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Nota di contenuto	Preface -- Introduction -- From Branly Coherer to Chua Memristor, Jean-Marc Ginoux and Thomas Cuff -- Magnetron modes and the chimera states, Victor J. Law and Denis P. Dowling -- The Fokker- Planck Equation and the first exit time problem. A fractional second order approximation, Christos H Skiadas and Charilaos Skiadas -- Anomalous diffusion by the fractional Fokker-Planck equation and Lévy stable processes, Johan Anderson and Sara Moradi -- Analysis of low- frequency instabilities in low-temperature magnetized plasma, Dan- Gheorghe Dimitriu, Maricel Agop -- Theoretical modeling of the interaction between two complex space charge structures in low- temperature plasma, Stefan Irimiciuc, Dan-Gheorghe Dimitriu, Maricel Agop -- Some applications of fractional derivatives in many-particle disordered large systems, Z.Z. Alisultanov, A.M. Agalarov, A.A. Potapov, G.B. Ragimkhanov -- Similarities between dynamics at atomic and

cosmological scales, Maricel Agop, Alina Gavriluț, and Gabriel Crumpei -- Plasma Perturbations and Cosmic Microwave Background Anisotropy in the Linearly Expanding Milne-like Universe, S.L. Cherkas and V.L. Kalashnikov.

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## Sommario/riassunto

This book collects interrelated lectures on fractal dynamics, anomalous transport and various historical and modern aspects of plasma sciences and technology. The origins of plasma science in connection to electricity and electric charges and devices leading to arc plasma are explored in the first contribution by Jean-Marc Ginoux and Thomas Cuff. The second important historic connection with plasmas was magnetism and the magnetron. Victor J. Law and Denis P. Dowling, in the second contribution, review the history of the magnetron based on the development of thermionic diode valves and related devices. In the third chapter, Christos H Skiadas and Charilaos Skiadas present and apply diffusion theory and solution strategies to a number of stochastic processes of interest. Anomalous diffusion by the fractional Fokker-Planck equation and Lévy stable processes are studied by Johan Anderson and Sara Moradi in the fourth contribution. They consider the motion of charged particles in a 3-dimensional magnetic field in the presence of linear friction and of a stochastic electric field. Analysis of low-frequency instabilities in a low-temperature magnetized plasma is presented by Dan-Gheorghe Dimitriu, Maricel Agop in the fifth chapter. The authors refer to experimental results of the Innsbruck Q-machine and provide an analytical formulation of the related theory. In chapter six, Stefan Irimiciuc, Dan-Gheorghe Dimitriu, Maricel Agop propose a theoretical model to explain the dynamics of charged particles in a plasma discharge with a strong flux of electrons from one plasma structure to another. The theory and applications of fractional derivatives in many-particle disordered large systems are explored by Z.Z. Alisultanov, A.M. Agalarov, A.A. Potapov, G.B. Ragimkhanov. In chapter eight, Maricel Agop, Alina Gavriluț, and Gabriel Crumpei explore the motion of physical systems that take place on continuous but non-differentiable curves (fractal curves). Finally in the last chapter S.L. Cherkas and V.L. Kalashnikov consider the perturbations of a plasma consisting of photons, baryons, and electrons in a linearly expanding (Milne-like) universe taking into account the metric tensor and vacuum perturbations. .

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