Marian Gidea (Northeastern Illinois University). *Diffusion with optimal time in the large gap problem.*

Abstract. We present a topological mechanism for diffusion in the large gap problem for Hamiltonian systems. We consider systems consisting of n penduli and a rotator with a weak, periodic coupling, described by Hamiltonians of the form $\sum_{i=1}^{n} \pm \left(\frac{1}{2}p_i^2 + V_i(q_i)\right) + h_0(I) + \varepsilon h(p_1, \ldots, p_n, q_1, \ldots, q_n, I, \phi, t; \varepsilon)$, where $(p_1, \ldots, p_n, q_1, \ldots, q_n, I, \phi, t) \in \mathbb{R}^n \times \mathbb{T}^n \times \mathbb{R} \times \mathbb{T} \times \mathbb{T}$ with the standard symplectic structure. We assume that that V, h_0, h are C^{k+1}-differentiable ($k \geq 2$). We also assume that each V_i is periodic in q_i of period 1 and has a unique non-degenerate global maximum, that h_0 satisfies a uniform twist condition, and that the perturbation h is periodic in t of period 1.

We show that if the perturbation h satisfies some explicit non-degeneracy conditions of Melnikov type, which are C^{k+1}-open and C^∞-dense, then there exist trajectories $x(t)$ along which $|I(x(T)) - I(x(0))|$ is of order $O(1)$ with respect to ε, for some time T of order $O((1/\varepsilon)\ln(1/\varepsilon))$. There are known upper bounds for $|I(x(T)) - I(x(0))|$ which show that this time T is optimal up to a constant.

The proof is based on the theory of normally hyperbolic manifolds and on the method of correctly aligned windows.