Preface to the Third Edition

Main innovations in this edition concern the averaging principle. A new section on deterministic perturbations of one-degree-of-freedom systems was added in Chap. 8. We show there that pure deterministic perturbations of an oscillator may lead to a stochastic, in a certain sense, long-time behavior of the system, if the corresponding Hamiltonian has saddle points. To give a rigorous meaning to this statement, one should, first, regularize the system by the addition of small random perturbations. It turns out that the stochasticity of long-time behavior is independent of the regularization. The stochasticity is an intrinsic property of the original system related to the instability of saddle points. This shows usefulness of a joint consideration of classical theory of deterministic perturbations together with stochastic perturbations.

We added a new Chap. 9 where deterministic and stochastic perturbations of systems with many degrees of freedom are considered. Because of the resonances, stochastic regularization in this case is even more important.

Small changes in the chapters where long-time behavior of the perturbed system is determined by large deviations were made. Most of these changes, actually, concern the terminology. In particular, we explained that the notion of sub-limiting distribution for a given initial point and a time scale is identical to the notion of metastability. We also explained that the stochastic resonance is a manifestation of metastability and the theory of this effect is a part of the large deviation theory. We also made some comments on the notion of quasi-potential which we introduced more than forty years ago. One should say that many of notions and results presented in this book became quite popular in applications, and many of them were later rediscovered in applied papers.

We also added references to recent papers where the proofs of some conjectures included in previous editions were obtained.

College Park, Maryland — M.I. Freidlin
New Orleans, Louisiana — A.D. Wentzell

Springer

http://www.springer.com/978-3-642-25846-6

Random Perturbations of Dynamical Systems
Freidlin, M.I.; Wentzell, A.D.
2012, XXVIII, 460 p., Hardcover
ISBN: 978-3-642-25846-6