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Preface

The 30$^{\text{th}}$ edition of the International Conference on Ultra-relativistic Heavy-Ion Collisions, Quark Matter 2023, was held in Houston, Texas, on September 4-9, 2023. This was the eleventh time that the United States hosted the event since the inaugural Berkeley meeting in 1987 and the last U.S. meeting in Chicago in 2017. More notably, it marked the return of a fully in-person conference ever since the pandemic necessitated many conference series, including Quark Matter, to resume online or in hybrid format, as at Quark Matter 2022 in Cracow, Poland. It also allowed the reintroduction of important community-building and networking components, such as the Student Day and the Poster Session.

Hosted by the University of Houston, Rice University, and Texas A&M, the conference took place at the Hilton of the Americas in downtown Houston. Nearly 700 participants from 28 countries, half of them graduate students and young scientists, contributed to a broad program highlighting recent results from theory and experiments conducted at a range of accelerator facilities. New opportunities from theoretical developments, experiment upgrades, and new experiments at existing or new facilities were discussed in more than 500 oral and poster presentations.

The focus of the Quark Matter conference series is on the fundamental understanding of strongly-interacting matter at extreme conditions of temperature and density, as formed in ultra-relativistic nucleus–nucleus collisions. In these conditions, which also characterised the early Universe, matter appears in the form of a Quark–Gluon Plasma, with quarks and gluons not confined within hadrons. The scientific program of QM 2023 was broken down into the following fifteen topics: Chirality, Collective Dynamics, Critical point searches, Electromagnetic Probes, Future facilities/detectors, Heavy flavor physics, Initial state of particle collisions, Jets, Light and strange flavor physics, New theoretical developments, Nuclear astrophysics, Physics of the Future Electron Ion Collider and the RHIC Spin program, Physics of ultra-peripheral collisions, QCD at finite density and temperature, and Small systems.

The conference program started with a Student Day with introductory lectures for about 300 students and young postdocs held by Profs. Hemmick, Elayavalli, Zbroszczyk, Ruan, Schaefer, Scomparin, Takaki, and Aschenauer. Opening remarks to the main conference were given on Monday morning by the Presidents of the Univeristy of Houston and Rice University, Profs. Renu Khator and Prof. Reginald DesRoches, as well as the Associate Director for Nuclear Physics of the Department of Energy Office of Science, Dr. Timothy Hallman. The plenary sessions opened with a keynote talk by Nobel Prize Winner Prof. David Gross on 50 years of Quantum Chromodynamics and the Quark–Gluon Plasma, followed by presentations of the highlights from nine large Collaborations at the LHC, RHIC, SPS and GSI.

The first-day plenary program was completed by a selection of focus talks on current hot topics, such as lattice QCD, Nuclear Astrophysics, new Analysis Tools and Diversity, Equity and Inclusion in Nuclear and Particle Physics.

Topical parallel sessions and the poster session covered Tuesday and Wednesday of the conference. The final two and a half days were allocated to plenary presentations, flash talks for the best poster presenters and a summary talk. The presentations included 36 invited plenary talks, 210 parallel talks, 10 flask talks, and 282 posters. The conference highlighted many new results in experiment and theory. Representatives from twelve experimental Collaborations (ALICE, ATLAS, CBM, CMS, ePIC, HADES, LHCb, NA60+, NA61/SHINE, PHENIX, sPHENIX, and STAR) presented new results or future plans.

The LHC Collaborations reported new measurements on collective dynamics and hard probes of hot and dense strongly-interacting matter, studied in detail from small to large colliding systems. The RHIC Collaborations presented new results at finite baryon density and searches for a critical point, as well as preparations for a final campaign of heavy ion and proton beams utilizing the new sPHENIX detector. On the theory side, steady progress was reported on the development of a comprehensive description of the entire evolution of heavy-ion collisions, from the initial stages to the hydrodynamic evolution and hadronization of the system, as well as of the in-medium interactions of the various types of probes. The link of the physics of Quark Matter to astrophysics and emerging fields, such as quantum computing and machine learning, was highlighted in numerous plenary and parallel talks.

During the last day of the conference, young scientists were presented with the 2024 Zimanyi Nuclear Theory Medal and the APS and EPJ Young Scientist Awards for the best talks. Prize Winners were: Dr. Gabriel Denicol (for the Zimanyi Medal), and Drs. Kara Mattioli and Yu Shi for best postdoc presentation and Deborah Mrozcek, Dylan Neff, and Afnan Shatat for best student presentations. The scientific program concluded with a comprehensive overview talk by Prof. Helen Caines.

Social Program highlights included an excursion to NASA, a ballet performance by the Houston Ballet and an ‘After Dinner’ presentation by Marc Abrahams, the founder and Master of Ceremony of the IG Nobel Prize.

