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Nota di contenuto	Beyond Equilibrium Thermodynamics; Contents; Preface; Acknowledgments; Symbols and Notation; 1 Introduction; 1.1 To Be Expected, or Not to Be Expected; 1.1.1 Thermodynamics and Rigor; 1.1.2 Formulating Versus Deriving Irreversibility; 1.1.3 Beyond Balance Equations; 1.1.4 Guide Through the Book; 1.2 GENERIC Framework; 1.2.1 Fundamental Equations; 1.2.2 Reversible and Irreversible Ancestors; 1.2.3 Equilibrium Thermodynamics of Stationary States; 1.2.4 Transformation of Variables; 1.2.5 Fluctuations; 1.2.6 Benefits of a Framework; 1.2.7 Historical Context; Part I Phenomenological Approach 2 Hydrodynamics 2.1 Balance Equations; 2.1.1 Mass; 2.1.2 Momentum; 2.1.3 Energy; 2.1.4 Entropy; 2.1.5 Expressions for Fluxes; 2.2 GENERIC Formulation; 2.2.1 Energy and Entropy; 2.2.2 Poisson Matrix; 2.2.3 Friction Matrix; 2.2.4 Fluctuating Hydrodynamics; 2.2.5 Something is Missing; 2.3 On Constructing GENERIC Building Blocks; 2.3.1 Poisson Matrices; 2.3.2 Friction Matrices; 3 Linear Irreversible Thermodynamics;

3.1 Thermodynamic Forces and Fluxes; 3.1.1 Basic Concepts; 3.1.2 Electric Field and Current; 3.1.3 Transformation Behavior; 3.1.4 Curie's Principle; 3.1.5 Stationary States
3.2 Onsager-Casimir Relations 3.2.1 Bare and Dressed Symmetry; 3.2.2 Thermoelectric Effects; 3.3 Paralyzing Criticism; 4 Complex Fluids; 4.1 Basic Rheological Properties; 4.1.1 Linear Viscoelasticity; 4.1.2 Nonlinear Material Behavior; 4.2 Tensors and Scalars as Configurational Variables; 4.2.1 Energy and Entropy; 4.2.2 Poisson Matrix; 4.2.3 Friction Matrix; 4.2.4 Time-Evolution Equations; 4.2.5 Summary of Inputs and Implications; 4.2.6 Example: Dilute Polymer Solutions; 4.2.7 Example: Pompon Model; 4.3 Configurational Distribution Functions; 4.3.1 Dumbbell Model of Polymer Solutions
4.3.2 Reptation Model of Polymer Melts 5 Relativistic Hydrodynamics; 5.1 Prelude: A Tensor and a Vector as Variables; 5.1.1 Energy and Entropy; 5.1.2 Poisson Matrix; 5.1.3 Friction Matrix; 5.1.4 Time-Evolution Equations; 5.1.5 Limit of Classical Hydrodynamics; 5.1.6 Extended Irreversible Thermodynamics; 5.2 Special Relativistic Hydrodynamics; 5.2.1 Notation and Variables; 5.2.2 Gradients of Energy and Entropy; 5.2.3 Poisson and Friction Matrices; 5.2.4 Covariant Field Equations; 5.3 Covariant GENERIC Framework; 5.3.1 Fundamental Equation; 5.3.2 Degeneracy Requirements
5.4 Hydrodynamics in the Presence of Gravity 5.4.1 Notation and Variables; 5.4.2 Reversible Contribution; 5.4.3 Irreversible Contribution; 5.4.4 Field Equations; 5.5 Bulk Viscous Cosmology; 5.5.1 Relativistic Thermodynamics; 5.5.2 Input from Relativistic Boltzmann Gas; 5.5.3 Model Predictions; Part II Statistical Approach; 6 Projection-Operator Method; 6.1 Motivation of Basic Formulas; 6.1.1 Notation of Classical Mechanics; 6.1.2 Ensembles; 6.1.3 Projection Operators; 6.1.4 Atomistic Expressions for E, S, L, M; 6.1.5 GENERIC Properties; 6.1.6 Symmetries; 6.2 Direct Approach
6.2.1 Exact Time-Evolution Equation

Sommario/riassunto

Beyond Equilibrium Thermodynamics fills a niche in the market by providing a comprehensive introduction to a new, emerging topic in the field. The importance of non-equilibrium thermodynamics is addressed in order to fully understand how a system works, whether it is in a biological system like the brain or a system that develops plastic. In order to fully grasp the subject, the book clearly explains the physical concepts and mathematics involved, as well as presenting problems and solutions; over 200 exercises and answers are included. Engineers, scientists, and applied mathematicians can all