

Contents

1	Entropy Production and Convergence to Equilibrium	1
	C. Villani	
1.1	The Entropy Production Problem for the Boltzmann Equation	1
1.1.1	The Boltzmann Equation: Notation and Preliminaries	1
1.1.2	H Functional and H Theorem	4
1.1.3	What this Course is About: Convergence to Equilibrium	9
1.2	Tentative Panomara	11
1.3	Reminders from Information Theory	12
1.3.1	Background and Definitions	12
1.3.2	Inequalities	15
1.4	Quantitative H Theorem	18
1.4.1	Entropy–Entropy Production Inequalities	18
1.4.2	EEP Inequalities for the Boltzmann Equation	19
1.4.3	Proof of Cercignani’s Conjecture in a Special Case .	31
1.5	The State of the Art for the Spatially Homogeneous Boltzmann Equation	32
1.5.1	Preparations	32
1.5.2	Current State of Regularity Theory	34
1.5.3	Convergence to Equilibrium	35
1.6	A Review of Some Closely Related Topics	37
1.6.1	Particles Systems and Kac’s Problem	37
1.6.2	The Central Limit Theorem for Maxwellian Molecules	44
1.6.3	The Role of High Energy Tails	48
1.6.4	Behavior of the Fisher Information	49
1.6.5	Variations on a Theme	50
1.7	Wiping out Spatial Inhomogeneities	51
1.8	Towards Exponential Convergence?	62
	References	64
	Appendix	69

2 Kinetic Limits for Interacting Particle Systems 71

F. Rezakhanlou

2.1 Introduction 71

2.2 Equilibrium Fluctuations 80

2.3 Kinetic Limits in Dimension One 91

2.4 Kinetic Limits in Higher Dimensions 98

References 105

Index 107