

## Commission C15: Atomic, Molecular and Optical Physics

Report 2022-2024 to the IUPAP Council & Commission Chairs meeting

Submitted by Rosario González-Férez (Chair)

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### **C15 Activities:**

The major activities from this three years period are categorized into the following items.

#### **1. IUPAP C15 Early Career Scientist Prize 2022, 2023 and 2024.**

The Commission C15 in AMO Physics of the International Union of Pure and Applied Physics (IUPAP) decided to award the Early Career Scientist Prize in AMO Physics to

- Dr. Ana Asenjo-García (2022): *“For her outstanding theory contributions to the understanding of fundamental physics associated with light-matter interactions in cold and ultracold atoms, the role of many-body optical phenomena, and their applications to quantum technologies.”*
- Dr. Hong-Guang Duan (2023): *“For his outstanding contributions to the field of biomolecular lightharvesting and excitation energy transfer, to understand the role of quantum coherence in the exciton transfer dynamics and refine of the tools of nonlinear femtosecond spectroscopy.”*
- Dr. Matthew Norcia (2024): *For his seminal contributions to cavity-QED, optical tweezers, and dipolar quantum gases, specifically, the realization of an optical tweezer clock and of two dimensional supersolids in dipolar quantum gases”.*

## 2. Conference Support.

Type A conferences:

- The 27th International Conference on Atomic Physics (ICAP 27) held in Toronto, Canada, from July 17<sup>th</sup> to 22<sup>nd</sup>, 2022.
- The 33rd International Conference on Photonic, Electronic and Atomic Collisions (ICPEAC 2023) held in Ottawa, Canada, from July 25<sup>th</sup> to August 1<sup>st</sup>, 2023.
- The 28th International Conference on Atomic Physics (ICAP 28) held in London, UK, from July 14<sup>th</sup> to 19<sup>th</sup>, 2024.

For next year, we have recommended to support as Type A conference The XXXIV International Conference on Photonic, Electronic and Atomic Collisions, ICPEAC XXXIV, to be held in Sapporo, Japan, from July 29<sup>th</sup> till August 5<sup>th</sup>, 2025, and as Type B conference The 26th International Conference on Laser Spectroscopy, ICOLS 2025, to be held at the Elba Island, in Italy from June 2<sup>nd</sup> to 7<sup>th</sup> 2025.

## 3. Conference attendance.

The Chair has attended the three conferences supported by IUPAP: ICAP 27, ICPEAC 2023, and ICAP 28. In all of them, the IUPAP Early Career Scientist Prize in AMO Physics ceremony took place. The Chair gave to the ECSP winners the Medal and Diploma, and afterwards they delivered the invited talks. Before these prize ceremonies, the Chair made a short presentation about IUPAP, and its importance to the international physics community, which helped to enhance the IUPAP's visibility.

The Chair and Vicechair of C15, together with three members of C15 had attended the ICPEAC in Ottawa, Canada, met during one of the coffee breaks to have an informal discussion about IUPAP and C15, and to get to know each other better.

The Chair, Vicechair and Secretary were present in London, UK, for the ICAP 28 and had an informal meeting during lunch to discuss several points related to the C15.

## 4. Meetings of the C15 members.

Due to low attendance of C15 members at IUPAP conferences, we decided to have our annual meeting online. These virtual meetings were held on January 2022, January, and November 2023, and the next one will be on September 27<sup>th</sup>, 2024.

In all these meetings the Chair informed the members about the EC&CC and General Assemblies, and different IUPAP matters. We discussed:

- the conditions and rules applied for the organization of conferences, with emphasis on the necessity to increase women participation as invited speakers,
- the Early Career Scientist Prizes and possible actions so that nominations represent the whole international AMO Physics community in terms of gender, other under-represented groups, and geographical regions,
- ways of ensuring the Call for nominations for Early Career Scientist Prize reaches as many relevant colleagues as possible, particularly those in countries that are not represented in the Commission,
- ways to facilitate the free circulations of scientists, which has affected our community. We discussed the problems faced by several of our Chinese and Indian

colleagues with their visa applications to visit Canada in 2023. The visa of more than 50 scientist was either rejected or delayed, and they could not attend the ICPEAC 2023. This visa problem was repeated at the ICAP 28, but on a much smaller scale, five scientists were denied visas to travel to UK, and could not attend the meeting.

