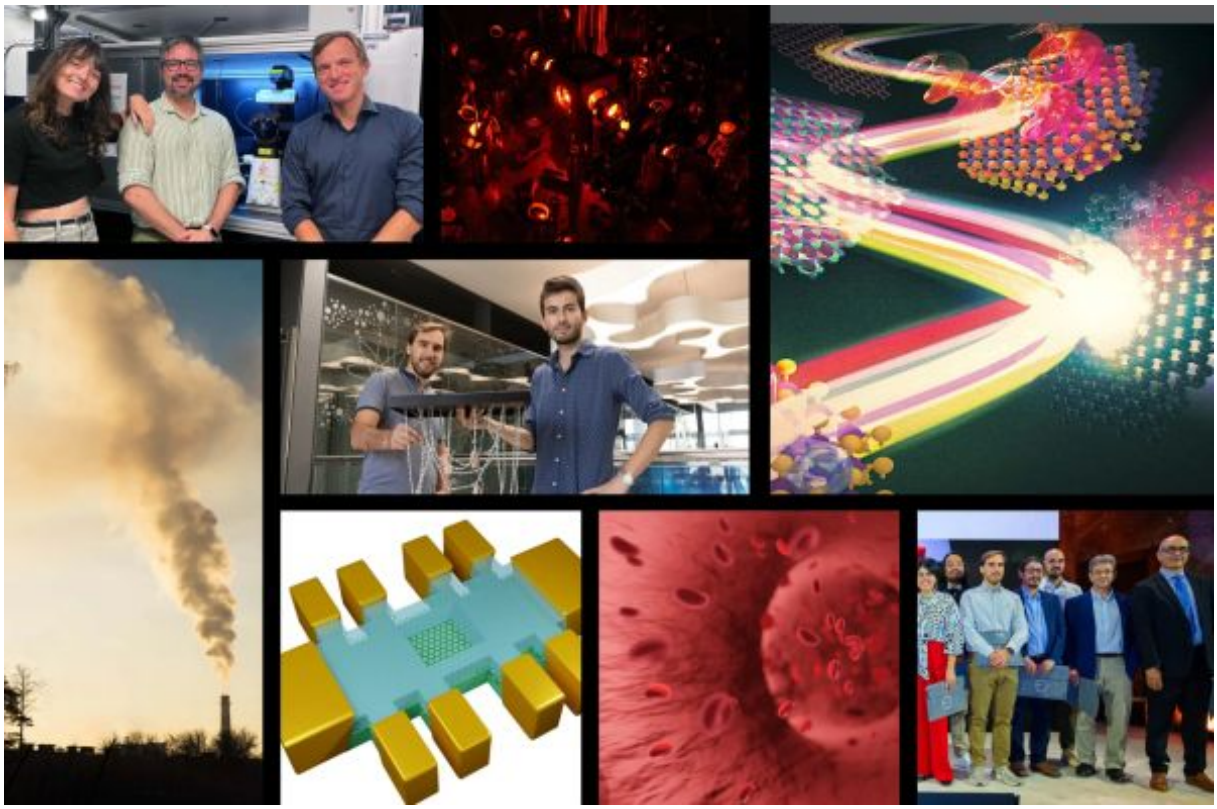


October Science News Recap

ICFO's summary of news highlights of the scientific discoveries and stories from the month of October 2025.

November 06, 2025

October was packed with different scientific discoveries, results and findings that have sparked different stories to share. We've gathered the most important updates to keep you in the know. Whether you missed a few of them or just want a quick recap, our summary of October's top scientific news has you covered. Dive in and catch up on everything that happened this month.

News 1

Breakthrough wearable device enables practical blood-flow monitoring

Monitoring how blood flows in our tissues in real time is essential for many medical procedures, such as supervising patients with vascular diseases or tracking blood flow in newborns' brains. Most current devices, however, are bulky, fragile, and prone to measurement noise.

A team led by ICFO researchers has now developed a new type of wearable blood flow

monitor that, without sacrificing data quality, is more compact, stable, and user-friendly. This design, recently reported in Biomedical Optics Express, could make clinical monitoring in hospitals more convenient and may even be suitable for everyday use in sports, wellness, and remote home care.
Date: October 3, 2025
Topic: Medical Optics
ICFO Researchers: Dr. Andres Quiroga, Dr. Lorenzo Cortese, Dr. Manish Verma, led by ICREA Prof. at ICFO Turgut Durduran.
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News 2:
Interconnecting quantum memories for the quantum internet
Quantum entanglement is not only one of the most fascinating features of quantum mechanics but also the cornerstone of many exciting future applications such as interconnecting distant quantum computers or sensors, and ensuring ultra-secure communications.
Researchers at ICFO have recently achieved a milestone towards the distribution of entanglement over long distances. Specifically, they have been able to entangle two quantum memories capable of storing photons (which encode quantum information) and retrieving them on-demand. This is a fundamental element for the realization of quantum repeaters, which allow quantum communication to be extended over longer distances and, as such, are essential for establishing a worldwide quantum internet. The results are presented in Physical Review X.
Date: October 7, 2025
Topic: Quantum communication.
ICFO Researchers: Jonathan Hanni, Alberto Rodriguez-Moldes, Dr. Felicien Appas, Dr. Soeren Wengerowsky, Dr. Dario Lago-Rivera, Dr. Markus Teller, Dr. Samuele Grandi, led by ICREA Prof. Hugues de Riedmatten.
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News 3:
Roadmap for photonics with 2D materials and for quantum nanophotonics with free electrons
ICFO researchers have coordinated and published two roadmaps in ACS Photonics, laying the foundations for future discoveries in their respective fields.
The first roadmap summarizes the main discoveries achieved in photonics through the use of 2D materials, both in fundamental science and in numerous applications ranging from sensors to quantum information processing technologies.
The second describes recent advances in the use of free electrons for quantum nanophotonics, exploring their ability to transport and transfer quantum information, create

