the Indian Ocean, they would still be alive today.

This recalls the wisdom of Solomon: *I returned, and saw under the sun, that the race is not to the swift, nor the battle to the strong, neither yet bread to the wise, nor yet riches to men of understanding, nor yet favour to men of skill; but time and chance happeneth to them all.* Ecclesiastes 9:11.

1. Gould, Stephen Jay, *Nat. Hist.*, 1996, **105**, 22–33.
2. Shapiro *et al.*, *Science*, 2002, **295**, 1683.

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Lectures on Quantum Mechanics. Ashok Das. Hindustan Book Agency, India, P-19 Green Park Extension, New Delhi 110 016. 2003. 528 pp. Price: Rs 600.

Quantum mechanics provides the basic structure on which most of modern physics and chemistry is built. The fundamentals of the subject were developed almost a century ago by scientists who were mainly trying to understand the nature of electromagnetic radiation, atoms and molecules, and the interactions between the two. Since then, the domain of applicability of quantum mechanics has broadened to encompass a vast range of natural phenomena and objects such as radioactivity, chemical bonds, superconductivity and neutron stars. Some of the most useful devices invented by mankind directly use the principles of quantum mechanics, such as transistors, lasers and nuclear magnetic resonance imaging.

Quantum mechanics is unusual in that many of its concepts seem to contradict the intuition we build-up through our daily observations which are made at length, time and mass scales typical to human beings. Learning quantum mechanics therefore requires putting aside many of our notions which are based on classical mechanics, and a willingness to think about the world in some strange ways. Even people who have many years of familiarity with quantum mechanics are sometimes struck by its apparent contradictions with common sense. This explains why new ways of understanding or applying quantum mechanics continue to be developed even after a century, some examples being geometric phases, Bell's inequalities, entanglement, decoherence and quantum computation.

As already mentioned, some knowledge of quantum mechanics is essential for working in most areas of modern science. Considering the importance of the subject, it is not surprising that there are many textbooks at the elementary level. Most of these textbooks cover more or less the same material and use similar mathematical techniques. The main feature which distinguishes different books from each other is the way in which the authors explain the physical concepts.

The book under review covers most of the topics which are usually taught in a two-semester course on quantum mechanics, such as a brief review of classical mechanics and the essential mathematical concepts, the basic postulates of quantum mechanics, solutions of the Schrödinger equation in one and three dimensions in the presence of various kinds of potentials (in particular, the harmonic oscillator and the hydrogen atom), orbital and spin angular momentum, the variational method and the WKB approximation, time-independent and time-dependent perturbation theory, scattering theory, the Klein–Gordon and Dirac equations, and path integrals.

A distinctive feature of the book is that the author presents the complete details of almost every calculation. Indeed, the author says in the preface that the material almost follows word-to-word the lecture notes of some two-semester courses on quantum mechanics that he has taught in the University of Rochester over the years. This makes it possible for a reasonably motivated student to work through the entire book, with no help from anyone else. I cannot say this of any other book on quantum mechanics that I have seen.

The physical explanations that the author provides at various points and his choice of examples to illustrate different ideas are generally excellent. For instance, when discussing tunnelling, he works out in detail the rate of cold emission of electrons from a metal, and the lifetime of alpha decay of heavy nuclei. Similarly, the connection formulae in the WKB formalism, the ground state of the helium atom, the fine structure of the hydrogen atom, and inelastic scattering are discussed with a thoroughness which is unusual for an elementary book on quantum mechanics. I also appreciated the inclusion of certain topics such as the dynamical symmetry of the hydrogen atom (the Runge–Lenz operator), some general remarks on groups, and path integrals, which are not always covered in books at this level.

On the other hand, this book omits several topics which are present in many other textbooks, such as the occurrence of bands in a periodic potential, the Aharonov–Bohm effect, the Landau levels of an electron in a magnetic field, the Zeeman effect, the Wigner–Eckart theorem, the hyperfine structure of atoms, the vibrational and rotational spectra of molecules, and electromagnetic transitions between different atomic states. Also, the book does not provide a large collection of problems for students to work out, and it does not discuss, even briefly, any of the new developments in quantum mechanics mentioned above. For the sake of completeness, I hope that the author will take some of these suggestions into account in a future edition.

Based on my experience in teaching quantum mechanics to Ph D students, I feel that the contents of the book can be covered in one and a half semesters rather than two semesters. I would strongly recommend the book to libraries and to students who are interested in learning the basics of the subject.

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