

PREFACE

International Conference on “Strongly Coupled Coulomb Systems” (July 24–29, 2022, Görlitz, Germany)

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This special issue contains papers presented at the International Conference on Strongly Coupled Coulomb Systems (SCCS) held from July 24–29, 2022 at the Cultural Forum Görlitz Synagogue in Görlitz in Germany, under the auspices of the Center for Advanced Systems Understanding (CASUS), a newly established German-Polish research institute that brings together researchers from many disciplines. As an institute of the Helmholtz-Zentrum Dresden-Rossendorf, CASUS was able to provide the generous financial support, experience, and infrastructure needed to host a major international event of this type.

The SCCS conference series provides a forum where physicists, material scientists, chemists, engineers, and mathematicians from a variety of disciplines can communicate across disciplinary boundaries. Its purpose is to provide a regular international forum for presentation and discussion of research achievements and ideas relating to many different plasma-liquid and condensed-matter systems that are dominated by strong Coulomb interactions between their constituents. The series name SCCS encompasses diverse many-body systems and physical conditions. A special feature of the series is to bring people together from very different fields, researchers who share a common interest in systems with strong Coulomb interactions. The SCCS Conferences emphasize common behavior and techniques arising from these interactions, an emphasis which favors cross fertilizations that would otherwise never happen. Each meeting has seen an evolution of topics and emphasis that follow on the heels of new discoveries and new methods, driven by new experimental tools and access to new strongly coupled conditions. This makes for a vibrant and challenging field.

This was the 15th in the Conference series that was initiated in 1977 at Orleans-la-Source in France as a NATO Advanced Study Institute on Strongly Coupled Plasmas, hosted by Marc Feix and Gabor J. Kalman. There followed:

1982: Les Houches, France (hosted by Marc Baus and Jean-Pierre Hansen);
1986: Santa Cruz, California, USA (hosted by Forrest J. Rogers and Hugh E. DeWitt);
1989: Tokyo, Japan (hosted by Setsuo Ichimaru);
1992: Rochester, New York, USA (hosted by Hugh M. Van Horn and Setsuo Ichimaru);
1995: Binz, Germany (hosted by Wolf-Dietrich Kraeft and Manfred Schlanges).
In 1996, in order to expand the range of research topics, the name of the series was altered from Strongly Coupled Plasmas to SCCS.
1997: Boston, Massachusetts, USA (hosted by Gabor J. Kalman);
1999: St Malo, France (hosted by Claude Deutsch and Bernard Jancovici);
2002: Santa Fe, New Mexico, USA (hosted by John F. Benage and Michael S. Murillo);
2005: Moscow, Russia (hosted by Vladimir E. Fortov and Genri E. Norman);
2008: Camerino, Italy (hosted by David Neilson and Gaetano Senatore);
2011: Budapest, Hungary (hosted by Zoltan Donko and Peter Hartmann);
2014: Santa Fe, USA (hosted by Frank Graziani and Michael S. Murillo);
2017: Kiel, Germany (hosted by Michael Bonitz).

This 15th conference covered theory, simulation, and experiment. Systems and topics of interest are strikingly diverse: confined and mesoscopic Coulomb systems; dense and astrophysical plasmas (planetary and stellar interiors); dense

hydrogen; dense plasmas generated by shock waves or by laser, ion, or electron beams; dusty plasmas; electron–hole plasmas in semiconductors and nanostructures; non-neutral and ultra-cold plasmas; quark-gluon plasmas; statistical and kinetic theories of classical charged-particle systems; new developments in theoretical methods and numerical techniques. In addition, on each occasion, the local organizers can add an extra topic to reflect their own research speciality, and in this case, the intersection of Coulombic systems with machine-learning methods.

The local organizers succeeded in providing a relaxed and stimulating atmosphere in the charming medieval town of Görlitz located right on the German-Polish border. In such an atmosphere, productive scientific exchanges were readily achieved. The Program Committee, in consultation with the International Advisory Board, assembled a stimulating scientific program with exciting talks and poster contributions that gave participants a comprehensive overview of the latest scientific research results in SCCS.

The conference was held in the waning days of the COVID pandemic, and it proved a very welcome re-entry into the world of face-to-face meetings. A hybrid format permitted researchers to also contribute virtually. Talks were streamed online, with additional cameras and microphones to allow questioners to be seen and heard by all the virtual participants.

Over 100 researchers from four continents participated in the conference. The papers in these proceedings capture the depth and breadth of the field of SCCS. Papers were all peer reviewed in accordance with the high standards of Contributions to Plasma Physics. The practical assistance of the Editorial Board of the journal and its Managing Editor Dirk Naujoks are gratefully acknowledged. Two papers were selected as Editors' choice and they are freely available to read: P. Toliaş "On the Klimontovich description of complex (dusty) plasmas" and C. Makait et al., "Time-dependent charged particle stopping in quantum plasmas: testing the G1-G2 scheme for quasi-one-dimensional systems." We believe that researchers in the area of strongly correlated systems, and Strongly Correlated Coulomb Systems in particular, will find this compilation of work presented at SCCS-2022 educational and of practical use in their research.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available in Rossendorf Data Repository (RODARE) at <https://rodare.hzdr.de/>.

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