



## PREFACE

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# The 25th European Conference on Few-Body Problems in Physics (EFB25)

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The European Conference on Few-Body Problems in Physics is one of three major conference series in the field of few-body physics. Held every three years in a European country, it gathers international physicists from Europe and the rest of the world. The 25th European Conference on Few-Body Problems in Physics (EFB25) was held in Mainz, Germany, from July 30th through August 4th, 2023. Previous conferences of this series took place in Guildford (2019), Aarhus (2016), Krakow (2013), Salamanca (2010), and Pisa (2007). The purpose of the conference is to bring together scientists working on few-body problems in physics, as well as to engage young students and postdocs to nurture the future leadership of the field. As a matter of fact, this is one of the most important meetings of the few-body community, where the latest results in the field are discussed.

The conference had an interdisciplinary nature, focusing on problems with only a few degrees of freedom in different areas of physics. Such problems can often be solved exactly and thus play a special role in the investigation of fundamental physics questions. Recent developments in the field of few-body systems in the following areas were discussed: hadron physics, nuclei and hyper-nuclei, electroweak processes, nuclear astrophysics, cold atoms and quantum gases, atoms and molecules, few-body methods, and few-body aspects of many-body systems.

EFB25 was attended by 158 physicists (see group photo in Fig. 1), 35 of which (22%) were female, 30 of which (19%) were junior researchers without a doctoral degree, and many of which were early-career postdoctoral researchers. This underscores the diversity and vibrance of the field. The conference featured 27 plenary talks, with 8 of them (30%) delivered by female researchers, and 18 lead invited talks in the parallel sessions, 5 of which (28%) were delivered by female speakers.

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**Fig. 1** Group photo with EFB25 participants, Mainz, Summer 2023

The conference opened with a plenary talk by Dörte Blume from the Center for Quantum Research and Technology at the University of Oklahoma on “Dynamics of weakly-bound molecules”, a hot topic in ultracold atom physics. There were two plenary sessions focused on specific topics. The first one addressed the “proton radius puzzle” with talks from Aldo Antognini (PSI and ETH Zürich), Haiyan Gao (Duke University and Brookhaven National Lab), and Ulf-G. Meißner (U. Bonn and FZ Jülich), who discussed the experimental and theoretical status of the field and future perspectives. The second covered recent research on the resonance-like structure in the four-neutron system with talks by Rimantas Lazauskas (U. Strasbourg), Miguel Marquez (GANIL), and Michele Viviani (INFN Pisa). During and after both sessions, there were lively discussions of experimental results and theoretical insights.

We had two special prize sessions: one for the Few-Body Systems Award for Young Researchers, which honours significant achievements of young researchers within seven years of their PhD (excluding career interruptions), and one for the Faddeev medal, which is awarded jointly by the Topical Group on Few-Body Systems & Multiparticle Dynamics of the American Physical Society and the European Research Committee on Few-Body Problems in Physics to recognize distinguished achievement in Few-Body Physics. The Few-Body Systems Award for Young Researchers was given to Meytal Duer (TU Darmstadt, Germany) for her experimental work on the four-neutron system. The theoretical award was split between Bijaya Acharya (Oak Ridge National Lab, USA) and Khepani Raya (Huelva U., Spain) for their work on nuclear reactions relevant to astrophysics and the Schwinger-Dyson approach to QCD, respectively. The Faddeev medal was awarded to Evgeny Epelbaum (Bochum, Germany) for his contributions to the chiral effective field theory for nuclear forces.

All doctoral students were given the opportunity to present their work in a poster session. We tried a new format which proved to be very successful. All doctoral researchers were given the opportunity to present their research in a 3 min “elevator pitch” talk in the plenary session. The task was to get the audience interested in their research and the corresponding poster. After a short break, we had the poster session, where more detailed questions could be discussed in a relaxed and informal atmosphere. This format worked very well, and the physics discussions continued well into the evening. The best poster and best “elevator pitch” presentation were honoured by prizes sponsored by NuPPEC.

On Tuesday evening, we hosted a popular lecture for the general public on “A Sun on Earth - Nuclear Fusion as a CO<sub>2</sub>-free energy source” by Ulrich Stroth from the Max-Planck-Institute for Plasma Physics. The lecture, also supported by NuPPEC, was very well attended and spurred many questions. On Friday afternoon,

the scientific program of the conference concluded with laboratory visits in Mainz (Mainz Microtron, Quantum Computing, Laser Spectroscopy) and in Darmstadt (GSI/FAIR).

Overall, the conference was a great success, fostering the cross-exchange of ideas between different research areas and stimulating new collaborations between attendees. Participants were coming from 30 different countries (Algeria, Austria, Belgium, Brasil, Canada, China, Czech Republik, Denmark, France, Germany, Georgia, Japan, Korea, India, Iran, Israel, Italy, Lithuania, Netherland, New Zealand, Poland, South Africa, Spain, Sweden, Switzerland, Tunisia, Turkey, UK, Ukraine, and USA), showcasing the international character of the event. The conference organization was possible thanks to the generous support from the Deutsche Forschungsgemeinschaft, the Helmholtz Institute Mainz, the PRISMA<sup>+</sup> Cluster of Excellence, CRC 1245, the ExtreMe Matter Institute EMMI, the Johannes-Gutenberg University Mainz, and NuPECC.

To share the novelties of the field with the broader scientific audience, we collect papers from speakers of EFB25 in this special issue of Few-Body Systems. All papers were subject to a careful reviewing process and include original results. Finally, we are pleased to announce that to continue the tradition, the next European Conference on Few-Body Problems in Physics will be held in Prague, Czech Republic in 2026.

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