Long-time behavior of stochastic parabolic equations.

We study the long-time behavior of systems governed by nonlinear stochastic reaction-diffusion equations, which have a wide range of applications in physics, medicine, economics, and finance. These equations are known to have a uniformly bounded (in time) solution provided the nonlinearity (the reaction term) possesses certain dissipative properties, which are fairly restrictive. The existence of a bounded solution implies, in turn, the existence of an invariant measure for this equation, which is an important step in establishing the ergodic behavior of the underlying physical system. In my presentation I will talk about a new approach to establishing the existence of a bounded solution, which allows to expand the existing class of nonlinearities. Our approach is based on applying an infinite dimensional analog of the classic Ito's formula to a certain, carefully constructed Lyapunov functional of a weak solution. I will also address the question of uniqueness of the stationary solution, and its asymptotic behavior.