M. I. Rabinovich, *Pathways to and properties of stochasticity in dissipative systems.* The traditional interest of physicists in the stochastic behavior of nonlinear dissipative systems has become even deeper in recent years. During the last five years (for earlier results see, for example, Ref. 1), stochastic self-oscillations which are determined by the complex dynamics of a system and not by external noise (mathematically, the strange attractor consists of such oscillations), have been observed experimentally and investigated in a wide variety of applications—biological membranes excited by a periodic field, Josephson junctions, autocatalytic chemical reactions, convective fluid flows, etc; the experiments that were performed stimulated theoreticians and as a result a complete analytic description of the transition was achieved for certain cases that was later confirmed by suitably designed experiments. From a physical point of view, there is considerable interest in the establishment and recognition of several basic phenomena during this period: the transition of dissipative nonlinear systems to stochastic behavior on a change in parameters comes about in only a few different ways: these transition pathways are often found to be common not only for systems of arbitrary physical nature, but, near the transition boundary, also for lumped and distributed systems (for example, flows in cells[2]); the stochasticity properties of dissipative and Hamiltonian systems are also similar in many cases.

The paper discusses specific results obtained recently in this area by the USSR Academy of Sciences Institute of Applied Physics (IPF). Among them: observation of a transition to stochastic behavior through doubling of the period in a parametrically excited nonlinear chain[3] and in a model that describes the decay of a pair of quanta in the same state in a nonequilibrium medium (stochastic modulation)[4]; use of the fractal dimension of strange attractors to estimate the closeness of the stochastic behavior of a dissipative system to the behavior of stochastic Hamiltonian systems or one-dimensional mappings[5]; establishment of the fact that on transition to stochasticity via a hierarchy of period doublings, the width of the spectral peaks observed in the power spectrum of the stochastic motion increases in accordance with the universal law $\Delta\omega \sim (r - r_c)^{\rho}$, where the critical index is $\rho = 2.42\ldots$[6]; detection of stochastization of soliton motion in periodic fields within the framework of the nonintegrable models encountered in solid-state physics, plasma physics, etc.[7]

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