Book Reviews

Reactor-Noise Analysis in the Time Domain by Nicola Pacilio, Critical Review Series, U.S. Atomic Energy Commission, 98 pp., $3.00 (1969).

We are all indebted to Dr. Pacilio for his excellent Critical Review on the measurement and analysis of counting statistics from chain reacting systems. This volume throughout bears the stamp of the theoretician who has actually carried out experiments over the entire spectrum of techniques. His approach is direct, efficient and to the point, which perhaps slants the treatment toward those who are experienced in the field. For those readers this condensed format is ideal. Although some other readers might fault Dr. Pacilio for not including more detailed information on instrumentation, I find his philosophy of indicating methods of measurement by block diagrams to be preferable because this does not dilute his text with soon-to-be-obsolete information. One of the most useful contributions of this treatise is the unbiased consideration of advantages and limitations of the alternative techniques. Dr. Pacilio does not attempt to sell any particular method.

The division of the book is into four logical sections. The first, "Time Correlation Analysis Among the Neutron-Detection Pulses," treats the Rossi-alpha method and other derived techniques. Dr. Pacilio does dwell on the pitfalls associated with time analyzer operational modes and deadtimes when detectors are of high efficiency, but perhaps not even strongly enough. Anyone contemplating experiments to establish reactor parameters by time correlation analysis should refer to Edelmann's investigation of the effects of non-ideal conditions (Karlsruhe report INR-4/68-15).

The second section, "Analysis of the Moments of Neutron Distribution," begins with the Feynman variance method, includes the other important moments techniques, and finishes with a short rundown on two-detector covariance analysis. I believe that the author's contention that lower efficiencies are required for success with the latter technique than with the single-detector variance method bears investigation.

The section, "Analysis of the Probability of Neutron Detection," considers the methods based on individual probabilities of detection, of which the well-known P_0, or zero count probability method, is an example. These methods have the advantages that instrumentation may be extremely simple and that nearly 100% duty cycle for data collection can be achieved. The author could have pointed out that a measurement of the complete probability distribution would permit several different fluctuation analyses of the same data, thus leading to an evaluation of the relative advantages and shortcomings that exist. This exercise could profitably be undertaken by someone. Modern instrumentation makes the P_n distribution measurement relatively simple and inexpensive.

A final short section, "Correlation Analysis Among the Signs of the Fluctuations," adequately summarizes the existing work on polarity correlation.

In conclusion, I would recommend purchase of this book for a comprehensive summary of the subject. The bibliography alone is well worth the price.

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About the Reviewer: John Orndoff has been a member of the staff of the Los Alamos Scientific Laboratory since 1946 where, in most of the intervening years, he has been engaged in reactor physics studies with critical assemblies. Dr. Orndoff did undergraduate work at Waynesburg (Pennsylvania) College and completed his graduate work at Purdue in 1944. He is very well known for his early, and continuing, investigations in the time behavior of fission neutrons.

Introduction to Modern Physics, 2nd Edition. By C. H. Blanchard, C. R. Burnett, R. G. Stoner, R. L. Weber, 100s ($12.00), 488 pp., Prentice-Hall International, Englewood Cliffs, N.J. (1969).

The authors have admirably met the goals set forth in the preface to provide a more rigorous introduction to modern physics. In addition, the broad scope of the text adds much to its value as a second year physics text. Student preparation for a course using this text to its fullest would require a high level, rigorous general physics course with mathematics beyond the first year of calculus. Assuming the appropriate student preparation, the text provides an excellent introduction to the concepts needed for the understanding of modern physics.

The scope of the text takes the student from classical physics to high energy physics. The development of classical physics through the review presented in the early chapters provides an excellent basis. The fundamentals of atomic and molecular physics are more thoroughly treated than is usual for a text of this level. The placing of relativity in Chap. 10 seems somewhat anomalous. Most texts introduce relativity earlier and use it more fully in the development of atomic and molecular structure. However, the rigor and coherence of the text does not seem to be compromised by this sequence of subjects. The principles developed so thoroughly in the text do not seem to be adequately brought out in the problem sets. Some of the problems seem too simple for a text of this level. A

reworking of the problem sets for the next printing would seem appropriate.

The broad scope of topics does not allow for uniform rigor and thoroughness in all areas. The nuclear area seems to be less thoroughly developed than the atomic and molecular sections. The scope of nuclear physics is extensive and provides some introduction to a wide range of topics. A more thorough development of fewer topics may be more appropriate in the later chapters of the text. The chapters on applications and accelerators seem somewhat out of place; they necessarily assume the form of a survey in nature and may serve better as an appendix. The introduction of high energy physics is very worthwhile for a text at this level although more exhaustive coverage could provide the student with needed reference as well as the basis for future advanced courses.

In summary, the text appears to provide an excellent introduction to modern physics. The rigor of the text is at the level suggested in the authors preface. The scope of the text is more than adequate for this level student. Most of the problem sets are adequate, but should be extended to provide a greater range of choice for teachers utilizing this test.

Introduction to Modern Physics, Second Edition, can be recommended highly as an appropriate text for a rigorous second year undergraduate physics course. A more suitable evaluation will be made by using the text.

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About the Reviewer: *Joe Spangler is an associate professor of physics at the recently adopted branch of the University of Tennessee at Chattanooga where he has been a member of the staff since 1968 teaching modern physics among other subjects. He was with Atomics International for ten years concomitantly completing his graduate studies at U.C.L.A. Dr. Spangler has held appointments to the Health Physics staff at Hanford and at Oak Ridge.*