

Commission A4 Celestial Mechanics and Dynamical Astronomy

Christos Efthymiopoulos & Giovanni Gronchi

Division Meeting at the XXXI IAU General Assembly



From the Commission's webpage

Celestial Mechanics and Dynamical Astronomy deals primarily with the general dynamics of N-body systems, with applications stretching from orbital mechanics of artificial satellites to galactic dynamics. Although it constitutes one of the oldest fields in astronomy, it is constantly reinvigorated by new discoveries and problems. These are widespread and include (among many others) extrasolar planets, asteroids and KBOs, NEOs and space debris, low-energy interplanetary trajectories, etc.

Commission's main objective: to support *research and educational activities* in the broad field of dynamical astronomy. These include: treatments of the mathematical, physical and computational aspects of planetary theory, perturbation theory, resonance models, chaos and diffusion, stability criteria, orbital and space mechanics, ring systems, tidal models, galactic dynamics, non-gravitational forces, and computer languages for analytical developments.

Organizing committee:

Celletti, Alessandra (Advisor - Past President)

Correia, Alexandre

Di Sisto, Romina

Efthymiopoulos, Christos (President)

Giuliatti Winter, Silvia

Gronchi, Giovanni (Vice-President)

Wlodarczyk, Ireneusz

Zhou, Li-Yong

Members: 207 (M166, F41)

Europe: 56%

North America: 21%

Asia: 14%

South America: 6%

Africa 3%

Oceania 0.5%

Europe (115)

France	17
Russia	16
Spain	13
Italy	12
Germany	9
Serbia	6
UK	6
Greece	5
Poland	5
Belgium	4
Romania	4
Hungary	3
Portugal	3
Switzerland	3
Netherlands	2
Slovakia	2
Ukraine	2
Czech Republic	1
Slovakia	1
Sweden	1

North America (44)

USA	42
Canada	1
Mexico	1

Asia (28)

China	12
Japan	8
India	4
Indonesia	1
Iraq	1
Thailand	1
Vietnam	1

South America (13)

Brazil	7
Argentina	4
Colombia	1
Uruguay	1

Africa (6)

Egypt	6
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Oceania (1)

New Zealand	1
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IAU Symposium 364

"Multi-Scale (Time and Mass) Dynamics of Space Objects"

Held in dual form in Iasi, Romania, from **October 18 to 22, 2021**
(A. Celletti & C. Gales - co-chair of the OC).

Proposed by the previous organizing committee (2018-2021) in 2019, but it was postponed due to the COVID events.

200 participants, 98 speakers (20 invited)

Topics: Large-scale body dynamics: planets and exoplanets, medium-scale body dynamics: asteroids, comets, NEOs, natural satellites, perturbation methods and long-term evolution of space objects, exploration and exploitation of space objects, small-scale body dynamics: dust particles, rings and space debris & numerical and analytical methods for resonances and chaos.

IAU volume of proceedings (A. Celletti, C. Gales, C. Beaugé, and A. Lemaitre (eds), Cambridge University Press).

https://www.math.uaic.ro/~IAU_S364/.

Forthcoming conferences and schools

One of the main goals of the IAU Commission A4 (see https://www.iau.org/science/scientific_bodies/commissions/A4/) is to "promote the periodic holding of a Summer School aiming to train young researchers on the most important current topics in Celestial Mechanics and Dynamical Astronomy. Such schools can take place before major scientific meetings, such as the CELMEC conferences.

Advanced Study School on "Celestial Mechanics -Theory and Applications" (CELTA ASI), 15 to 27 August 2022 at Inverness & Skye, Scotland.

The school is under the patronage of the IAU Commission A4, and it will include lectures by 16 invited speakers. The school is organized jointly with the 77th Scottish Universities Summer School in Physics, under the direction of Prof. **Bonnie Steves** (Glasgow Caledonian University).

8th International Meeting on Celestial Mechanics (CELMEC VIII), University of Rome Tor Vergata, 5-9 September 2022

(Organizing/Scientific committee: A. Celletti, G.F. Gronchi, C. Lhotka, U. Locatelli, G. Pinzari, S.Terracini). The format will be hybrid, and there will be 203 participants (including 24 invited talks).

CELMEC has reached an agreement with the international journal "Celestial Mechanics and Dynamical Astronomy", to allow the publication of original papers presented at the meeting. The papers will be organised in two **Topical Collections**, under the titles:

- a. Innovative computational methods in Dynamical Astronomy*
- b. Variational and perturbative methods in Celestial Mechanics*

Priority actions for the period 2021-2024 (besides the support of events)

1. Increase membership
2. Proposal of new working groups
3. Connection between 3-year report and the results of WGs
4. Organization of web seminar
5. Enhance interaction with other commissions of the Divisions A-F

Topics presently covered: Reference systems - astrometry - minor bodies dynamics solar and extrasolar system dynamics - rotational dynamics - tidal interactions of celestial bodies

Need for expansion:

stellar and galactic dynamics

general relativistic celestial mechanics

astrodynamics - dynamics of artificial satellites and space debris

particle dynamics under non-gravitational forces

new computational methods (evolutionary algorithms - machine learning etc)