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Special Issue on Critical Stability

Preface

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This special issue contains 24 articles devoted to various aspects of Few-Body physics, under the title *Critical Stability*.

This is the physics of low-lying resonances, or weakly bound states, including improbable configurations whose stability sometimes challenges our naive intuition, and whose description requires new methods. The experimental approach to these states involves very sophisticated devices and analyses.

The applications are numerous and often of paramount importance. Historically, the negative hydrogen ion is perhaps the first *halo*: its stability requires quantum mechanics beyond a simple factorised wave function, and its existence is crucial in many chemical and biochemical processes, as well as for understanding the optical properties of the Sun's surface. Similarly, the nuclear synthesis uses nuclear states at the edge of stability.

The physics of critical stability is intrinsically interdisciplinary, with concepts and methods elaborated for nuclei, further developed for atoms, and vice-versa. Most contributors have themselves crossed several times the border of the physics of quarks, nuclei, atoms or molecules.

From these combined fields and from the variety of geographical and historical origins, this domain has inherited a rich vocabulary: universality, Efimov states, Borromean binding, Tango stability, rearrangement, etc., in addition to the already mentioned “halo”, coming as a leitmotiv.

This physics is more and more discussed in atomic and nuclear-physics conferences, and of course in various “Few-Body” meetings. It has also motivated various dedicated workshops, where experts can discuss their progress and speculations in some more details. It is hoped that this special issue will inform both experts and non-experts about the recent developments.

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