

Book Review: *Renormalization Group*

Renormalization Group. Giuseppe Benfatto and Giovanni Gallavotti, Physics Notes, Princeton University Press, Princeton, New Jersey, 1995.

The renormalization group technique (RG) can be regarded as a perturbation approach to the evaluation of functional integrals with propagators containing different types of singularities. It was originally developed toward the end of the 1940s and afterward was used to advantage in developing the theory of the ground states of the Fermi liquid and the Bose gas. However, its greatest success can be considered to be in its application to the theory of phase transitions in classical statistical mechanics. All of these problems are discussed in the present book. The authors also apply the method to a problem which they regard as being one of the most controversial subjects in condensed matter theory, namely the condensation of a Bose gas in three dimensions at zero temperature.

The authors discuss such general concepts in the framework of RG theory as the effective potential, perturbation theory, anomalous dimensions, and the ε expansion. The authors write, "We may have just exhausted the simple problems in classical and quantum physics." In view of the fact that the subjects mentioned earlier are hardly simple, can this optimistic statement be indeed correct?

Although the authors try to avoid more rigorous aspects of mathematical analysis, thereby making the book more readable for the theoretical physicist, their success is, in fact, limited. The subject is presented in so succinct a style that only a reader with prior research experience using RG techniques will be able to benefit from this brief survey. Nevertheless, the book might be useful to someone wanting to switch research fields. That this can indeed be profitable is illustrated by the experience of Kenneth Wilson, who changed his focus from applications of the RG in quantum electrodynamics to the many very fruitful applications in statistical mechanics.

This book is the first one in a new series of Physics Notes published by Princeton University Press. In order to make the succeeding books

more accessible to a wider range of readers, I would suggest the inclusion of more comprehensive introductory material than is found in the present book.

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