

Letter of Intent for Renewal of Commission 7 of the IAU

- Proposed Commission Details:

- Full Name: Celestial Mechanics and Dynamical Astronomy
- Commission Category: Inter-Division Commission
Hosted by Division A & affiliated to Division F
- Estimated Number of Members: 341 (size of current Commission 7)

- Aims and Scope:

The proposed Commission will have the responsibility for promoting the scientific progress and major achievements in the broad field of Celestial Mechanics and its applications, as well as in peripheral fields.

These include: treatments of the mathematical, physical and computational aspects of planetary theory, lunar theory, general and special perturbation theory, resonance models, general dynamical systems, the 3-body problem, the N-body problem, chaos and diffusion, stability criteria, orbital and space mechanics, ring systems, planetary systems dynamics, tidal models, galactic dynamics, relativity, non-gravitational forces, computer methods, computer languages for analytical developments, and database management.

The aims and scope of this commission are not topical or object-oriented, but focus on the theory of general dynamics of N-body systems. These include the construction of analytical and semi-analytical models, as well as numerical tools for orbital evolution and analysis.

Application to astronomical bodies are a natural extension, and fundamental to test the validity and precision of the dynamical theories. However, following the characteristics of the current Commission 7, the proposed Commission will create a working space for the more mathematically-oriented members of the astronomical community whose lines of research concentrate more on methods than on astronomical bodies. It will also encourage interactions between theoretical and applied researchers in the field.

- Relation with Other Commissions:

The proposed Commission will serve the astronomical community increasing our knowledge of the general dynamics, whose results can be applied to many objects. Among these: planets (both solar system and extra-solar), small bodies (comets and asteroids), natural and artificial satellites, planetary rings, stars, stellar clusters and galaxies.

In collaboration with other commissions, we will be able to provide additional services to the community, which include (but are not restricted to):

1. Coordinating the collection and dissemination of certified and documented software of interest for general applications, such as orbital integration, filtering, proper elements calculations, frequency analysis, statistical clustering.
2. Providing a scientific service to the researchers in the field by encouraging and formally supporting the organization and maintenance of the databases of relevant dynamical parameters for different kinds of celestial bodies;

- Tasks of the Proposed Commission:

In order to facilitate the interaction with other commissions and sciences, the proposed Commission will establish the following tasks:

1. Proposing, facilitating and supporting scientific meetings, in particular the IAU symposia, on Celestial Mechanics and/or Dynamical Astronomy and on their application to various dynamical problems;
2. Promoting a Summer School on Celestial Mechanics, to be held every 3 years, following the example of the NATO Advanced Study Institute, held in Cortina d'Ampezzo (Italy) in the 1980s. This school will include both theoretical topics as well as their application to astronomical problems. As was the case with the Cortina meetings, they will prove an excellent opportunity for the education and training of young researchers in both theory of general dynamics (especially analytical methods) as well as in current astronomical problems.
3. Maintaining fruitful cooperation with other sciences: applied mathematics, mathematical physics, geophysics, space sciences, etc., whose research is often applicable to astronomical problems. This feedback has been a constant in the history of Commission 7, and many of the analytical and numerical tools currently used in astronomy can be traced back to such interactions: analytical perturbation methods, chaos and diffusion estimators, numerical integration techniques, frequency analysis, tidal models, etc.
4. Establishing an efficient information system to facilitate collaboration among the researchers in the field by maintaining an up-to-date Commission website with news important for the membership, reports on the activities of the commission's officers and its Organizing Committee, information on recent publications of interest, on the past and future meetings in the field, etc.;