

## Contents

### Introduction 1

#### **1 The early years in Manchester and Cambridge 6**

- 1.1 Manchester 6
- 1.2 Science in Manchester 8
- 1.3 Thomson's early days 12
- 1.4 Owens College 14
- 1.5 The Unseen Universe 18
- 1.6 Undergraduate in Cambridge 21
- 1.7 Second wrangler in the Mathematical Tripos 23

#### **2 J. J. Thomson's early work in Cambridge: a continuous and all-embracing physics 29**

- 2.1 In Cambridge as a graduate 29
- 2.2 Early experimental work at the Cavendish 31
- 2.3 The origins of the electromagnetic theory of matter 33
- 2.4 The vortex ring theory of the atom 36
- 2.5 Director of the Cavendish Laboratory 41
- 2.6 Third edition of Maxwell's *Treatise* 44
- 2.7 Mapping the domains of the physical sciences 46
- 2.8 A new tripos for engineering 51

#### **3 The ether and the corpuscle: from waves to particles 55**

- 3.1 Electric discharge in tubes 55
- 3.2 From discharge tubes to Faraday tubes 60
- 3.3 Tubes, electricity, and matter 67
- 3.4 Opening the Cavendish to new researchers 70

viii Contents

- 3.5 The corpuscle: notes from a ‘discovery’ 73
- 3.6 Corpuscles and electrons 81

**4 On creeds and policies: the corpuscular theory of matter 86**

- 4.1 What is an atom like? 86
- 4.2 A world of electrons 91
- 4.3 Psychic research 96
- 4.4 The collapse of a dream 99
- 4.5 The carriers of positive electricity 103
- 4.6 Cambridge as a playground: George Paget Thomson 109

**5 Father and son. Old and new physics 114**

- 5.1 The nature of light 114
- 5.2 The early theory of the quantum 119
- 5.3 Britain and the quanta in 1913 124
- 5.4 A father-son collaboration 126
- 5.5 Physics at war 132
- 5.6 The electron in chemistry 137

**6 The electron in Aberdeen: from particle to wave 143**

- 6.1 Professorship in Aberdeen 143
- 6.2 Electron diffraction 150
- 6.3 The father’s interpretation 156
- 6.4 The son’s reaction 160
- 6.5 Moving to London. Electron diffraction turns into an instrument 164
- 6.6 End of an epoch 166

*References* 171

*Index* 183