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Book Review

Perspectives in Statistical Physics. M. S. Green Memorial Volume *H. J. Raveché, ed.* Volume IX of **Studies in Statistical Mechanics.** E. W. Montroll and J. L. Lebowitz, eds. Amsterdam: North-Holland Publishing Co., 1981.

It is a pleasure to recommend this book to students and research workers in the field of statistical mechanics. M. S. Green's contributions to science were monumental, insightful, and deep. His major contributions were to the microscopic aspects of irreversible processes, kinetic theory, graphical expansions of correlation functions, and critical phenomena. Accordingly, the contributions to this volume are arranged in three major sections: Nonequilibrium Processes, Phase Transitions, and Foundations. These sections follow the very interesting remarks on Green as scientist and human being by H. J. Raveché, E. G. D. Cohen, and M. E. Fisher.

It is impossible to cite all of the contributions to this volume in a brief review. They are all of high caliber and of interest to specialists in the field. I shall merely list a few which are most directly stimulated by Green's work and which, I believe, have the widest appeal to students and specialists.

The articles which follow from Green's work on the microscopic aspects of irreversible processes are those by Garcia-Colin and Del Rio, on "Green's contributions to non-equilibrium statistical mechanics revisited"; by van Kampen, on "Stochastic description of many-body systems"; by Kubo, on "H-theorems for Markoffian processes"; and by Zwanzig, "Where do we go from here?".

Green's work on kinetic theory is commemorated by two very interesting contributions by Dorfman, "Some recent developments in the kinetic theory of gases" and by Ernst and Cohen on "Nonequilibrium fluctuations and the hierarchy."

Finally, Green's work on phase transitions and critical phenomena is the touchstone for the articles by Domb, on "Critical phenomena—A model illustration of scientific method"; by Levelt Sengers and Sengers, on

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"How close is 'close to the critical point'?"; and by Widom, on "The interfaces between fluid phases."

I hope that this selection from the eighteen contributions in this volume will stimulate scholars to delve into this book and, more importantly, to return to Green's fundamental contributions themselves.

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Relativistic Kinetic Theory. S. R. de Groot, W. A. van Leeuwen, and C. G. van Weert. Amsterdam: North-Holland Publishing Co., 1980, pp. xiv + 417.

Nominally, this subject was launched 70 years ago with a paper by F. Jüttner on the equilibrium distribution function of a relativistic Boltzmann gas. But only in the last 20 years has it received serious attention under the stimulus of developments in high-energy astrophysics and cosmology. This volume by three of the foremost contributors to the field is a systematic and critical survey of the present state of the theory which rivals Chapman and Cowling's famous 1939 account of the classical theory in scope and authority.

The book is in four parts. The first part develops the elementary properties (conservation laws, H theorem) of the relativistic Boltzmann equation, which is first derived heuristically. A careful field-theoretical derivation, employing covariant Wigner distribution functions, is given in the second part for particles of spin 0 and 1/2. Next comes a very detailed account of relativistic Chapman–Enskog theory and the Grad method of moments, with applications to the calculation of transport coefficients and the propagation of sound. Finally, the transport coefficients are obtained explicitly for some cases of astrophysical interest: plasmas, neutrino gases, and hard-sphere models for hadronic systems.

The exposition is marked by the authors' characteristic attention to clarity, accuracy, and conciseness. It is in the nature of the subject that the density of formulas is fairly high. In order not to lose the wood for the trees a newcomer may find concurrent reading of a broad survey of the field advantageous. Good examples are the summer school lectures by Ehlers and by Stewart which are listed in the (very extensive) bibliography.

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