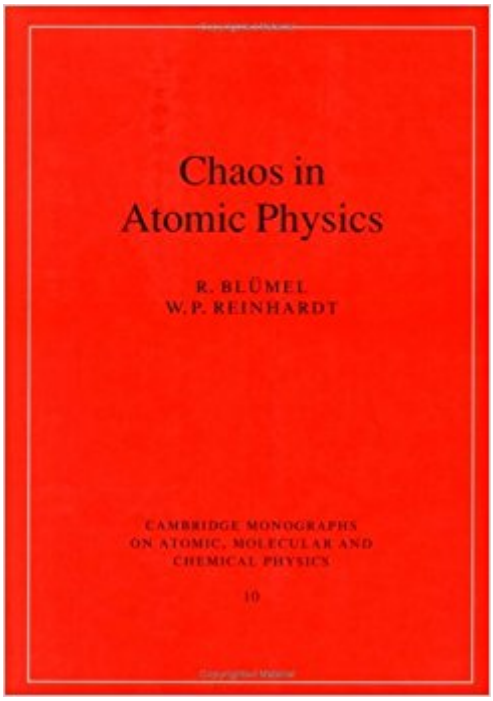
Chaos In Atomic Physics (Cambridge Monographs On Atomic, Molecular And Chemical Physics)



Synopsis

The study of chaos is today one of the most active and prolific areas in atomic physics. This book describes the manifestations of chaos in atoms and molecules, and is an introduction to this fascinating area. The first part of the book deals with the theory and principles of classical chaos, which are then applied to actual atomic and molecular physics systems in the second part of the book. The book covers microwave-driven surface state electrons, the hydrogen atom in a strong microwave field, the kicked hydrogen atom, chaotic scattering with CsI molecules and the helium atom. The book contains many diagrams and a detailed reference list.

Book Information

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Customer Reviews

"The book under review is the first very successful attempt to summarize the main results of this research area in a monograph....The book contains a comprehensive list of references and has a style that makes it easy to read. It contains many useful physical remarks and suggestions for new experiments. It will be read with keen interest by graduate students and scientists working in this new developing branch of chaotic science, and, because of its unique features, stands out in the current literature devoted to chaos." Journal of Statistical Physics"To their credit, the authors provide a useful introduction to aspects of chaos that arise in some atomic problems." Physics Today"...warmly recommended not only as an excellent textbook for graduate students in atomic physics, but also as a pleasant reading for researchers who want an introduction to chaos in

classical and quantum mechanics." Mathematical Reviews

About ten years ago, atomic physics received a rejuvenating jolt from chaos theory with far-reaching implications. The study of chaos is today one of the most active and prolific areas in atomic physics. This is the first attempt to provide a coherent introduction to this fascinating area. In line with its scope, the book is divided into two parts. The first part (chapters 1 - 5) deals with the theory and principles of classical chaos. The second part applies these ideas to actual atomic and molecular physics systems.

If you’re an atomic physicist, or someone interested in quantum physics in general which might have a chaotic classical regime, this is a fantastic light treatment of the subject. I think it’s written clearly enough, a first year graduate student shouldn’t have much difficulty with it. Any Ph.D. in physics should be able to read it. It is a start to finish survey of the field as current in 1997.It starts off with a decent explanation of chaos in classical mechanics, leading up to what is probably the best brief treatment of chaos in quantum mechanical (and wave mechanical) systems I have ever read. You won’t become an expert in ’quantum chaos’ from reading chapter 4, but you will be well informed in the subject. From there, the book goes on to treat the standard models and experimental systems; the kicked rotor, the microwave ionization of hydrogen (as pioneered by Jim Bayfield and Peter Koch). It ends up with a nice treatment of the helium atom. There are a few experimental odds and ends I would have put in this chapter (easy for me to say), dealing with experimental reasons chaos in helium may be unobservable, but that’s probably a silly complaint on my part.I didn’t really understand why they put in the chapter on CdI scattering; I figure diamagnetic hydrogen is a more important and interesting quantum chaotic system -I’m guessing this is because the authors did some work with this system. No accounting for taste, I suppose.There are things I’d like to see included in such a book; I think Joe Ford’s late contributions to the field were very important. For example, I do not think the "Ford paradox" has been adequately thought through by anyone, and I think it is a very important question. It should be one of the great challenges of science; it touches on the very roots of quantum mechanics (and dynamics) in a clear and compelling way. Of course, only a few of my chums have even heard of the Ford paradox, so I probably can’t complain too much that B & R don’t think it is important enough to talk about. Future editions should probably also treat the Loschmidt Echo, as that seemed to be a fertile area of research as to characterization of quantum chaos around the time I left the field.All in all, this is a great example of clear, witty scientific writing on a very interesting subject.

This text is a very good summary of chaos in atomic and molecular physics. It starts by giving some examples in the first champter and then builds its way up from numerical chaos, classical chaos, and finally quantum chaos. Unfortunately, this material is relatively new and not part of the core cirriculum of most undergrade physics programs so most of the material is unfamiliar to most students. However, along with a book which goes more in depth to the fundementals of the subject it would make a fine text (but not alone).

Chaos in Atomic Physics (Cambridge Monographs on Atomic, Molecular and Chemical Physics) Atomic and Molecular Radiation Physics (Wiley Monographs on Chemical Physics) The Chemical Physics of Ice (Cambridge Monographs on Physics) Light at Extreme Intensities 2011 (AIP Conference Proceedings / Atomic, Molecular, Chemical Physics) Quantum Electrodynamics: Gribov Lectures on Theoretical Physics (Cambridge Monographs on Particle Physics, Nuclear Physics and Cosmology) Fundamental Aspects of Plasma Chemical Physics: Transport (Springer Series on Atomic, Optical, and Plasma Physics) Chemical Bonds: An Introduction to Atomic and Molecular Structure Chemical Oscillations and Instabilities: Non-linear Chemical Kinetics (International Series of Monographs on Chemistry) Advances in Chemical Physics, Volume 15: Stochastic Processes in Chemical Physics (v. 15) Numerical Methods with Chemical Engineering Applications (Cambridge Series in Chemical Engineering) Atomic Spectra and Radiative Transitions (Springer Series in Chemical Physics, Vol. 1) Twistor Geometry and Field Theory (Cambridge Monographs on Mathematical Physics) Covariant Loop Quantum Gravity: An Elementary Introduction to Quantum Gravity and Spinfoam Theory (Cambridge Monographs on Mathematical Physics) Quantum Field Theory and Condensed Matter: An Introduction (Cambridge Monographs on Mathematical Physics) The Scalar-Tensor Theory of Gravitation (Cambridge Monographs on Mathematical Physics) Superstring Theory: Volume 1, Introduction (Cambridge Monographs on Mathematical Physics) Superstring Theory 2 Volume Hardback Set: 25th Anniversary Edition (Cambridge Monographs on Mathematical Physics) Cambridge Global English Stage 9 Workbook: for Cambridge Secondary 1 English as a Second Language (Cambridge International Examinations) Advanced Molecular Quantum Mechanics: An Introduction to Relativistic Quantum Mechanics and the Quantum Theory of Radiation (Studies in Chemical Physics) The Atomic Sea: Part Seven: The Atomic Jungle

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