

Contents

Preface — v

Ethan Akin

Furstenberg Fractals — 1

- 1 Introduction — 1
- 2 Furstenberg Fractals — 3
- 3 The Fractal Constructions — 9
- 4 Density of Non-Recurrent Points — 12
- 5 Isometries and Furstenberg Fractals — 14

Idris Assani and Kimberly Presser

A Survey of the Return Times Theorem — 19

- 1 Origins — 19
 - 1.1 Averages along Subsequences — 21
 - 1.2 Weighted Averages — 23
 - 1.3 Wiener–Wintner Results — 25
- 2 Development — 26
 - 2.1 The BFKO Proof of Bourgain’s Return Times Theorem — 27
 - 2.2 Extensions of the Return Times Theorem — 29
 - 2.3 Unique Ergodicity and the Return Times Theorem — 31
 - 2.4 A Joinings Proof of the Return Times Theorem — 33
- 3 The Multiterm Return Times Theorem — 35
 - 3.1 Definitions — 37
- 4 Characteristic Factors — 41
 - 4.1 Characteristic Factors and the Return Times Theorem — 42
- 5 Breaking the Duality — 44
 - 5.1 Hilbert Transforms — 45
 - 5.2 The (L^1, L^1) Case — 48
- 6 Other Notes on the Return Times Theorem — 50
 - 6.1 The Sigma-Finite Case — 50
 - 6.2 Recent Extensions — 51
 - 6.3 Wiener–Wintner Dynamical Functions — 52
- 7 Conclusion — 54

Joseph Auslander

Characterizations of Distal and Equicontinuous Extensions — 59

Zoltán Buczolich

Averages Along the Squares on the Torus — 67

- 1 Introduction and Statement of the Main Results — 67

2	Preliminary Results and Notation — 69
3	Proofs of the Main Results — 70

Nicolas Chevallier

Stepped Hyperplane and Extension of the Three Distance Theorem — 81

1	Introduction — 81
2	Kwapisz's Result for Translation — 82
3	Continued Fraction Expansions — 84
3.1	Brun's Algorithm — 84
3.2	Strong Convergence — 86
4	Proof of Theorem 1.1 — 87
5	Appendix: Proof of Theorem 2.4 and Stepped Hyperplane — 88

Jean-Pierre Conze and Jonathan Marco

Remarks on Step Cocycles over Rotations, Centralizers and Coboundaries — 93

1	Introduction — 93
2	Preliminaries on Cocycles — 94
2.1	Cocycles and Group Extension of Dynamical Systems — 94
2.2	Essential Values, Nonregular Cocycle — 95
2.3	$\mathbb{Z}^2$ -Actions and Centralizer — 97
2.4	Case of an Irrational Rotation — 98
3	Coboundary Equations for Irrational Rotations — 100
3.1	Classical Results, Expansion in Basis $q_n\alpha$ — 101
3.2	Linear and Multiplicative Equations for φ_β and $\varphi_{\beta,\gamma}$ — 101
4	Applications — 104
4.1	Non-Ergodic Cocycles with Ergodic Compact Quotients — 104
4.2	Examples of Nontrivial and Trivial Centralizer — 106
4.3	Example of a Nontrivial Conjugacy in a Group Family — 108
5	Appendix: Proof of Theorem 3.3 — 109

Danijela Damjanović

Hamilton's Theorem for Smooth Lie Group Actions — 117

1	Introduction — 117
2	Preliminaries — 118
2.1	Fréchet Spaces and Tame Operators — 118
2.2	Hamilton's Nash–Moser Theorem for Exact Sequences — 119
2.3	Cohomology — 119
3	An Application of Hamilton's Nash–Moser Theorem for Exact Sequences to Lie Group Actions — 120
3.1	The Set-Up — 120
3.2	Tamely Split First Cohomology — 121
3.3	Existence of Tame Splitting for the Complex $(Lin)_{(\lambda,H,\pi)}$ — 122
3.4	A Perturbation Result — 125

- 3.5 A Variation of Theorem 3.6 — 126
- 4 Possible Applications — 126

Krzysztof Frączek, Agata Piękniewska, and Dariusz Skrenty

Mixing Automorphisms which are Markov Quasi-Equivalent but not Weakly Isomorphic — 129

- 1 Introduction — 129
- 2 Gaussian Automorphisms and Gaussian Cocycles — 130
- 3 Coalescence of Two-Sided Cocycle Extensions — 132
- 4 Main Result — 134

Joanna Kułaga-Przymus

On the Strong Convolution Singularity Property — 139

- 1 Introduction — 139
- 2 Definitions — 142
- 2.1 Spectral Theory — 142
- 2.2 Joinings — 143
- 2.3 Special Flows — 143
- 2.4 Continued Fractions — 143
- 3 Tools — 144
- 4 Smooth Flows on Surfaces — 146
- 5 Results — 147
- 5.1 New Tools – The Main Proposition — 147
- 5.2 New Tools – Technical Details — 148
- 5.3 Application — 180

Carlos Matheus

Fractal Geometry of Non-Uniformly Hyperbolic Horseshoes — 197

- 1 Part I – A Survey on Homoclinic/Heteroclinic Bifurcations — 197
- 1.1 Transverse Homoclinic Orbits and Smale’s Horseshoes — 199
- 1.2 Homoclinic Tangencies and Newhouse Phenomena — 203
- 1.3 Homoclinic Bifurcations Associated to Thin Horseshoes — 213
- 1.4 Homoclinic Bifurcations Associated to Fat Horseshoes and Stable Tangencies — 218
- 1.5 Heteroclinic Bifurcations of Slightly Fat Horseshoes after J. Palis and J.-C. Yoccoz — 220
- 1.6 A Global View on Palis–Yoccoz Induction Scheme — 223
- 2 Part II – A Research Announcement on Non-Uniformly Hyperbolic Horseshoes — 232
- 2.1 Hausdorff Dimension of the Stable Sets of Non-Uniformly Hyperbolic Horseshoes — 233
- 2.2 Final Comments on Further Results — 236

Omri Sarig and Martin Schmoll

Adic Flows, Transversal Flows, and Horocycle Flows — 241

- 1 Introduction — 241
- 2 Adic Flows — 243
- 2.1 Ergodic Properties of Adic Flows — 251
- 3 Application to Horocycle Flows — 252
- 3.1 The Compact Case — 257

Kelly B. Yancey

Uniform Rigidity Sequences for Topologically Weakly Mixing Homeomorphisms — 261

- 1 Introduction — 261
- 2 Uniform Rigidity Sequences — 263
- 2.1 Proof of Theorem 1.2 — 264