entanglement and reveal details of quantum phenomena at the nanoscale.
Date: October 13, 2025
Topic: Nanophotonics
ICFO researchers: ICREA Prof. at ICFO Javier Garcia de Abajo.
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News 4:
Quantum Simulators: the Models of the Microscopic World
ICFO researcher and UPC Associate Professor Javier Argüello Luengo, together wit
Alejandro Gonzalez Tudela from CSIC, have written a book titled i¿½Quantum Simulato
s: Building Models of the Microscopic World.i¿½ In it, they show what Antoni Gaud
and physicists specialized in quantum simulation, such as Daniel Barredo, Ignacio Cirac
and Leticia Tarruell, have in co
mon. Through a journey filled with metaphors, images, and fictionalized stories of some o
the most influential authors in the field, the reader finishes the book understanding, among
ther things, what optical tweezers and lattices are, how they are used to trap atoms movi
g at incredibly high speeds, and how all this is harnessed for quantum simula
Date: October 20, 2025
Topic: Quantum simulation
ICFO researchers: Dr. Javier Argüello Luengo
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News 5:
CSIC Honors Scientific Excellence at its Annual Awards Ceremony
On October 9, 2025, the Spanish National Research Council (CSIC) held the award ceremony for the Outstanding Doctoral Thesis Awards, an event that celebrates excellence in research, mentorship, and scientific training.
Luciano Ivan Pereira Valenzuela, now a postdoctoral researcher at ICFO, was one of the 20 honored researchers. He was recognized for his exceptional doctoral thesis carried out at the Institute of Fundamental Physics (IFF-CSIC), which stood out for its scientific impact and its contribution to advancing the characterization of quantum technologies.
Date: October 23, 2025
Topic: Quantum technologies
ICFO researchers: Dr. Luciano Ivan Pereira Valenzuela.
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News 6:
Exposing graphene's surface without sacrificing quality
The synthesis of high-quality hexagonal-boron nitride (hBN) marked a turning point in

two-dimensional (2D) materials research. By encapsulating a 2D material (for instance, graphene) in between hBN layers, the relevant 2D material is protected from harsh environmental degradation, ensuring its highest quality and unique functionalities.
Some applications, however, require direct access to the material surface. Yet removing the hBN layer is not an option, as it would severely compromise its quality. To overcome this limitation, ICFO researchers have now developed a new technique capable of selectively removing the top hBN layer while preserving the electronic quality of graphene. Their approach, reported in the Journal of Physics: Materials, opens the door to a wide range of applications such as high-resolution probing, biochemical sensing, and plasmonics.
Date: October 24, 2025
Topic: 2D Materials
ICFO researchers: Dr. Hitesh Agarwal, Dr. Antoine Reserbat-Plantey, Dr. David Barcons Ruiz, Dr. Karuppasamy Pandian Soundarapandian, Dr. Geng Li, Dr. Vahagn Mkhitaryan, Dr. Johann Osmond, Dr. Helena Lozano, Dr. Petr Stepanov, led by ICREA Prof. Frank Koppens and Dr. Roshan Krishna Kumar.
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News 7:

New clues on how physical forces spread in neurons

In a project originally launched to pilot a new idea sparked by curiosity, ICFO researchers and collaborators have now uncovered new insights into how physical stresses (which might encode mechanical information) spread across the membranes of neurons. In a Nature Physics article, the team presents the most detailed description to date of this process at the molecular level, which is key to explaining how several fundamental biological processes unfold, from embryo development to the sense of touch.
The study focuses on two different sensory receptors in the neurons of the roundworm Caenorhabditis elegans, showing that they propagate tension differently. More surprisingly, the researchers discovered that not only the presence of obstacles in the cell's membrane, but also their arrangement, affects how far the tension propagates. This arrangement acts as a regulatory switch: it can keep signals concentrated and localized or let mechanical information travel over extended distances further through the neuron.
Date: October 29, 2025
Topic: Bionanophotonics
ICFO researchers: Dr. Frederic Catala-Castro and Dr. Neus Sanfeliu-Cerdan, led by Prof. at ICFO Michael Krieg.
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News 8:

Turning pollution into potential

Copper-based materials are the most efficient catalysts for converting CO2 into methane, th main component of the natural gas used in water and home heaters, and for electricit generation. However, these copper catalysts undergo significant transformation in th process, and keeping the system working for a long period of time remains criticall challenging

ICFO researchers have participated in a Nature Energy study, where reseachers have developed an innovative method to synthesize and recycle the copper catalyst during the electrochemical reaction within the carbon conversion system. These insights pave the way to practical applications of carbon conversion technologies and may reshape how we design future carbon conversion systems.

Date: October 31, 2025

Topic: CO2 mitigation

ICFO researchers: Dr. Viktoria Golovanova and Prof. F. Pelayo Garcia de Arquer.

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