

Book Review: *Nonlinear Nonequilibrium Thermodynamics I. Linear and Nonlinear Fluctuation-Dissipation Theorems*

Nonlinear Nonequilibrium Thermodynamics I. Linear and Nonlinear Fluctuation-Dissipation Theorems, R. L. Stratonovich, Springer-Verlag, Berlin, 1992.

This is a highly personal book by one of the leading contributors to the theory of stochastic processes. Its major theme is the presentation of extensions of the techniques used to obtain results for equilibrium and linear nonequilibrium thermodynamic systems to nonlinear nonequilibrium thermodynamics.

The emphasis is on the derivation of linear and nonlinear fluctuation-dissipation theorems for both Markovian and non-Markovian processes. Chapter 1 presents a brief historical introduction to work leading to nonlinear nonequilibrium thermodynamics. Chapter 2 introduces some notions of probability theory, equilibrium statistical mechanics, Markov processes, and the master equation. Chapters 3 and 4 extend linear results to nonlinear Markov systems, while Chapters 5 and 6 describe non-Markovian systems. These chapters contain applications of the general theory to electrical, chemical, and Brownian motion systems.

There is a misstatement of the second law of thermodynamics on p. 33. The author defines an equilibrium process as one in which all intermediate states are those of thermodynamic equilibrium. These processes are usually termed quasistatic and it is not true that $dS = \delta q/T$ for all quasistatic processes.

The approach is novel and readers may find it difficult to relate the presentation here to standard discussions of nonequilibrium thermodynamics and statistical mechanics. Approximately one-third of the references are to the work of Stratonovich and collaborators, while there is one reference each to the work of Kubo and Mori and no reference to the work of Zwanzig or M. S. Green.

The book will be stimulating to active workers in the field because of its novel point of view, but it is unlikely to be useful for students, because of its narrow focus.

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