<<超越KMA理论的哈密顿混沌>>

图书基本信息

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前言

George M. Zaslavsky was born in Odessa, Ukraine in 1935 in a family of an artilleryofficer. He received education at the University of Odessa and moved in 1957 toNovosibirsk, Russia. In 1965, George joined the Institute of Nuclear Physics wherehe became interested in nonlinear problems of accelerator and plasma physics.Roald Sagdeev and Boris Chirikov were those persons who formed his interest inthe theory of dynamical chaos. In 1968 George introduced a separatrix map thatbecame one of the major tools in theoretical study of Hamiltonian chaos. The work"Stochastical instability of nonlinear oscillations" by G. Zaslavsky and B. Chirikov,published in Physics Uspekhi in 1971, was the first review paper "opened the eyes"of many physicists to power of the theory of dynamical systems and modern ergodictheory. It was realized that very complicated behavior is possible in dynamical sys-tems with only a few degrees of freedom. This complexity cannot be adequatelydescribed in terms of individual trajectories and requires statistical methods. Typi-cal Hamiltonian systems are not integrable but chaotic, and this chaos is not homo-geneous. At the same values of the control parameters, there coexist regions in thephase space with regular and chaotic motion. The results obtained in the 1960s weresummarized in the book "Statistical Irreversibility in Nonlinear Systems" （Nauka,Moscow, 1970） .The end of the 1960s was a hard time for George. He was forced to leave theInstitute of Nuclear Physics in Novosibirsk for signing letters in defense of someSoviet dissidents. George got a position at the Institute of Physics in Krasnoyarsk,not far away from Novosibirsk. There he founded a laboratory of the theory of non-linear processes which exists up to now. In Krasnoyarsk George became interestedin the theory of quantum chaos. The first rigorous theory of quantum resonance wasdeveloped in 1977 in collaboration with his co-workers. They introduced the impor-tant notion of quantum break time （the Ehrenfest time） after which quantum evolu-tion began to deviate from a semiclassical one. The results obtained in Krasnoyarskwere summarized in the book "Chaos in Dynamical Systems" （Nauka, Moscow andHarwood, Amsterdam, 1985） .

内容概要

Hamiltonian Chaos Beyond the KAM Theory Dedicated to George M. Zaslavsky (1935-2008) covers the recent developments and advances in the theory and application of Hamiltonian chaos in nonlinear Hamiltonian systems. The book is dedicated to Dr. George Zaslavsky, who was one of three founders of the theory of Hamiltonian chaos. Each chapter in this book was written by well-established scientists in the field of nonlinear Hamiltonian systems. The development presented in this book goes beyond the KAM theory, and the onset and disappearance of chaos in the stochastic and resonant layers of nonlinear Hamiltonian systems are predicted analytically, instead of qualitatively. The book is intended for researchers in the field of nonlinear dynamics in mathematics, physics and engineering.

作者简介

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章节摘录

插图：The stochastic web concept dates back to the 1960s when Arnold showed （Arnold,1964） that, in non-degenerate Hamiltonian systems of dimension exceeding 2, reso-nance lines necessarily intersect, forming an infinite-sized web in the Poincar6 sec-tion. It provides in turn for a slow chaotic （sometimes called "stochastic"） diffusionfor infinite distances in relevant dynamical variables. It was discovered towards the end of 1980s （Zaslavsky et al., 1986; Chernikovet al., 1987a,b, 1988） that, in degenerate or nearly-degenerate systems, a stochas-tic web may arise even if the dimension is 3/2. One of the archetypal examples ofsuch a low-dimensional stochastic web arises in the 1D harmonic oscillator per-turbed by a weak traveling wave the frequency of which coincides with a multipleof the natural frequency of the oscillator （Zaslavsky, 2007; Chernikov et al., 1987b;Zaslavsky et al., 1991）. Perturbation plays a dual role: on the one hand, it givesrise to a slow dynamics characterized by an auxiliary Hamiltonian that possesses aninfinite web-like separatrix; on the other hand, the perturbation destroys this self-generated separatrix, replacing it by a thin chaotic layer. Such a low-dimensionalstochastic web may be relevant to a variety of physical systems and plays an impor-tant role in corresponding transport phenomena: see （Zaslavsky, 2007; Chernikovet al., 1987b; Zaslavsky et al., 1991） for reviews on relevant classical systems. Inaddition, there are quantum systems in which the dynamics of transport reduces tothat in the classical model described above. The latter concerns e.g. nanometre-scalesemiconductor superlattices with an applied voltage and magnetic fied （Fromholdet al., 2001, 2004）.

编辑推荐

《超越KMA理论的哈密顿混沌(英文版)》编辑推荐：Nonlinear Physical Science focuses on the recent advancesof fundamental theories and principles, analytical andsymbolic approaches, as well as computational techniques innonlinear physical science and nonlinear mathematics withengineering applications.

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