A D V A N C E D S E R I ES I N N O N L I N E A R D Y N A M I C S

HAMILTONIAN SYSTEMS AND CELESTIAL MECHANICS

Edited by

E. A. Lacomba

Universidad Autónoma Metropolitana, Mexico

J. Llibre

Universitat Autònoma de Barcelona, Spain





PREFACE

The papers in this volume form a self-contained collection of lectures on Hamiltonian Systems and Celestial Mechanics. They are an outgrowth of the lectures that took place during the "International Symposium on Hamiltonian Systems and Celestial Mechanics", which was held at CIMAT (Centro de Investigación en Matemáticas, Guanajuato, México) from September 30 to October 4, 1991. The emphasis of all the talks was on Hamiltonian Dynamics and Celestial Mechanics and their relationship to several aspects of topology, mechanics and dynamical systems in general. The Scientific organizers of the Conference were E.A. Lacomba and J. Llibre, the administrative organizer was K.B. Wolf on the part of CIFMA (Centro Internacional de Física y Matemáticas Aplicadas, Cuernavaca, México).

The symposium gathered together 41 researchers (13 from México and 28 from abroad), in addition to 17 graduate students, 38 lectures were given (4 of them by graduate students) during 32 session hours. All speakers were invited to submit a contribution to these proceedings. All papers that were received went through the refereeing process typical of a mathematical research journal and those that were accepted form the present volume.

The organization and realization of the meeting was possible due to a lot of work on the part of a number of people. First, thanks are due to Bernardo Wolf and Petra Seligman from the CIFMA who took care with great enthusiasm of the logistic administration of the meeting and many other things. Fausto Ongay and the staff at CIMAT have been particularly helpful in providing all their facilities for the realization of the meeting. We are also indebted to Joaquín Delgado and Ernesto Pérez Chavela for their collaboration and support in the preparation and realization of the symposium. We must thank the economical support provided by the following institutions. From México the CONACYT, the Universidad Autónoma Metropolitana, and the Universidad Nacional Autónoma de México; from Spain CIRIT and DGICYT; from the International Center of Theoretical Physics in Trieste. And last but not least, the participants at the Conference must be thanked for offering everyone a week-long intense and highly interesting mathematical experience.

CONTENTS

Preface	1
The Spring-Pendulum System M. Alvarez and J. Delgado	1
Stability of Blocks of Compact Orbits of an Action of \mathbb{R}^2 on M^3 J. L. Arraut and M. Craizer	15
A Remark on a Conjecture of Arnold: Linking of Spheres and Fixed Points A. Banyaga and C. Golé	23
On Jacobi Coordinates in the Three-Body Problem H. E. Cabral	31
Transversal Homoclinic Orbits for a Class of Hamiltonians J. Casasayas, E. Fontich and A. Nunes	35
Knotted Periodic Orbits and Integrability J. Casasayas, J. Martínez Alfaro and A. Nunes	45
Time-Dependent Linear Lagrangians: The Inverse Problem, Symmetries and Constants of Motion M. de León and J. C. Marrero	55
Poincaré Compactification of the Collinear Three-Body Problem J. Delgado, E. A. Lacomba, J. Llibre and E. Pérez	85
Asymptotic Behaviour Near Parabolic Fixed Points for a Class of Reversible Maps E. Fontich	101
Symmetry Lines in the Störmer Problem L. Jiménez Lara and E. Piña	111
Global Flow of the Rotating Kepler Problem J. Llibre and J. Soler	125
Hamiltonian Flows on Supermanifolds F. Ongay	141

The Non-Symmetric Top E. Piña

The Stability Transition Curve At L_4 in the Elliptic Restricted Problem of Three Bodies

D. Schmidt

Horseshoe Mapping and Collision Orbits in the Restricted Three-Body Problem

M. Sekiguchi and K. Tanikawa

A Heteroclinic Map and the Oscillatory Capture, Escape Motions in the Three-Body Problem

Z. H. Xia