Contents

| Foreword | vii |
|--|-----|
| Introduction | 3 |
| Chapter I. Werner Heisenberg's Scientific Development | 5 |
| I.1 Early Influences | 5 |
| I.2 Escape from Mathematics and the Encounter with Sommerfeld | 13 |
| I.3 Sommerfeld's Seminar | 16 |
| I.4 Sommerfeld's Mathematical Approach | 20 |
| I.5 Lectures and Courses | 22 |
| I.6 Introduction to Research in Quantum Theory | 28 |
| I.7 Success in a Problem of Classical Physics | 49 |
| I.8 Life in Munich and a Near Failure in the Doctoral Examination | 63 |
| Chapter II. Towards the Recognition of the Crisis | 71 |
| II.1 A New Environment | 72 |
| II.2 Born's Seminar and the Pursuit of New Subjects | 79 |
| II.3 Concern with the Helium Problem | 86 |
| II.4 Half-Integral Quantum Numbers and the Difficulties | |
| of Atomic Theory | 98 |
| II.5 Return to the Anomalous Zeeman Effects | 106 |
| Chapter III. The Penultimate Sharpening of the Correspondence Principle | 125 |
| III.1 Getting to Know Niels Bohr | 127 |
| III.2 Spring Visit to Copenhagen | 135 |
| III.3 In the Footsteps of Niels Bohr | 144 |
| III.4 Ad Majorem Correspondentiae Principii Gloriam | 154 |
| III.5 The Kramers-Heisenberg Dispersion Theory | 170 |
| III.6 Atomic Models and Complex Spectra | 190 |

| Content | ts |
|----------|----|
| 00110011 | ~~ |

| Chapter IV. Sunrise in Helgoland | 209 |
|---|-------|
| IV.1 Return to Göttingen and the Hydrogen Problem | 210 |
| IV.2 The Quantum-Theoretical Fourier Series and an | |
| Unexpected Difficulty | 220 |
| IV.3 The Anharmonic Oscillator and a Letter to Kronig | 231 |
| IV.4 The Determination of the Constants and a Severe | |
| Attack of Hay Fever | 242 |
| IV.5 Energy Conservation and Stationary States | 251 |
| | • • • |
| Chapter V. The Discovery of Quantum Mechanics | 261 |
| V.1 Pauli's Attitude Towards Attempts to Formulate a | |
| Quantum Mechanics | 262 |
| V.2 A Guiding Philosophical Principle | 273 |
| V.3 Quantum-Theoretical Kinematics and Mechanics | 290 |
| V.4 Preliminary Tests and Applications of Quantum Mechanics | 305 |
| V.5 A Farewell to 'Term Zoology and Zeeman Botany' | 316 |
| Defense | 222 |
| Kelerences | 323 |
| Author Index | 351 |

vi