

# ΑΡΙΣΤΟΤΕΛΕΙΟ ΠΑΝΕΠΙΣΤΗΜΙΟ ΘΕΣΣΑΛΟΝΙΚΗΣ

## ΤΜΗΜΑ ΦΥΣΙΚΗΣ

### ΣΕΜΙΝΑΡΙΟ

ΤΟΜΕΑΣ ΑΣΤΡΟΦΥΣΙΚΗΣ, ΑΣΤΡΟΝΟΜΙΑΣ ΚΑΙ  
ΜΗΧΑΝΙΚΗΣ

Θέμα: **The theory of secondary resonances in the spin-orbit problem**

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Τόπος: **Εργαστήριο Αστρονομίας, ΑΠΘ**

Ώρα: **13:00**

### Περίληψη:

The spin-orbit problem of astrodynamics is a model used in the past in order to explain a wide variety of observed phenomena in our solar system. The synchronous rotation of most of the large planetary satellites, the 3:2 rotational to orbital frequency ratio of Mercury as well as the chaotic rotation of Hyperion have been studied in this framework. The problem is ruled by two parameters: i) the orbital eccentricity, and ii) the asphericity of the body, i.e. its shape divergence from a perfect sphere. Near a primary resonance, like the synchronous or 3:2, there can appear secondary resonances which alter locally the spin-orbit stability and dynamics. Our work focuses on developing an analytical theory for the secondary resonances that appear in the system for large asphericities. We construct a normal form approximation of the original dynamics using two key ideas: 1) the expansion in a parameter, called the detuning, measuring the shift from the exact secondary resonance and 2) the implementation of a suitable separation of the terms in orders of smallness, called the 'book-keeping' method. By the normal form approach, we can analytically approximate the form of phase space portraits, locate the periodic solutions of the system and determine the bifurcation thresholds for the secondary resonances. Our analytical results are in very good agreement with numerical integrations of the equations of motion.

Η ομιλία θα μεταδοθεί ζωντανά στη σελίδα:  
<http://www.astro.auth.gr/seminars/live/live.html>