

## The BPU Congress – a voice of Physics in the Balkans

This volume includes scientific papers that were presented during the BPU Congress held in Bucharest, between July 8-12, 2025. BPU stands for *Balkan Physical Union*, an association of 10 of the 42 National Physical Societies that are members of the European Physical Society (EPS). It practically express the voices of the physics communities in the 10 member countries from the Balkans: Albania, Bulgaria, Cyprus, Greece, Moldova, Montenegro, North Macedonia, Romania, Serbia and Turkey, <https://balkanphysicalunion.info/>.

Founded in 1985, BPU organizes a general conference (now called Congress) once every 3 years, an excellent opportunity for exchanging ideas, initiating new collaborations, but also for presenting scientific results. The conference organized in the summer of 2025 in Bucharest was the 12th in the series and had an additional significance, marking 40 years of the Union's existence. The entire event consisted of scientific presentations, round tables and three summer schools, two of them related to the International Year of Quantum Science and Technology. The participants had also the opportunity to visit the "Extreme Light Infrastructure" (ELI), the most powerful laser in the world that operates within the National Institute of Physics and Nuclear Energy "Horia Hulubei" (NIPNE-HH) in Magurele, near Bucharest. The total number of 400 registered participants from 25 countries, of which almost 100 were students who participated in the three summer schools, shows that the interest in the Congress far exceeded the area of the Balkan countries. Among the participants were prominent personalities of science, as well as leaders of prestigious organizations, such as the President of EPS, the General Director of ICTP, ministers-secretaries of state from the Government of Romania.

The pure scientific activity during the congress consisted of 225 plenary, oral and poster communications, presented in 10 different sections. The authors of 99 of these communications decided to use the opportunity to publish their contributions, without paying a publication fee, in one of the three volumes offered by the organizers: Proceedings published by EDP Sciences, a special issue of Symmetry published by MDPI and a Focus Point of the European Journal of Physics Plus (EPJP) published by Springer and Societa Italiana di Fisica.

Referring now strictly to the Proceedings, the present volume, it should be noted that it includes 31 contributions selected after a rigorous peer review process. The thematic distribution is wide, from theoretical to applied topics. Papers on optics, biophysics, condensed matter, or environmental physics, but also on gravitation, astrophysics or quantum physics are included. However, most of the papers, namely 9, are related to Physics Education, History and Philosophy of Physics.

Regarding the authors of the 31 articles included in the volume, by simply adding up the co-authors mentioned in each paper, we reach 102 co-authors, that is, an average of 3 co-authors per paper. This is a positive fact that demonstrates a developed ability to work in a team. For the objectivity of

assessments, we must note that the actual number of authors of a paper varies between 1 and 9, and some authors' names are repeated 2 or 3 times. The teams of co-authors of the articles usually come from the same country, with only two exceptions, when the articles are the result of international cooperation. Most of the authors are affiliated with universities or institutes in South-Eastern European countries, but there are also authors with affiliations in Western countries, such as Switzerland, Belgium or Germany.

We cannot conclude this preface without thanking some people and institutions without whom the BPU Congress and this volume would have been difficult to complete.

The congress was hosted by the National University of Science and Technology "Politehnica" Bucharest and organized by BPU in cooperation with the European Physical Society, the Romanian Physical Society, the University of Craiova and the University of Bucharest. From a financial point of view, the activities were also supported by the Romanian Ministry of Education and Research, ICTP Trieste, the W.E. Heraeus Foundation from Germany and the Q-Fort company from Romania.

Special thanks go to those who agreed to help as topic editors: Turkan Alkan, Lambe Barandovski, Hassan Chamati, Eugen Cioroianu, Alexander Dreischuh, Aurelian Isar, Sebastian Popescu, Mihai Radu, Vladimir Sreckovic, Ionut Topala, Kostas Vourlias, Ömer Yavaş. Equally, our appreciation goes to those on the non-public list of reviewers who have agreed to volunteer their time and knowledge to ensure that the articles are properly evaluated.

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Prof. Radu Constantinescu  
BPU President, 2022-2025



The participants in the BPU Congress



The BPU Logo




**BPU 12**

## THE 12TH CONGRESS OF THE BALKAN PHYSICAL UNION

JULY 8-12, 2025, BUCHAREST, ROMANIA  
<https://bpul2.ucv.ro/>

### SCIENTIFIC SECTIONS

- Atomic, Molecular and Optical Physics
- Biophysics, Life Sciences, Medical Physics
- Condensed matter, Materials and Applied Physics
- Environmental and Solar Physics, Meteorology and Geophysics
- High Energy, Particle Physics, Gravitation and Cosmology
- Interdisciplinary Physics, Mathematical and Computational Methods
- Nuclear Physics, Energy Science and Technology, Accelerators and beams
- Plasma, Statistical and Nonlinear Physics
- Physics Education, History and Philosophy of Physics
- Quantum Physics, Information and Communication

### SATELLITE EVENTS

- SEENET-MTP Workshop
- EPS – TIG “Hands on” Session
- International Balkan Workshop in Applied Physics
- School “Frontiers in Quantum Science and Technology”
- PHD School “Modern Methods in Quantum Gravity and Cosmology”

### ROUND TABLE

Physics for development – ways of scientific cooperation in Europe






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The Poster of the BPU 12 Congress



Main Venue: The National University for Science and Technology “Politehnica” Bucharest