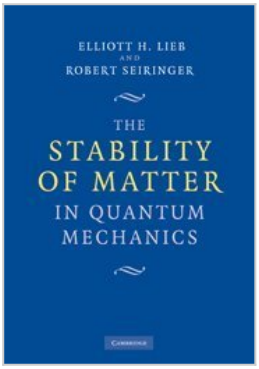

The Stability of Matter in Quantum Mechanics

By Elliott H. Lieb, Robert Seiringer

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Research into the stability of matter has been one of the most successful chapters in mathematical physics, and is a prime example of how modern mathematics can be applied to problems in physics. A unique account of the subject, this book provides a complete, self-contained description of research on the stability of matter problem. It introduces the necessary quantum mechanics to mathematicians, and aspects of functional analysis to physicists. The topics covered include electrodynamics of classical and quantized fields, Lieb-Thirring and other inequalities in spectral theory, inequalities in electrostatics, stability of large Coulomb systems, gravitational stability of stars, basics of equilibrium statistical mechanics, and the existence of the thermodynamic limit. The book is an up-to-date account for researchers, and its pedagogical style makes it suitable for advanced undergraduate and graduate courses in mathematical physics.

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Editorial Review

Review

Pre-publication praise: "This is an outstanding book which will be used both for research and for teaching. It will make an excellent text for a graduate course in either a physics or mathematics department. Physics students will learn to appreciate the beauty and relevance of mathematics and vice versa. The authors are leaders in the field. Their book not only describes important results but also makes them exciting."
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Pre-publication praise: "The stability of matter - in the sense that the binding energy of any agglomerate of particles never exceeds their rest energy - is one of the important contributions of quantum mechanics to the functioning of our cosmos. But quantum mechanics alone is not enough. It is necessary to distinguish the difference between the two kinds of elementary particles, fermions and bosons, for the tremendous increase of the binding energy with the number of bosonic particles violates the required energy bound and makes them unsuitable for ordinary matter. Maybe that's why we live in a fermionic world. These subtleties and much more are hidden in the innocent looking Schroedinger equation. To distill that out you need the appropriate mathematical tools, as provided in this magnificent book where on each page you can feel the hands of masters of the subject."
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Pre-publication praise: "Why does matter, from the size of atoms to stars avoid collapse? "The Stability of Matter in Quantum Mechanics" gives an impeccably written, self-contained introduction to the gems of this subject and the beautiful work of Elliott Lieb and coworkers over the past several decades. Every argument is ideally polished in this concise masterpiece. This book is an absolute must for any graduate students and active researchers, both mathematicians and physicists, interested in how a powerful yet elegant mathematics has answered one of the fundamental problems in mathematics and physics."
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"This book enjoys all the qualities that make it certain to become a standard reference for both researchers as well as students in the stability of matter field for many years to come."
H. Hogreve, Mathematical Reviews

"...the book's pedagogical style carefully guides them through the physical concepts and relevant mathematics before putting all the pieces together. Students and teachers alike will enjoy a marvelous experience as they learn from [this book]." Physics Today

About the Author
Elliott H. Lieb is a Professor of Mathematics and Higgins Professor of Physics at Princeton University. He has been a leader of research in mathematical physics for many decades, and his achievements have earned him numerous prizes and awards, including the Heineman Prize in Mathematical Physics of the American Physical Society, the Max-Planck medal of the German Physical Society, the Boltzmann medal of the International Union of Pure and Applied Physics, the Schock prize in mathematics by the Swedish Academy of Sciences, the Birkhoff prize in applied mathematics of the American Mathematical Society, the Austrian Medal of Honor for Science and Art, and the Poincaré prize of the International Association of Mathematical Physics.

Robert Seiringer is an Assistant Professor of Physics at Princeton University. His research is centred largely on the quantum-mechanical many-body problem, and has been recognized by a Fellowship of the Sloan Foundation, by a U.S. National Science Foundation Early Career award, and by the 2009 Poincaré prize of the International Association of Mathematical Physics.

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