

Commission C15

Atomic, Molecular and Optical Physics

Report to the IUPAP Council

January 2025 – August 2026

Submitted by Jaewook Ahn, Chair

Overview

During the reporting period, Commission C15 selected the 2025 and 2026 Early Career Scientist Prize recipients, supported major international AMO conferences, and held meetings to coordinate its activities. The Commission also contributed to IUPAP initiatives on climate action, sustainable development and quantum technology, including the Global Quantum Initiative.

C15 officers

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1 Early Career Scientist Prize 2025

Commission C15 selected Kirill Koshelev for the 2025 IUPAP Early Career Scientist Prize in AMO Physics for his pioneering explanation of how interacting optical resonances, particularly Mie modes and bound states in the continuum, enable exceptionally strong confinement of light in nanoscale structures.

Kirill Koshelev received his Ph.D. in Physics from the Australian National University (ANU) in 2022, investigating light confinement in dielectric metastructures and its applications to nonlinear optics. He subsequently held postdoctoral positions at ANU and UNSW Canberra before becoming an ARC DECRA Fellow at ANU's Research School of Physics. His research combines theoretical analysis and numerical modelling to understand and control light-matter interactions in nanostructured materials. His interests include nonlinear optics, resonant metasurfaces and chiral photonics, with particular emphasis on using optical resonances to enhance light confinement and nonlinear optical processes. His doctoral work was recognized with the Australian Institute of Physics' Bragg Gold Medal in 2023.

2 Early Career Scientist Prize 2026

Commission C15 selected Laura Rego Cabezas for the 2026 IUPAP Early Career Scientist Prize in AMO Physics for her pioneering discoveries concerning the polarization structure and self-torque of light produced by high-harmonic generation, and their use in controlling matter on ultrafast timescales.

Laura Rego Cabezas received her Ph.D. in Applied Physics from the University of Salamanca in 2021. Her doctoral research developed theoretical and computational approaches to generating ultrashort light pulses with tailored polarization and orbital angular momentum. She subsequently held a Margarita Salas postdoctoral fellowship at Imperial College London and the Autonomous University of Madrid, followed by a postdoctoral position at IMDEA Nanociencia. In 2024, she joined the Instituto de Ciencia de Materiales de Madrid (ICMM-CSIC) as a "la Caixa" Postdoctoral Junior Leader Fellow. Her research explores how structured light can probe and control ultrafast molecular processes, particularly those associated with molecular chirality and photoionization. By connecting high-harmonic generation with the control of light's angular momentum, her work provides new approaches to investigating light-matter interactions on ultrashort timescales.

3 Conference support

C15 supported the 34th International Conference on Photonic, Electronic and Atomic Collisions (ICPEAC 2025), held in Sapporo, Japan, from July 29 to August 5, 2025, as a Type A conference.

C15 also supported the 29th International Conference on Atomic Physics (ICAP 2026), held in Wuhan, China, from June 14 to 19, 2026, as a Type A conference.

C15 recommended Type A support for the 35th International Conference on Photonic, Electronic and Atomic Collisions (ICPEAC 2027), to be held in Hamburg, Germany, from August 1 to 6, 2027.

4 Meetings of C15 officers and members

January 15, 2025 — Virtual officers' meeting

The C15 officers discussed:

- the call for nominations for the 2025 Early Career Scientist Prize, the selection timetable, and arrangements for presenting the award at ICPEAC 2025 in Sapporo;
- the distribution of the call through international and regional networks, encouraging nominations that reflect the diversity of the international AMO physics community;
- preparations for a meeting of the full Commission in early March and the application deadline for conference support in 2026.

March 4, 2025 — Virtual Commission meeting

The Chair welcomed the members for the 2025–2027 term and reported on the Executive Council and Commission Chairs (EC&CC) meeting held on January 13–15, 2025. Members discussed:

- the evaluation and selection procedure for the 2025 Early Career Scientist Prize, including the ranking of candidates by Commission members;
- support for upcoming AMO conferences, emphasizing international participation, inclusiveness and diversity, and plans for a C15 meeting during ICPEAC 2025;
- IUPAP's organizational renewal and opportunities to contribute to the International Year of Quantum Science and Technology 2025 and the International Decade of Sciences for Sustainable Development.

January 28, 2026 — Virtual Commission meeting

The Chair reported on the IUPAP General Assembly held on October 31, 2025, including the approval of the IUPAP Rejuvenation Action Plan. Members discussed:

- the nomination and new selection procedure for the 2026 Early Career Scientist Prize, including evaluation by Commission members, group discussion and voting;
- preparations for the prize presentation at ICAP 2026 in Wuhan, the possibility of a C15 meeting during the conference, and applications for conference support in 2027;
- IUPAP's organizational restructuring, including stronger engagement with industry and other non-academic sectors, support for early-career scientists, and measures to promote diversity, inclusion and ethics;
- the proposal to establish a Commission on Quantum Technology, including quantum simulation and quantum metrology within its scope and ensuring close collaboration with related commissions.

ICAP 2026 — In-person meeting in Wuhan

An in-person meeting of C15 members was held during ICAP 2026 in Wuhan, China, attended by Chair Jaewook Ahn and Commission member Xiaojun Liu (China, Beijing).

5 Other activities

Contribution requested by WG21

C15 prepared a written perspective entitled “Atomic, Molecular, and Optical Physics for Climate Action and Sustainable Development” on October 29, 2025. The contribution highlighted the role of AMO physics and quantum technologies in environmental monitoring, climate modelling, sustainable energy and resource management. It emphasized the importance of international collaboration in connecting scientific advances with sustainability goals.

Action requested for WG19

C15 participated in consultations with C2, C5, C8 and C12 and contributed to a joint report dated October 3, 2025, supporting the establishment of a new Commission on Quantum Technology. C15 recommended the name “Quantum Technology,” the inclusion of quantum simulation and quantum metrology within its scope, and active participation of C15 members to strengthen collaboration between commissions.

Participation in the Global Quantum Initiative

Representing IUPAP, the C15 Chair participated in the thematic event “Global Quantum Initiative: Closing the Quantum Divide for Sustainable Futures” at UNESCO Headquarters in Paris on July 17, 2026, during the 2026 Global Conference of the International Decade of Sciences for Sustainable Development. He presented the plans of GQI Working Group 2 on Sustainable Infrastructure, promoting open access to quantum infrastructure, software and training, with particular attention to regional hubs and the Global South.