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Rafael de la Llave is a Prof. at Georgia Inst. of Technology.

He received his undergraduate in Physics from Univ. Complutense in 1979.
He obtained a Fulbright fellowship to obtain a Ph. D. in Mathematics from Princeton Univ. in 1983.
He spent a semester in IMA (Minneapolis).
After a postdoctoral position in IHES he returned to Princeton in 1984 as an assist prof. He moved to Univ of Texas at Austin in 1989 and to Georgia Inst. of Technology in 2010, where he is currently, He recieved a Centennial Fellowship of AMS and is a Fellow of the institute of Physics. He has supervised 26 Ph. D. thesis and has been a co-organizer of 6 special semester in several institutes.

Title: How to get lots of energy with small effort

Abstract:
In systems with no friction (called Hamiltonian), the effects of external forces can sometimes accumulate and some times they average out. In systems with one particle in one dimension whether averaging takes place or not depends on whether the external frequency is an integer multiple or not of natural frequencies. In higher dimensional systems, whether there is accumulation or not depends on number theoretic properties of the combination of frequencies.

Two powerful theorems from the 60's (KAM and Nekhoroshev) showed that, in many systems, averaging happened for many initial conditions and for a long time. However, an example of V. I. Arnold in 1964 showed that accumulation was still possible. This raised the mathematical question of how often it happened. Also the practical question of designing machines having accumulation or suppresing it according to whether it is desirable or not. Given the mathematical interest and the practical importance, the problem has been pursued by many people with many points of view and different tools.

We will review some recent progress in a program to identify landmarks which organize the dynamics of many trajectories and lead to the accumulation of energy. At the end, one gets tools to analyze the presence of these behaviors in rather general systems or to construct systems with the desired properties as usual in engineering. Some recent developments by many people involve the theory of systems with some friction, the relations with control theory, the theory of generic properties (Baire sense) and the applications concrete models in celestial mechanics or in PDE's.

LocalWords: Baire