CHAOS IN THE SOLAR SYSTEM

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In the recent article *Birds and Frogs* that appeared in the February 2009 issue of the Notices of the American Mathematical Society, Freeman Dyson wrote "a good example of chaos is the orbital motions of planets and satellites of the solar system upsetting the traditional picture of the solar system as the prime example of orderly stable motion. The mathematician Laplace thought he had proved that the solar system is stable. It now turns out that Laplace was wrong".

A clear indication of this behavior is provided by Hyperion, a satellite of Saturn. In this seminar we shall discuss the irregular oscillations of its longest axis with respect to the planet-satellite center line. With a careful mixture of theoretical reasoning and numerical evidence we will explain why they can be regarded as chaotic. We shall also give our opinion on why the Space Station Freedom has been stabilized by NASA with four gyroscopes.

The presentation will be based on the nonlinear equation of motion

$$\ddot{\varphi} + \ddot{\theta} = -\frac{3(B-A)}{2C}\left(\frac{a}{r}\right)^3 \sin 2\varphi \tag{0.1}$$

The analysis of (**??**) will be the main part of our discussion.

This seminar is based on a collaborative work with Massimo Furi (University of Florence, Italy) and Adam Landsberg (Joint Science of CMC, Pitzer and Scripps). The work will appear in the Journal of Fixed Point Theory and Applications.