Contents

Introduction 1

Chapter 1: Some History and the Mysteries Of Superposition 9

Chapter 2: Linear Algebra 33

Chapter 3: Principles and Spin 60

Chapter 4: The Schrödinger Equation and two more Principles 83

Chapter 5: Putting It All Together 101

Chapter 6: Problems, Distinctions, and Interpretations 113

Chapter 7: Uncertainty, and the Classical Limit 131

Chapter 8: The EPR Paper 157

Chapter 9: Three No-Go Theorems and the Measurement Problem 191

Chapter 10: The Measurement Problem I: the Orthodox View, Spontaneous Localization, and Worlds and Minds 216

Chapter 11: Measurement Problem II: the Modal Interpretation, the Epistemic Interpretation, the Relational Interpretation, Decoherence, and Wigner's Formula. 240

Chapter 12: Local Weak Property Realism: Consistent Histories 272

Chapter 13: Non-Local Strong Property Realism (of a Kind): Bohmian Mechanics 301

Chapter 14: Individuals 324

Chapter 15: Physical Objects, Retrodiction, Holism and Entanglement 347

Chapter 16: Free Will 372

Appendix 1: Ordinary and Partial Derivatives 388

Appendix 2: Trigonometry 399

Appendix 3: Information and Quantum Teleportation 404

Appendix 4: The Ehrenfest Theorem 411

Appendix 5: Unitary Operators, the Evolution Operator, the Schrödinger and the Heisenberg Pictures, and Wigner's Formula 413

Appendix 6: Time-Energy Uncertainty (so called) 420

Bibliography 424