayer semiconductor

Wigner crystals have been observed in 2D semiconductors, but their internal dynamics have been largely inaccessible. Now this is demonstrated in a monolayer semiconductor.

Lifu Zhang, Liuxin Gu ... You Zhou

Article
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08 Oct 2026

Short-range excitonic correlations and enhanced excitonic susceptibility in 1T-TiSe$_2$

In bulk materials, excitonic condensation is hard to separate from charge-density-wave formation. Now short-range excitonic correlations are revealed above the transition temperature in 1T-TiSe$_2$ via few-femtosecond extreme-ultraviolet spectroscopy.

Alfred Zong, Sheng-Chih Lin ... Michael W. Zuerch

Article
16 Sept 2026

Weakly interacting spinons and tightly bound triplons in the frustrated quantum spin-Peierls chain

A combination of one-dimensional magnetic frustration and three-dimensional lattice distortions causes the quantum magnet CuGeO$_3$ to form a dimerized state. Now the authors demonstrate how this interplay affects fractionalized quasiparticles of CuGeO$_3$.

Pyeongjae Park, Bo Xiao ... Andrew D. Christianson

Article
13 Aug 2026

Diamond melting in shock compression experiments at 1 TPa pressures

The location of the melting curve of diamond is unclear. Now, this is illuminated with shock compression experiments that provide strong evidence for shock-induced melting.

Marius Millot, Federica Coppari ... Jon H. Eggert

Article
Open Access
24 Sept 2026

Probing picosecond depairing currents in type-II superconductors

Vortex motion and heating prevent direct-current measurements from reaching the intrinsic depairing limit of type-II superconductors. Picosecond pulses bypass these effects and reveal a sharp threshold in NbN but gradual pair breaking in YBa$_2$Cu$_3$O$_7$.

E. Wang, M. Chavez-Cervantes ... A. Cavalleri

Article
Open Access
14 Sept 2026

Electrification mechanisms in sliding liquid and frozen drops

When sliding along an insulating surface, liquid drops become charged. Experiments with self-ionizing and non-polar liquids on different substrates suggest the competition of at least two underlying mechanisms.

Rutvik Lathia, Benjamin Leibauer ... Hans-Jürgen Butt

Article
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23 Sept 2026

String-breaking dynamics in a quantum simulator

The study of string breaking in gauge theories involves the real-time evolution of charges, which is difficult to simulate. Spatiotemporal dynamics of string breaking in a one-dimensional gauge model have now been observed in a trapped-ion platform.

Arinjoy De, Alessio Lerose ... Christopher Monroe

Article
11 Sept 2026

Digital quantum simulations of scattering in quantum field theories using W states

Quantum simulations of field-theory scattering require preparing particles and following their collision dynamics. A digital quantum simulation now reveals the inelastic production of particles in one-dimensional Ising field theory.

Roland C. Farrell, Nikita A. Zemlevskiy ... John Preskill

Article
08 Sept 2026

A cascaded random access quantum memory

Random access memory is an important element of classical computers, but equivalent schemes for quantum computers are much less mature. Now an eight-qubit random access memory has been demonstrated using superconducting circuits.

Ziqian Li, Eesh Gupta ... David I. Schuster

Article
Open Access
30 Sept 2026

Fully developed active turbulence defined through a non-equilibrium phase transition

The continuous energy injection in active fluids leads to active turbulence. Now, geometric and mechanical analyses reveal a phase transition that leads to fully developed active turbulence.

Lasse Bonn, Tianxiang Ma ... Amin Doostmohammadi

Article
20 Oct 2026

Fibres and glasses are competing material states in protein condensation

Fibres are thought to emerge from a dense protein condensate ageing into a glassy state. It is now shown that protein fibres and glassy condensates may result from two competing ageing pathways.

Liru Feng, Ryota Takaki ... Louise Jawerth

Article
20 Oct 2026

Light-induced asymmetric pseudogap below the critical temperature in cuprates

How superconductivity relates to the pseudogap in cuprates remains unclear. Now, time-resolved photoemission measurements show a light-induced pseudogap-like state below critical temperature, revealing a dynamic interplay with superconductivity.

D. Armanno, O. Gingras ... F. Boschini

Article
24 Aug 2026

Decaying and expanding Erk gradients process memory of skeletal size during zebrafish fin regeneration

Zebrafish can regenerate amputated fins back to their original size. It is now shown that gradients in extracellular signal-regulated kinase activity act as rulers during fin bone regeneration.

Ashley Rich, Ziqi Lu ... Stefano Di Talia

Article
Open Access
03 Sept 2026

Relativistic position verification with coherent states

By combining quantum and relativistic physics, it is possible to verify someone's position remotely without needing to trust them. Such a position verification protocol has now been introduced and demonstrated with a quantum optics experiment.

Guan-Jie Fan-Yuan, Yang-Guang Shan ... Zheng-Fu Han

Article
28 Sept 2026

Hyperbolic wave attractors

Wave propagation in irregular cavities made from conventional isotropic media is typically chaotic. Now odd-shaped cavities made from hyperbolic metamaterials are shown to suppress chaotic wave dynamics and produce stable geometric wave patterns.

Simon Yves, Enrico M. Renzi ... Andrea Alù

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Measure for Measure

Measure for Measure
09 Nov 2026

The edge of the Sun

Defining the solar radius is not as easy as it might seem. José Vaquero tells us a story of eclipses, meridian lines, astronomical archives and space observations.

José M. Vaquero

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