

TABLE OF CONTENTS

INTRODUCTION TO THE 1966 EDITION	iii
PREFACE TO THE 1966 EDITION.....	iv
PREFACE TO THE 1927 EDITION.....	vi

CHAPTER I PHYSICAL ASPECTS OF DYNAMICAL SYSTEMS

	PAGE
1. Introductory remarks	1
2. An existence theorem	1
3. A uniqueness theorem	5
4. Two continuity theorems.....	6
5. Some extensions	10
6. The principle of the conservation of energy. Conservation systems	14
7. Change of variables in conservative systems	19
8. Geometrical constraints.....	22
9. Internal characterization of Lagrangian systems.....	23
10. External characterization of Lagrangian systems	25
11. Dissipative systems.....	31

CHAPTER II

VARIATIONAL PRINCIPLES AND APPLICATIONS

1. An algebraic variational principle.....	33
2. Hamilton's principle	34
3. The principle of least action.....	36
4. Normal form (two degrees of freedom)	39
5. Ignorable coöordinates.....	40
6. The method of multipliers	41
7. The general integral linear in the velocities	44
8. Conditional integrals linear in the velocities.....	45

9.	Integrals quadratic in the velocities	48
10.	The Hamiltonian equations	50
11.	Transformation of the Hamiltonian equations.....	53
12.	The Pfaffian equations	55
13.	On the significance of variational principles	55

CHAPTER III

FORMAL ASPECTS OF DYNAMICS

	PAGE	
1.	Introductory remarks	59
2.	The formal group.....	60
3.	Formal solutions.....	63
4.	The equilibrium problem	67
5.	The generalized equilibrium problem	71
6.	On the Hamiltonian multipliers	74
7.	Normalization of H_2	78
8.	The Hamiltonian equilibrium problem	82
9.	Generalization of the Hamiltonian problem	85
10.	On the Pfaffian multipliers	89
11.	Preliminary normalization in Pfaffian problem	91
12.	The Pfaffian equilibrium problem	93
13.	Generalization of the Pfaffian problem	94

CHAPTER IV

STABILITY OF PERIODIC MOTIONS

1.	On the reduction to generalized equilibrium.....	97
2.	Stability of Pfaffian systems	100
3.	Instability of Pfaffian systems.....	105
4.	Complete stability	105
5.	Normal form for completely stable systems	109
6.	Proof of the lemma of section 5.....	114
7.	Reversibility and complete stability	115
8.	Other types of stability	121

CHAPTER V

EXISTENCE OF PERIODIC MOTIONS

1.	Role of the periodic motions	123
2.	An example	124

3.	The minimum method.....	128
4.	Application to symmetric case.....	130
5.	Whittaker's criterion and analogous results	132
6.	The minimax method.....	133
7.	Application to exceptional case.....	135
8.	The extensions by Morse	139
9.	The method of analytic continuation	139
10.	The transformation method of Poincaré.....	143
11.	An example	146

CHAPTER VI

APPLICATION OF POINCARÉ'S GEOMETRIC THEOREM

1.	Periodic motions near generalized equilibrium ($m = 1$)	150
2.	Proof of the lemma of section 1	154
3.	Periodic motions near a periodic motion ($m = 2$)	159
4.	Some remarks.....	162
5.	The geometric theorem of Poincaré.....	165
6.	The billiard ball problem	169
7.	The corresponding transformation T	171
8.	Area-preserving property of T	173
9.	Applications to billiard ball problem	176
10.	The geodesic problem. Construction of a transformation TT^*	180
11.	Application of Poincaré's theorem to geodesic problem.....	185

CHAPTER VII

GENERAL THEORY OF DYNAMICAL SYSTEMS

1.	Introductory remarks	189
2.	Wandering and non-wandering motions.....	190
3.	The sequence M, M_1, M_2, \dots	193
4.	Some properties of the central motions	195
5.	Concerning the role of the central motions.....	197
6.	Groups of motions.....	197
7.	Recurrent motions	198
8.	Arbitrary motions and the recurrent motions	200
9.	Density of the special central motions	202
10.	Recurrent motions and semi-asymptotic central motions	204
11.	Transitivity and intransitivity	205

CHAPTER VIII

THE CASE OF TWO DEGREES OF FREEDOM

	PAGE
1. Formal classification of invariant points	209
2. Distribution of periodic motions of stable type	215
3. Distribution of quasi-periodic motions	218
4. Stability and instability.....	220
5. The stable case. Zones of instability.....	221
6. A criterion for stability.....	226
7. The problem of stability	227
8. The unstable case. Asymptotic families	227
9. Distribution of motions asymptotic to periodic motions	231
10. On other types of motion	237
11. A transitive dynamical problem.....	238
12. An integrable case.....	248
13. The concept of integrability.....	255

CHAPTER IX

THE PROBLEM OF THREE BODIES

1. Introductory remarks	260
2. The equations of motion and the classical integrals.....	261
3. Reduction to the 12th order.....	263
4. Lagrange's equality	264
5. Sundman's inequality	265
6. The possibility of collision	267
7. Indefinite continuation of the motions.....	270
8. Further properties of the motions.....	275
9. On a result of Sundman	283
10. The reduced manifold M_7 of states of motion	283
11. Types of motion in M_7	288
12. Extension to $n > 3$ bodies and more general laws of force.....	291
ADDENDUM.....	293
FOOTNOTES.....	296
BIBLIOGRAPHY	300
INDEX	303