popular science writing; in particular, his book is almost completely devoid of analogies. Personally, I am not that fond of analogies when explaining quantum mechanics, since they are invariably misleading in one way or another, but a few well-chosen ones can liven things up.

The author indulges in a good deal of philosophical hair-splitting. Some of it, such as the distinction between parameter independence and outcome independence, is helpful for understanding the material; some, such as the author's insistence that the EPR paper was correct, is not. Also, the book is littered with formulas, mostly state vectors written as kets. Although perhaps sometimes abstract, none of the math in the book is in other respects more difficult than addition, but a reader unwilling or unable to parse statements containing mathematical symbols will not get far.

Unfortunately, part 3 is not as reliable as the first two parts. It contains several errors, mostly small but a few more significant. For instance, in the discussion on private-key cryptography, the author appears to confuse the one-time pad with DES, a now-retired private-key encryption protocol. The one-time pad is completely secure, independent of how much computer power the eavesdropper Eve can throw at the problem, so long as the sender Alice and the receiver Bob use a secret key that is as long as the message and is not reused. By contrast, DES can be broken with a concerted computational effort by Eve. Outdated portions in this section include the discussion of how to build a quantum computer.

The New Quantum Age fits into an unusual niche. It provides an exceptionally detailed look at the physics and the historical development of the notion that hidden classical variables underlie quantum indeterminacy, and it also carefully examines the major theoretical and experimental results bearing on it. And it does this at a level completely accessible to a layperson, albeit one who is willing to work to attain understanding. For someone interested in other interpretations of quantum mechanics or wishing to learn about quantum computation, this is not the place to go. But for those interested in hidden variable theories, *The New Quantum Age* provides an authoritative introduction.

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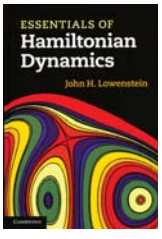
Essentials of Hamiltonian Dynamics

John H. Lowenstein
Cambridge U. Press, New York, 2012.
$60.00 (188 pp.).
ISBN 978-1-107-00520-4

If two people are teaching separate courses on Hamiltonian dynamics, there is a good chance that the classes will be completely different. A course for mathematicians will be quite different from one for physicists; an introductory course will be different from one for advanced students. Also, the instructor's selection of topics will usually reflect his or her personal taste.

The choice of a textbook certainly depends on a course's aim and style. For a course aimed at students who intend to study the internal structure of Hamiltonian dynamics rather than to use it for applications, one good option is Vladimir Arnold's *Mathematical Methods of Classical Mechanics* (2nd edition, Springer, 2010). For students looking for tools to attack problems in celestial mechanics, there's the useful text by Kenneth Meyer, Glen Hall, and Dan Offin, *Introduction to Hamiltonian Dynamical Systems and the* N*-Body Problem* (2nd edition, Springer, 2010).



John Lowenstein's *Essentials of Hamiltonian Dynamics* will be particularly helpful for physics instructors. The ideal reader for this book is a graduate physics student who has already been exposed to the Lagrangian and Hamiltonian formulations of classical mechanics, has a basic knowledge of the theory of dynamical systems, and now needs sufficient familiarity with Hamiltonian dynamics to apply its methods and results to specific models and systems.

The introductory chapter is a review of the fundamentals of classical mechanics; it introduces the notion of configuration space as a differential manifold, briefly covers the Lagrangian and Hamiltonian formulations, and works through some basic examples. Chapter 2 introduces the Hamiltonian formalism. Chapter 3 defines integrable systems; considers several examples, including the spherical pendulum and the three-particle Toda model; and formulates the Liouville–Arnold theorem and gives an idea of its proof. The basics of canonical perturbation theory are described in chapter 4. Then in chapter 5,

the author addresses order and chaos in Hamiltonian systems and introduces such topics as the Kolmogorov-Arnold-Moser (KAM) theory, Lyapunov exponents, and several illustrative systems, including the kicked oscillators and a chaotically rotating moon. He devotes chapter 6, the final chapter, to the dynamics of the swing–spring model that serves as an example of how all the previously introduced notions and techniques can be used to study the properties of a particular system. Each chapter concludes with a collection of exercises.

A special feature of the book that may attract some readers, and repel others, is the extensive use of the Mathematica computational software. Mathematica helped create pictures and numerical data in the text, and many exercises are formulated as numerical experiments that students are expected to solve using Mathematica. Also, the author provides an appendix that includes samples of the Mathematica programs used in the text.

Overall, *Essentials of Hamiltonian Dynamics* offers a minimalistic approach, which, depending on the reader, can be a plus or a minus. The choice of topics is natural for a one-semester graduate course, but many traditional "enrichment topics" are mentioned barely or not at all. In general, the book mostly emphasizes how this or that notion or phenomenon appears in particular models. Also, the exposition of the standard topics is sometimes sketchy. For example, the entire KAM theorem, which addresses quasi-periodic motions in near-integrable systems, is presented in only five pages. The author also uses a bare minimum of mathematical tools. For instance, although the notion of differential manifold was introduced and used, the book completely avoids the language of differential forms. The minimalistic approach also reveals itself in the references section, which contains a mere 47 items, mostly to original sources rather than to easier-to-read modern expositions.

This book does not provide a comprehensive exposition on the state of the art in Hamiltonian dynamics. Instead, it provides a shortcut to many amazing and useful applications of this fascinating subject. I have no doubt that many instructors and students will benefit from this text.

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Diamondoid Molecules

With Applications in Biomedicine, Materials Science, Nanotechnology and Petroleum Science

G. Ali Mansoori, Patricia Lopes Barros de Araujo, and Elmo Silvano de Araujo
World Scientific, Hackensack, NJ, 2012. $128.00 (400 pp.).
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Of the many biologically interesting molecules in existence, few have attracted such broad interest as diamondoids, cage-like organic hydrocarbon molecules whose structures are similar to diamonds'. One can think of diamondoids as truncated diamonds whose dangling bonds are terminated with hydrogen atoms. Similar to diamonds, diamondoids can be stiff, comparable to graphite and carbon nanotubes. Besides serving in applications that exploit their physical properties, including their strength, they are the building blocks