

cifically selection, viability and adaptation of some biological species.

The sixth chapter examines the stochastic properties of systems due to deterministic dynamics in a space with three or more degrees of freedom. One of the basic assumptions of classical statistical mechanics is the ergodicity condition. In this chapter an analysis is given of the ergodicity of different systems which, as A. N. Kolmogorov had already shown on the example of a system of two nonlinear oscillators, can exist in systems with a small number (four) degrees of freedom. Strange attractors are examined in detail. A discussion is given of the possible role played by chaos in the information process, and the influence of internal fluctuations and external noise on the stability of dynamical systems are analyzed.

The seventh chapter is devoted to the problem of chaos

in biology and in related fields.

In the appendix are presented individual points of view on the role played by external noise, affecting the neuron levels of organization. Attention is called to the difficulties arising in the investigation of connections between two hierarchical levels by utilizing nonlinear dynamics. In so doing special emphasis is placed on the study of the effect of external noise on the relaxation of a nonlinear oscillator.

On the whole the monograph of J. S. Nicolis under present discussion is quite an interesting publication which acquaints its readers with the basic concepts and the modern premises underlying the investigation of complex dynamical systems.

The book will doubtless be useful for physicists, biologists, and chemists who are studying processes of self-organization, occurring in nonlinear dynamical systems.

---

## Kinetic theory of particles and photons

K. P. Zybin

Usp. Fiz. Nauk **31**, 536–537 (March 1988)

**J. Oxenius**, *Kinetic Theory of Particles and Photons: Theoretical Foundations of Non-LTE Plasma Spectroscopy*. Springer-Verlag, Berlin; Heidelberg; New York; Tokyo, 1986, pp. 353 (Springer Series in Electrophysics V. 20) This monograph by J. Oxenius is devoted to the development of methods of describing the spectroscopy of nonequilibrium plasma. In the book a kinetic theory is constructed of weakly ionized plasma and photons, in which both the particles and the radiation field are described by distribution functions for which kinetic equations are obtained.

The book consists of seven chapters. In the first chapter the author discusses in detail the principle of detailed balance, and also different processes associated with the excitation of atoms and emission of photons. In the second and third chapters kinetic equations are derived which describe the dynamics of particles, and various integrals are discussed for collisions of particles with particles and of particles with photons. In the fourth chapter hydrodynamics equations are obtained both for particles, and for photons, taking into account different radiation processes, and a discussion is given

of the limits of applicability of hydrodynamics. The fifth chapter is devoted to an examination of Boltzmann's H-theorem both for gas and for radiation. The sixth chapter examines processes associated with energy exchange between matter and radiation for the case of an optically thin plasma. In the seventh chapter processes are investigated in detail in which momentum exchange between radiation and matter is important.

The book examines many examples of concrete processes of interaction of matter and radiation. The majority of these processes refer to the interaction of radiation with hydrogen and helium. Therefore the book is of particular interest to specialists involved with problems of interaction of radiation with matter under cosmic conditions.

The material is presented in the book clearly and sequentially. The book contains seven appendices explaining and complementing the text. It is an excellent textbook and reference book.

Translated by G. M. Volkoff