Homoclinic and Heteroclinic Solutions of Hamiltonian Systems: a Variational Approach

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During the past thirty years there has been a great deal of progress in the use of variational methods to find homoclinic and heteroclinic solutions of Hamiltonian systems including Newtonian ones. Such solutions are global in time. Therefore it is reasonable to use global methods to receive them rather than by means of approaches based on initial value problems. Moreover, solutions of Hamiltonian systems are critical points of so called action functionals in suitable functional spaces.

The study of quantity and quality of solutions of Hamiltonian systems is a problem of great importance, since most of them derives for instance from mechanics, theoretical physics and differential geometry.

We will discuss Hamiltonian systems under various assumptions on a potential. We will show how to receive homoclinic and heteroclinic solutions applying the approximative scheme developed by Janczewska, Lion's concentration-compactness principle, Ekeland's principle, minimax methods and the shadowing chain lemma for singular systems by Izydorek and Janczewska.