The financial contributions from many national and international organisations enabled the participation of more than 300 young scientists. The Organizing Committee thanks the following organizations: the Department of Energy, the National Science Foundation, the University of Houston, Rice University, Texas A&M University, Yale University, the Laboratory for Nuclear Science at MIT, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, Oak Ridge National Laboratory, Brookhaven National Laboratory, the American Physical Society, the European Organization for Nuclear Research (CERN, Switzerland), the ExtreMe Matter Institute (EMMI) and the GSI Helmholtz Centre for Heavy Ion Research (Germany), The European Journal of Physics - Web of Conferences, Central

China Normal University (China), Shandong University (China), Fudan University (China), The University of Science and Technology (China), and the Inter-American QCD Network of Networks.

Finally, we thank the International Advisory Committee for providing valuable advice. Without their input, the scientific and organizational success of Quark Matter 2023 would not have been possible. We warmly thank the members of the Organizing Committee, the team of secretaries, technical and administrative support staff, and our more than thirty student and postdoc helpers for ensuring that all aspects of the meeting were handled smoothly and efficiently. A special acknowledgement goes to our administrative coordinators, Rachell Marks from UH, for her efficiency and dedication before and during the conference.

More information about the conference, including all oral and poster presentations, can be found at https://indico.cern.ch/e/QM2023. The 31st International Conference on Ultra-relativistic Nucleus–Nucleus Collisions, Quark Matter 2025, will be held in Frankfurt, Germany, on April 6-12, 2025. We are looking forward to welcoming everybody back in Frankfurt.

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Ivan Vitev

Conference Demographics

The main demographics displayed here are based on the 650 attendees. Originally we had 810 registrations, but many of our Asian colleagues experienced visa problems and had to cancel their attendance. Thus, the Country of Origin distribution (Fig.1) is somewhat slanted towards Europe and the United States.

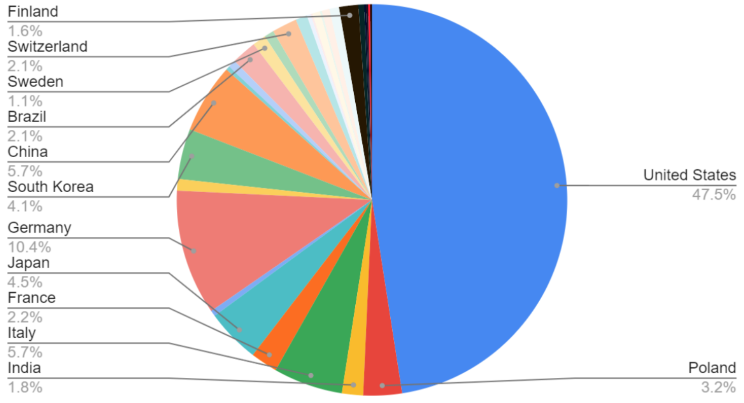

Figure 1. Country of Origin.

The gender distribution (Fig.2) has been slighlty adjusted for the presentations. 22% of the parallel speakers were female, 29% of the poster presenters were female and 35% of the plenary speakers were female.

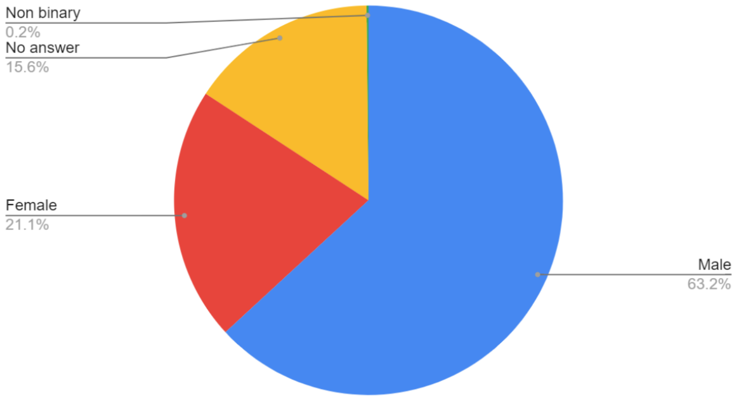

Figure 2. Gender distribution.

The career position distribution shows that the field is vibrant and active, which is highlighted by around 60% of the attendees identifying as students or postdocs.

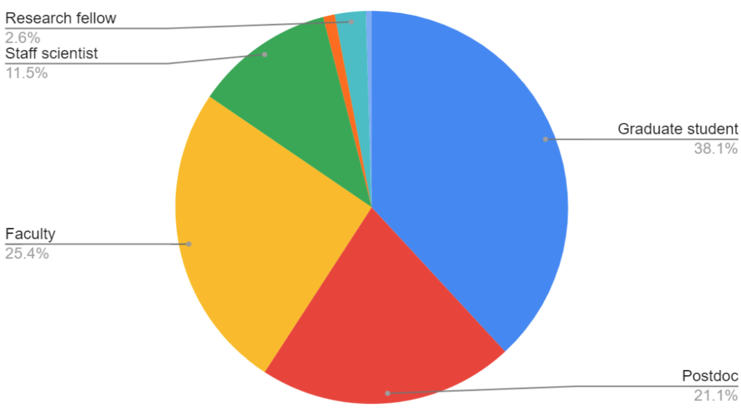

Figure 3. Career position.