

PREFACE

The Rochester conference ICHEP'06, the thirty third in this series, was held on 26 July — 2 August, 2006 in the main building of the Russian Academy of Sciences in Moscow.

About a thousand physicists from 53 countries took part in the conference. The extensive scientific program consisted of 27 plenary reports and 365 original presentations at 14 parallel sessions. In addition, 95 poster presentations were displayed. For six days, the conference participants discussed urgent issues of astrophysics and cosmology, neutrino physics, lattice and quantum field theory, heavy-ion collisions and quark-gluon matter, hard and soft processes in quantum chromodynamics, physics of electroweak interactions, rare decays of elementary particles, spectroscopy and exotic states of hadrons, heavy quark physics, theoretical scenarios and experimental searches beyond the Standard Model, creation of a unified system GRID for data processing, new accelerators and particle detectors, mathematical aspects of quantum field theory and string theory.

On the theory side, the progress in the so-called “practical theory” is evident, primarily in sophisticated calculations in quantum chromodynamics. Splendid harmony of analytical calculations with the results obtained on the lattice with account of dynamics of quarks is a remarkable achievement. Considerable emphasis in theoretical discussions was placed on the concept and use of gravity/gauge duality, the framework generalizing the renown AdS/CFT correspondence. This duality is a conjectured relationship between confining gauge theories in four dimensions, on the one hand, and gravity and string theory in five and more dimensions, on the other.

On experimental side, numerous candidates for exotic hadronic states, both with light quarks only and with heavy quarks and/or gluons, were confirmed or newly reported. These exotic states are yet to be given theoretical interpretation, within either gravity/gauge duality or more traditional approaches.

A relatively novel area of QCD — properties of matter at high temperatures and particle densities — is under intense study at the Relativistic Heavy Ion Collider in Brookhaven.

With the B-factories and Tevatron in operation, the conference witnessed impressive progress in flavor physics, including B-meson decays, processes with CP-violation.

Precision measurements of the masses of the heaviest known particles are still an important aspect of experimental high energy physics. New results in this area presented at the conference were based mainly on the data from the CDF and D0 collaborations at the Tevatron.

Considerable attention at this conference was paid to the search for new physics. Numerous possible properties beyond the Standard Model, such as supersymmetry, extra space-time dimensions, effective contact interactions in quark and lepton sectors, additional heavy gauge bosons, excited states of quarks and leptons, leptoquarks, etc., are more constrained than before. Yet the majority of the community is confident that new physics is within the reach of LHC, and, indeed, more theoretical scenarios for TeV-scale physics beyond the Standard Model were presented at the conference.

More generally, the atmosphere at the conference was largely determined by the fact that it was the last pre-LHC Rochester meeting.

Properties of neutrinos continue to be among the top issues. The first data reported at this conference by the new player — MINOS collaboration — support the pattern of the oscillations of muon neutrinos observed by Super-K and K2K.

Astroparticle physics is another area of continuing interest. The new measurement of the neutron lifetime contributes considerably to the calculation of the abundance of primordial Helium-4 in the Universe. Techniques for the direct and indirect detection of dark matter particles are rapidly developing, with indications for positive signals from DAMA and EGRET still persisting.

Traditionally, the Rochester conference discusses future accelerators for high energy physics and new developments in particle detection, and receive reports from the International Committee for Future Accelerators (ICFA) and IUPAP Commission on Particles and Fields (C11). This was particularly timely in Moscow in view of the upcoming LHC. At present, the world scientific community is widely discussing a new mega-project of the 21st century — the ILC. Together with the LHC at CERN, the new machine will be a unique tool for studying fundamental properties of matter and the Universe.

In his concluding report V. Rubakov (INR Moscow) summarized the discussions at the conference with emphasis on the current confusion of (some) theorists regarding new physics and on the impact of LHC on the entire field and beyond. Hopefully, with the first results from LHC, at least some of the numerous questions raised in Moscow will be answered at the next Rochester conference — 2008 in Philadelphia.

The participants and guests of the conference took part in an extensive, traditionally hospitable cultural program including excursions around Moscow, the Moscow region, St.-Petersburg and other Russian cities after the conference.

We wish to thank the members of the Organizing Committee, the conveners of parallel sessions who worked hard to make the Conference a success. Special thanks are due to members of the International Advisory Program Committee for setting-up the scientific directions at an early stage of planning. We would also like to take this opportunity to express our sincere gratitude to all those who gave us financial and/or logistic support: International Union of Pure and Applied Physics, the Russian Academy of Sciences, the Moscow State University, the Joint Institute for Nuclear Research, the RF Federal Agency of Science and Innovation.

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V. A. Matveev (INR RAS, Moscow) A. N. Skrinsky (BINP, Novosibirsk)
 V. I. Savrin (SINP MSU, Moscow) A. N. Sissakian (JINR)