

---

## Contents

	<i>Preface</i>	<i>page ix</i>
<b>1</b>	<b>Haar Measure on the Classical Compact Matrix Groups</b>	<b>1</b>
	1.1 The Classical Compact Matrix Groups	1
	1.2 Haar Measure	7
	1.3 Lie Group Structure and Character Theory	17
<b>2</b>	<b>Distribution of the Entries</b>	<b>31</b>
	2.1 Introduction	31
	2.2 The Density of a Principal Submatrix	38
	2.3 How Much Is a Haar Matrix Like a Gaussian Matrix?	42
	2.4 Arbitrary Projections	53
<b>3</b>	<b>Eigenvalue Distributions: Exact Formulas</b>	<b>60</b>
	3.1 The Weyl Integration Formula	60
	3.2 Determinantal Point Processes	71
	3.3 Matrix Moments	80
	3.4 Patterns in Eigenvalues: Powers of Random Matrices	85
<b>4</b>	<b>Eigenvalue Distributions: Asymptotics</b>	<b>90</b>
	4.1 The Eigenvalue Counting Function	90
	4.2 The Empirical Spectral Measure and Linear Eigenvalue Statistics	106
	4.3 Patterns in Eigenvalues: Self-Similarity	113
	4.4 Large Deviations for the Empirical Spectral Measure	117
<b>5</b>	<b>Concentration of Measure</b>	<b>131</b>
	5.1 The Concentration of Measure Phenomenon	131
	5.2 Logarithmic Sobolev Inequalities and Concentration	133

5.3	The Bakry–Émery Criterion and Concentration for the Classical Compact Groups	141
5.4	Concentration of the Spectral Measure	153
<b>6</b>	<b>Geometric Applications of Measure Concentration</b>	<b>161</b>
6.1	The Johnson–Lindenstrauss Lemma	161
6.2	Dvoretzky’s Theorem	165
6.3	A Measure-Theoretic Dvoretzky Theorem	170
<b>7</b>	<b>Characteristic Polynomials and Connections to the Riemann <math>\zeta</math>-function</b>	<b>181</b>
7.1	Two-Point Correlations and Montgomery’s Conjecture	181
7.2	The Zeta Function and Characteristic Polynomials of Random Unitary Matrices	186
7.3	Numerical and Statistical Work	197
	<i>References</i>	205
	<i>Index</i>	212