

## Preface

The present 42-nd volume of the Nuclear Theory series contains articles based on presentations given at the Forty Second International Workshop on Nuclear Theory (IWNT-42) held from 29-th of June to 5-th of July 2025 in the Rila Mountains, Bulgaria. This year the Workshop was organized again in a hybrid form combining talks of on-site and on-line participants. For a seventh year the venue of the Workshop was Hotel Lion in Borovets Resort. Since 1980 the Workshop has been annually organized by the Nuclear Theory Laboratory (NTL) of the Institute for Nuclear Research and Nuclear Energy (INRNE) of the Bulgarian Academy of Sciences (BAS). The Organizing Committee with the help of the Advisory Committee and the members of the Laboratory make continuous efforts to enlarge the scientific field covered by the Workshop. Two sessions of the Workshop were devoted to the hundredth anniversary of Professor Vadim Soloviev (1925-1998) from the Joint Institute for Nuclear Research in Dubna, Russia, and Dr. Christo Christov (1950-2025), a member of the NTL of INRNE-BAS, who passed away in January 2025.

Our aim is to sustain the interest of the participants in the contemporary developments and problems in the fundamental theory and experiment in nuclear physics studies, as well as, in applications which are of utmost importance for the whole society.

The main topics of the 2025 Workshop:

- nuclear structure and reactions;
- nuclear equation of state and symmetry energy;
- nucleon correlations in nuclei;
- symmetries and dynamics;
- collective and intrinsic motions of nuclei;
- exotic nuclei;
- few-body and many-fermion systems;
- nuclear astrophysics and related topics,

are part of the NTL's program for basic nuclear physics research. This broad range of subjects makes it possible for the participants to cover the most actual areas relating the theory with experiment, providing interpretation and predictions, bridging interdisciplinary topics related to nuclear structure and reactions.

The Workshop was attended totally by 78 participants (including the organizers) from 24 countries: Algeria, Bulgaria, China, Croatia, Czech Republic, France, Germany, Greece, Hungary, India, Italy, Japan, Kazakhstan, Korea, Kuwait, Morocco, Portugal, Romania, Russia, Spain, Türkiye, Ukraine, United Kingdom, USA. The scientific program contained totally 63 oral talks (23 of them remote).

## *Preface*

The Workshop proved once more time itself as a fruitful ground for exchanging ideas not only between nuclear physics scientists from different fields and institutions, but also between the experienced scientists and the new coming generation of young physicists. During IWNT-42 a number of young scientists and students were introduced to real scientific activities including the newest trends in the theoretical and experimental nuclear physics as well as in the prospective related fields of research providing them a variety of ideas for a possible career development.

The beautiful mountain nature and the friendly atmosphere at the Workshop provided a nice opportunity for a direct communication between participants. We were able to realize our full social program with an excursion to the sandstone pyramids of Stob and the magnificent Rila Monastery, the largest and most famous Eastern Orthodox monastery in Bulgaria.

The Workshop was organized and the proceedings are published partly by the donation of the Kozloduy Nuclear Power Plant. Having this support we were able to help the participation of a number of international young and first-time visitors, as well as of our retired colleagues who are prominent specialists in the subject of the Workshop.

The editors of the volume would like to express their gratitude to the colleagues from the Organizing Committee, as well as to all members of the of Nuclear Theory Laboratory for their help and invariable support during the organization of the Workshop. We are also grateful to the members of the International Advisory Committee (six of totally eight of them were among the participants) for the valuable suggestions and ideas about the organization of the Workshop.

Finally, we would like to thank all the participants of IWNT-42 for their contribution to the nice scientific atmosphere as well as the participants who contributed to the present volume. We hope that the scientific level and the quality of the papers included prove the vitality and the future perspectives of the nuclear physics and its related areas.

The next 43-rd issue of the International Workshop on Nuclear Theory is planned to be held in Borovets, Rila Mountains, Bulgaria, from 28-th of June to 4-th of July 2026.

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