In addition, the Chair, Vicechair and Secretary had several virtual meetings where different points related with the ECSP 2024 were organized and discussed.

Future schedule: Since most of the C15 members did not attend the 28th International Conference on Atomic Physics [ICAP 28](#) held in London, the next C15 meeting will take place online on 27<sup>th</sup> September 2024.

## 5. Nobel Prize in Physics 2023.

Dr. Valerie Blanchet, member of C15, together with Dr. Phillippe Balcou, member of C17, had written an article about the Nobel Prize in Physics 2023 for the September - November IUPAP newsletter.

## 6. Appendix: Short CV of the IUPAP C15 ECSP winners.

**Ana Asenjo-García (2022)** received her Ph.D. degree from Universidad Complutense de Madrid in 2014. She was a Marie Curie postdoctoral fellow at the Institute of Photonic Sciences (ICFO) in Barcelona, and an IQIM Fellow at the Institute of Quantum Information and Matter at Caltech. She joined Columbia University as an assistant professor of physics in 2019. Her research focus is on theoretical quantum optics and its intersection with atomic physics, quantum information science and many-body physics. In particular, the research program of her group is centered at understanding out-of-equilibrium physics of large quantum systems in open environments, with the aim of developing scalable and efficient applications in quantum information storage and processing, non-linear optics, and metrology. Besides her research activities, Prof. Asenjo-García is committed to making science a more inclusive and diverse environment. To serve that purpose, she founded “Coding Club” at Democracy Prep Harlem High School, and actively participates in outreach and mentoring activities for under-represented communities in STEM.

**Hong-Guang Duan (2023)** obtained his bachelor’s and master’s degrees from Sichuan Normal University and Ningbo University, respectively. He continued his academic pursuits at the University of Hamburg and the Max Planck Institute in Germany, completing his Ph.D. with the distinction of Summa Cum Laude in 2018. Following his postdoctoral studies at the Max Planck Institute, Hamburg University, and the European XFEL, he was appointed Professor at Ningbo University in 2021 where he assumed a leadership role in the field of optical science within the physics department. Prof. Duan’s doctoral research focused on studying the ultrafast energy transfer and quantum coherence in photosynthetic systems. He is known by his outstanding contributions to the field of biomolecular lightharvesting and excitation energy transfer, where he combines excellent experimental skills, with the most advanced theoretical description of his experimental findings. Currently, his research centers on employing ultrafast spectroscopy and electron diffraction techniques to unravel the dynamics of wave packets and structural transformations in various materials.

**Matthew Norcia (2024):** performed his Ph.D. work in James Thompson's group at JILA, where he built the first system to achieve strong collective coupling between an optical cavity and ensembles of atoms using narrow-linewidth optical transitions. This enabled him to perform the first demonstrations of superradiant lasing on such transitions. In 2017, Matthew then joined Adam Kaufman's new group, also at JILA, as a postdoc to build one of the first experiments to obtain microscopic control over alkaline earth atoms in optical tweezers and demonstrated one of the world's first tweezer-array optical clocks. In 2019, Matthew joined Francesca Ferlaino's group at the IQOQI in Innsbruck to study newly observed dipolar supersolids composed of magnetic lanthanide atoms. His particular focus was on extending supersolid properties from one to two spatial dimensions, and initial studies of their rotational properties. Since 2021, Matthew has been at Atom Computing Inc in Boulder, Colorado, working with a team to develop quantum computing platforms based on optically trapped alkaline earth atoms. His work there focuses on extending the capabilities of neutral-atom-based quantum computers through mid-circuit measurement techniques, approaches to generating and maintaining arrays of many qubits, and the development of high-fidelity gates.