

PREFACE

Announced on January 9, 2020 decision of the U.S. Department of Energy on the localisation of the Electron–Ion Collider at Brookhaven National Laboratory created understandable excitement among physicists. The EIC is thought to provide collisions of the polarised lepton beam with ions ranging from proton to lead. Also, the light-ion beam up to the tritium will be polarised. Furthermore, the EIC will work with tunable centre-of-mass energy, ranging from 20 GeV to 140 GeV, and large instantaneous luminosity reaching $10^{34} \text{ cm}^{-2} \text{ s}^{-1}$. This triggered additional activity of the whole lepton–hadron physics community resulting in many publications, conferences and workshops, and the creation of a first detector collaboration. On the other hand, in Europe, a group of physicists proposed the construction of a lepton machine associated with the existing Large Hadron Collider, the Large Hadron Electron Collider, LHeC. The LHeC is planned to collide 60 GeV leptons with 7 TeV protons or 2.7 TeV/nucleon lead ions. This project also promotes a novel idea of the energy recovery linac to accelerate leptons.

Nearly three years after the DoE decision, the 29th Cracow Epiphany Conference was devoted to the physics opportunities at the Electron–Ion Collider and future facilities. The Henryk Niewodniczański Institute of Nuclear Physics Polish Academy of Sciences hosted the conference on 16–19 January, 2023. The aim was to review advances in physics at future lepton–hadron experiments. The present proceedings cover most of the topics presented during the conference, *i.e.*

- Accelerator;
- Detector proposal;
- Spin physics;
- Proton tomography,
- Proton and nuclear structure;
- Small $-x$ physics;
- Diffraction and saturation;
- Exotica and beyond Standard Model physics.

The electronic version of the presentations is available at:

<https://indico.ifj.edu.pl/event/901/timetable/?view=standard>

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