

## PREFACE

Modern dynamics is increasingly participating in the solution of problems raised by astronomical observations. This new relationship is being fostered on one side by the improvements in the observations, which in recent years contributed several discoveries of new systems, such as the objects in the Kuiper belt, the pulsar and star companions, to speak only of the most striking ones, and, on the other hand, by the progresses in modern dynamics.

The progresses in modern dynamics are due to two factors: the dissemination of fast computers, allowing the numerical studies of very complex systems by a large number of scientists, and the improvement in our understanding of the complex behaviour of Hamiltonian systems. KAM and Nekhorochev theories have shed a light on the subtle and surprizing interplays between regular and chaotic motions; numerical experiments and analytical approximations have shown how these peculiarities are indeed present in astronomically important systems and are instrumental in understanding their formation and evolution.

In view of this it seemed timely to bring together scientists who are applying the tools of modern dynamics to the understanding of various astronomical problems, in order to share their experiences and results. Commission 7 (Celestial Mechanics) of the IAU, supported by Commission 4 (Ephemerides), Commission 20 (Positions and motions of minor planets) and Commission 33 (Structure and Dynamics of Galactic Systems) proposed that a Colloquium be held on this topic. This Colloquium (Colloquium 172 of the IAU) was held in Namur (Belgium) from July 6 to July 11 1998.

Invited lectures (C. Simo, J. Laskar) and contributed papers were devoted to the mathematical and numerical tools underlying the various approaches to astronomical problems.

The two main areas of applications which were discussed are "Stellar Systems" and "Small Bodies in the Solar System". In both cases the concepts of chaotic motion were considered as very important and were fully discussed. S. J. Aarseth and S. Tremaine delivered invited papers on "Stellar Systems" and S. Ferraz-Mello, B. G. Marsden, C. Froeschlé and A. Morbidelli delivered invited papers concerning the dynamics of small bodies in the solar system. Sessions were also devoted to cosmology (invited paper by G. Contopoulos) and planetary systems (invited papers by P. Artymowicz and N. Rappaport).

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