



# NICE WEAK KAM METHODS IN NICE

2-7 FEBRUARY 2009

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## **On the dynamics of free time minimizers of the Newtonian N body problem (joint work with Adriana Da Luz)**

### **Abstract**

In the classical Lagrangian formulation of the Newtonian N body problem, motions are characterized by the local minimization property of the Lagrangian action. In this talk we will study the dynamics of a very special class of motions which satisfy a strong global minimization property. More precisely, if the bodies evolve in an Euclidean space  $E$ , then we say that a curve  $x : [t_0, +\infty) \rightarrow E^N$  is a free time minimizer if for any  $t > t_0$  the action of  $x|_{[t_0, t]}$  is less than or equal to the action of any curve binding  $x(t_0)$  to  $x(t)$ . A simple example of free time minimizer is a parabolic homothetical motion by a minimal central configuration. The existence of a large amount of nontrivial free time minimizers can be deduced from the weak KAM theorem. In particular, there is at least one satisfying  $x(t_0) = x_0$  for any choice  $x_0 \in E^N$ .

In this talk we will prove that such motions are completely parabolic and asymptotic to a central configuration. This means that the motion has critical energy, the moment of inertia grows like  $I(t) \sim t^{4/3}$  and that the normalized configuration  $u(t) = I(t)^{-1/2}x(t)$  converges to a central configuration.