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concentrates instead on disputes between logicians working within dialectical materialism and those working outside it.

Vucinich is best in his introductory chapter dealing with the history of science in Czarist Russia, the subject matter of his previous books. If one is already familiar with the Soviet scene and is able to exercise judgment as to where the author's biases are likely to condition the presentation of the material, a good deal of interesting information can be gleaned from the present book.

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Quantum Fields

N. N. Bogoliubov and D. V. Shirkov
388 pp. Benjamin-Cummings,
Reading, Mass. 1983.
\$39.95

N. N. Bogoliubov and D. V. Shirkov are famous Soviet physicists whose *Introduction to the Theory of Quantized Fields* was first written in 1957. At that time both the foundations of the subject and a discussion of recent topics could be contained in one volume. However, a glance at the contents brings home the fact that the only successful field theory at that time was quantum electrodynamics. Weak interactions were not discussed. After all, parity violation had just been discovered. Strong interactions were treated using unitarity and dispersion relations. Yang-Mills gauge fields were not mentioned. For many years perturbative quantum field theory remained unpopular because it did not seem to be relevant for the study of the strong interactions. However, the fantastic successes of gauge-field models for the weak and strong interactions necessitated major revisions, leading to the publication of the third edition of Bogoliubov and Shirkov's book in 1976.

Quantum Fields was originally written in 1980 and is clearly an offspring of the previous work. It is designed as a textbook for a one-year course for beginning graduate students. The book is divided into nine chapters that deal with basic concepts, free classical fields, the quantization of free fields, interacting fields, the scattering matrix, Feynman rules and diagrams, the evaluation of integrals, the removal of divergences and a description of real interactions. Nine appendices introduce the reader to the isotopic spin formalism, Dirac matrices, continuous groups, transformations of operators, singular functions, momentum-space integrals, kinematic relations for vertices, Feynman rules for gauge fields and the renormalization group. Final-

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ly there are 15 pages of problems grouped according to chapters.

From a scientific viewpoint there is no doubt that all these topics should be covered in a first course on the subject. The problem is how to dovetail the mathematics with the physics of elementary particles. Several monographs have recently been written on the physics assuming that the reader knows some field theory, and therefore they are not suitable as introductory field-theory texts. Bogoliubov and Shirkov assume that the students are taking a parallel course in elementary-particle physics and concentrate almost entirely on the mathematical aspects of perturbative quantum field theory. Because they include descriptions of some of the physics, their presentation is somewhat unbalanced in the other direction. Although many of the chapters are well written, they tend to be very formal and even then they are not self-contained. There are several instances where the reader is referred to the third edition of *Introduction to the Theory of Quantized Fields* for further details.

Some rather obvious topics are given short shrift. For instance, after a nice introduction to the *S* matrix one would have expected to see a calculation of a few Born diagrams. Instead, the authors immediately jump into three ways of regulating higher-order diagrams. The discussion of renormalization is limited to scalar theories and quantum electrodynamics, with no discussion of problems associated with quantum chromodynamics or weak interactions. One topic of great importance is the renormalization group, but it has been relegated to an appendix instead of the text.

There are several shortcomings in the production of the book. For instance, the publisher has inserted the formulas from the Russian original in the typeset text of the translation, with the result that the mathematical symbols are not identical. Although this tactic has kept the price low, the difference in the symbols is very irritating and adversely affects the layout of the book. In several cases the translation lacks polish.

No references are given to the original literature, only to published books in the field. Proper credit is rarely given to those people whose contributions were essential to the advancement of the subject. On the whole, one gets the impression that the authors have prepared a simplified version of their *Introduction to the Theory of Quantized Fields*, with some additional sections commenting on recent advances, rather than trying to rewrite everything from scratch. For example, the group theory appendix was written by a different author. Then too, the

last chapter on the description of real interactions is extremely brief. It does include a derivation of the standard model for the unification of weak and electromagnetic interactions, but the treatment of quantum chromodynamics leaves much to be desired.

To sum up, this book is strong on mathematics but weak on physics. The fundamentals of the subject—for example, canonical quantization, time or-

dered products, regularization and renormalization—are fine. However it is weak on precisely the new advances that provided the original motivation for writing the book. A lecturer would need to add a lot of supplementary reading material to use this book in a course on quantum theory.

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