

A tasteful graduate text in quantum theory

Modern Quantum Mechanics

Jun John Sakurai, edited by San Fu Tuan
474 pp. Benjamin, Menlo Park, Calif., 1985.
\$45.95

Reviewed by Roger G. Newton

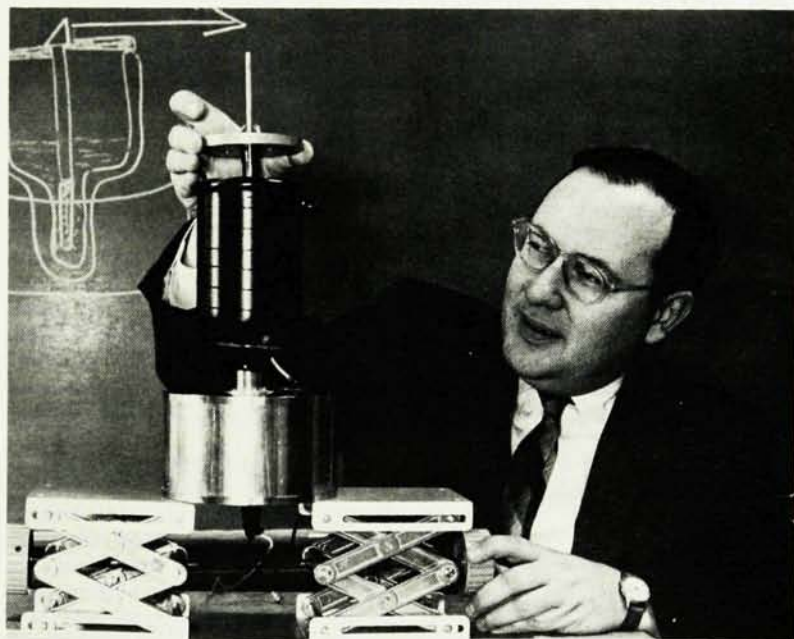
Jun John Sakurai was both a productive and imaginative particle theorist who paid close attention to experimental facts, and an elegant expositor with a strong interest in teaching. This book is based on an unfinished manuscript and lecture notes he left at his untimely death in 1982, which have been edited by San Fu Tuan. It is intended for a first-year graduate course for students who have absorbed a good preparation in wave mechanics at the junior or senior level. Sakurai's goals in adding one more volume to the large number of existing graduate texts in quantum mechanics were "clarity of presentation, a sharp focus on the key concepts, and attention to important recent experimental and theoretical developments in the field (e.g., neutron interferometer experiments, Feynman path integrals, correlation measurements, and Bell's inequality)." The book admirably succeeds in these aims.

After a brief discussion of the Stern-Gerlach experiment for conceptual purposes, Sakurai proceeds straight to the abstract Hilbert-space formulation of quantum mechanics in Dirac's notation. Students are expected to be familiar with both the early history of the quantum theory and solutions of the Schrödinger equation in various contexts. Sakurai makes frequent use of concrete physical examples and confines the mathematics to "formalism" (in contrast to rigor or abstraction). Each chapter is followed by a large set of carefully chosen problems, and the preface promises the availability of a solution manual to instructors adopting the text.

This book is concept oriented rather

than encyclopedic, which makes it an excellent text that can also be used easily by students on their own. The important recent developments mentioned above, which appear to be missing from most comparable texts, are discussed clearly and concisely. The chapter on identical particles even includes a brief exposition of Young tableaux, a technique for finding irreducible representations of permutation groups.

If I have a few minor criticisms they concern mostly some points in the chapter on scattering theory. The phase shift at a resonance is stated to rise rather than fall through $\pi/2$ (mod π), without explanation of the physical reason. The optical theorem is credited to Niels Bohr, Rudolph Peierls and George Placzek, as was customary for many years, rather than Eugene Feenberg or Lord Rayleigh. There is also no mention at all of the distinction



Arthur L. Schawlow demonstrating a ruby laser with a straight flash lamp and cylindrical reflector at Stanford University in 1962. This photo appears in *Laser Pioneer Interviews* (High Tech Publications, Torrance, Calif., 1985; \$17.95), a collection of interviews reprinted from *Lasers & Applications*. The interviews are intended to commemorate the 25th anniversary of the operation of the first laser in 1960. Members of the staff of *Lasers & Applications* interviewed 13 scientists, including three Nobel laureates, Charles Townes, Schawlow and Nicolaas Bloembergen; others include Gordon Gould, who outlined a plan for building a laser while a graduate student at Columbia University and who received two fundamental US patents on lasers, and Theodore H. Maiman, who built the first laser of any kind, a ruby laser, in 1960. In selecting the interviewees the editors tried to "sample the important areas" of laser science. Some of the interviews deal with early experiments while others concentrate on specific types of lasers, including excimer and free-electron lasers. Short biographical notes on the scientists precede the interviews, which are published in a question-and-answer format. A 33-page "Introduction to laser history" by Jeff Hecht and a short "Bibliography of laser history" complete the book. (Photo courtesy of High Tech Publications.)

Roger G. Newton, professor of physics at Indiana University, has taught quantum mechanics at the graduate level and has published extensively on quantum scattering theory.