

A walk into the “New Methods of Celestial Mechanics”

Alain Chenciner

Observatoire de Paris, IMCCE (UMR 8028), ASD

& University Paris 7

`chenciner@imcce.fr`

Abstract

Writing In 1925 about the 3 volumes of Henri Poincaré’s *New Methods of Celestial Mechanics* (1892, 1893, 1899), Paul Appell said: “*It is probable that, during the next millenium, this book will be the mine from which more modest researchers will extract their material*”. And indeed, a great part of the mathematical theory of Dynamical Systems originates from the works of Poincaré and in particular from the *New Methods*: exponents, invariant manifolds, homoclinic and heteroclinic solutions, analytic non-integrability and divergence of the perturbation series, exponentially small splitting of separatrices, variational equations and integral invariants, recurrence theorem, surfaces of section and return maps, these notions form the backbone of the general theory; a general theory which in turn, coupled with the development of powerful computers, has renewed the classical field of Celestial Mechanics. The talk will concentrate on one of the main themes of the New Methods, namely the Planar Circular Restricted Three Body Problem, the (un)stability of which was the motivation of the treatise.