# Dynamical symmetries of nonlinear dynamical processes

Dynamical symmetry is an underlying order, hidden in a group-theoretical structure of the respective evolution equation, which manifests itself in the course of the system's evolution. A group-theoretical approach and Lie-algebraic methods for solving quantum and classical operator evolution equations (Schroedinger, Heisenberg, Bloch, Liouville, Dirac, Fokker-Plank, etc.) have been used to study dynamics of nonstationary processes, in particular, the processes of the matter-radiation interaction. This approach enables to derive exact solutions in nontrivial cases and find approximate analytic solutions for the evolution equations when the perturbation theory fails. The theory of dynamical symmetries provides a formal basis in searching for and establishing analogies between seemingly different systems and phenomena. The method developed is used for solving problems of quantum control of the field and atomic states, the topic of great importance in quantum computers and processing quantum information.

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