Contents

LIST OF SYMBOLS	1
INTRODUCTION	2
PART I. Evolution of the Protoplanetary Cloud and the Formation of the Cluster of Solid Bodies	4
Chapter I. ORIGIN OF THE PROTOPLANETARY CLOUD	4
 A few remarks on present-day theories of the origin of the protoplanetary cloud	4
Poynting-Robertson effect	11
field	14
Chapter 2. TURBULENCE IN THE PROTOPLANETARY CLOUD	16
 4. Condition of convective instability in rotating systems 5. Other possible causes leading to disruption of stability 6. Influence of the magnetic field on the stability of the rotating cloud 	16 20 23
Chapter 3. FORMATION OF THE DUST LAYER	25
 7. Barometric formula for flat rotating systems 8. Flattening of the dust layer in a quiescent gas 9. Thickness of the dust layer in turbulent gas 	25 26 27
Chapter 4. TEMPERATURE OF THE DUST LAYER	32
 10. Statement of the problem	32 34 36
component of the cloud	42

	14.	Condensation of volatile substances on particles	44
Chapte	er 5.	GRAVITATIONAL INSTABILITY	4 5
	15.	Fundamental difficulties in the theory of gravitational	
		instability in infinite systems	45
	16.	Gravitational instability in flat systems with nonuniform rotation	47
	17.	Growth of perturbations with time	52
Chapte	er 6.	FORMATION AND EVOLUTION OF PROTOPLANETARY DUST CONDENSATIONS	57
	18.	Mare and size of condensations formed in the duet laws	57
	19.	Mass and size of condensations formed in the dust layer Evolution of dust condensations	61
		Conclusions	67
PART II.	Ace	cumulation of the Earth and Planets	69
Chapte	er 7.	VELOCITY DISPERSION IN A ROTATING SYSTEM OF	
r		GRAVITATING BODIES WITH INELASTIC COLLISIONS	6 9
	20.	Velocity dispersion in a system of solid bodies of equal mass	69
	21.	Increase in energy of relative motion in encounters	77
	22.	Velocity dispersion of bodies moving in a gas	81
	23.	Velocity dispersion in a system of bodies of varying mass	82
Chapte	r 8.	STUDY OF THE PROCESS OF ACCUMULATION OF PRO-	
		TOPLANETARY BODIES BY THE METHODS OF CO-	
		AGULATION THEORY	90
	24.	Solution of the coagulation equation for a coagulation	
		coefficient proportional to the sum of the masses	90
	25.	of the colliding bodies	97
0.1	•		
Chapte	er 9.	ACCUMULATION OF PLANETS OF THE EARTH GROUP	105
	26.	Growth features of the largest bodies	105
	27.	Accumulation of planets of the Earth group	109
Chapte	r 10	ROTATION OF THE PLANETS	113
	28.	Critical analysis of earlier research	113
	29.	Methods for solving the problem	123

Chapte	r 11.	THE INCLINATIONS OF THE AXES OF ROTATION OF THE	
		PLANETS	129
	30. E	Evaluating the masses of the largest bodies falling on the planets from the inclinations of the axes of rotation of the	
		planets	129
Chapte	r 12.	GROWTH OF THE GIANT PLANETS	136
		Duration of growth process among the giant planets	136
	32. H	Ejection of bodies from the solar system	138
	33. I	Dissipation of gases from the solar system	144
Chapte	r 13.	FORMATION OF THE ASTEROIDS	146
		Role of Jupiter in the formation of the asteroid belt	146
	35. F	Rabe's theory of the formation of rapidly rotating asteroids	148
	(Conclusions	152
PART III	. Prin	nary Temperature of the Earth	155
Chapte	r 14.	INTERNAL HEAT SOURCES OF THE GROWING EARTH	
-		AND IMPACTS OF SMALL BODIES AND PARTICLES	155
	36. 7	Warming of the Earthdue to generation of heat by radio-	
		activity and compression	155
	37.	Warming of the Earthby impacts of small bodies and particles	161
Chapte	r 15.	WARMING OF THE EARTH BY IMPACTS OF LARGE	
		BODIES	164
		Thermal balance of the upper layers of the growing Earth	164
		Fundamental parameters of impact craters Heat transfer in mixing by impact and depth distribution	166
		of the impact energy	171
Chapte	r 16.	PRIMARY INHOMOGENEITIES OF THE EARTH'S MANTLE .	182
	41. I	inhomogeneities due to differences in chemical composition	
		between large bodies	182
		nhomogeneities due to impacts of falling bodies	184
		Conclusions	187 190
BIBLIOGRAPHY			
SUBJECT	INDE	Y	203

,