

Book Reviews

Nuclear Structure, Vol. II: Nuclear Deformations. By Aage Bohr and Ben R. Mottelson. W. A. Benjamin, Inc., Reading, Massachusetts (1975). 748 pp. \$37.50.

At last the long-awaited Vol. II of Bohr and Mottelson's *Nuclear Structure* has appeared. It deals with nuclear deformations, a field that has been pioneered by the authors and for which they, together with J. Rainwater, received the 1975 Nobel Prize in physics. It is a monumental work. The central theme is the complementary nature (shades of Niels Bohr) of the concepts of the independent motion of the individual nucleons and the collective behavior of the nucleus as a whole. It demands the utilization of the full arsenal of available theoretical tools. As in Vol. I on single-particle motion and the bulk properties of nuclei [reviewed by this writer in *Nucl. Sci. Eng.*, **40**, 355 (1970)], it starts from symmetry considerations that classify and restrict the possible modes of excitation. They are then fleshed out by comparison with the vast experimental material and the study of model systems. The coupling constants are determined from parameters of observed nuclear spectra, but not from first principles. The authors have succeeded in incorporating the microscopic theory of collective motion from the analysis of particle-vibration coupling (which includes rotation as a special case). With this feature, the two now-available volumes constitute a self-contained and comprehensive view of nuclear dynamics.

The picture that emerges is one of vast richness. The authors have condensed an enormous amount of material in their book. It is enlivened by numerous sidelights on other domains of physics where related phenomena occur, and by many historical footnotes that describe how the ideas gradually evolved. It also includes a discussion of fission which represents extreme distortions of the nucleus. In support, there is an extensive bibliography with over 1000 entries that also show the pages where the references are quoted.

Is this then the ultimate book on nuclear structure? It represents a comprehensive representation of the work of the authors' famous Copenhagen school, which has revolutionized nuclear physics during the last 25 years. Bohr and Mottelson have to be admired for their concepts and insights, their leadership, and the enormous amount of labor required for the completion of this encyclopedic work. They have served science well.

However, there is place for one caution. No holds are barred in the exposition. The reader must be thoroughly familiar with advanced quantum mechanics and be well acquainted with the phenomenology of nuclear physics. Even if he has these prerequisites, his job is not an easy one. Due to the "multidimensionality" of nuclear physics, it is hardly possible to order its development in a logical

linear fashion. To overcome this difficulty, the authors have used the expedient of very extensive back and forth cross references. Thus, to get full value from the book, one has to study it again and again. As an introduction to the ideas and the main flow of thoughts, it is advisable to peruse the Nobel Lectures by Bohr and Mottelson, which have been published in *Rev. Mod. Phys.*, **48**, 345 and 357 (1976) and in *Science*, **193**, 203 and 287 (1976).

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About the Reviewer: In his long and distinguished career, Lothar Nordheim has witnessed and contributed to the development of quantum mechanics and the initiation and the fruition of nuclear energy. He has held positions in academia, at the national laboratories, and in industry. He is at present a consultant at the General Atomic Company in San Diego. He is a scientist rather than an engineer. As such, he is primarily interested in principles, philosophy, and fundamental methods, although he is well aware that meticulous regard for details is necessary in both types of endeavor. He is an alumnus of the Niels Bohr Copenhagen Institute and at least an acquaintance of the Aage Bohr and Ben Mottelson succession. He thus appears to be well qualified to review this book. He admits, however, that he found the going rather hard. It is quite likely that a younger generation of physicists will have an easier time. But anyhow, Mr. Nordheim acclaims this book as a milestone in nuclear science, although it may not be as useful for those primarily concerned with the practical applications of nuclear energy.

Of Acceptable Risk: Science and the Determination of Safety. By W. W. Lowrance. William Kaufmann, Inc., Los Altos, California (1976). 180 pp. \$4.95.

Professional loss-prevention people have long recognized that important contributions to the literature on safety have come from individuals outside the safety field. The author of this book, *Of Acceptable Risk*, has made a major contribution to the subject of loss control. Of course, Lowrance was well advised, as he acknowledges having received inspiration and guidance from G. B. Kistiakowsky, Emeritus Professor of Chemistry at Harvard University. Dr. Kistiakowsky was the major figure in