



## CONTENTS

|                                 |      |
|---------------------------------|------|
| Preface . . . . .               | ix   |
| Participating Authors . . . . . | xi   |
| Introduction . . . . .          | xiii |

### Part 1 The Beginnings

|   |                |
|---|----------------|
| Native Place of Cosmic Rays . . . . . ( <i>Pictorial Prologue</i> ) . . . . .   | 3              |
| Hess' Old Predecessors . . . . .  | Y. SEKIDO      |
| Erinnerungen an V.F. Hess, den Entdecker der Kosmischen<br>Strahlung, und an die ersten Jahre des Betriebes<br>des Hafelekar-Labors . . . . . | R. STEINMAURER |
| Early Propagation of Cosmic Ray Studies. . . . . ( <i>Old Photographs</i> ) . . . . .   | 33             |
| Early Evolution of Coincidence Counting, A Fundamental<br>Method in Cosmic Ray Physics. . . . .   | G. PFOTZER     |

### Part 2 Memory of Remote Days

|  |                    |
|--|--------------------|
| The Early Stage of Cosmic Ray Particle Research . . . . .  | D.V. SKOBELTZYNSKI |
| Arcetri 1928–1932 . . . . .  | B. ROSSI           |
| On Erich Regener's Cosmic Ray Work in Stuttgart and<br>Related Subjects . . . . .                        | G. PFOTZER         |
| Some of the Problems and Difficulties Encountered<br>in the Early Years of Cosmic-Ray Research . . . . . | H.V. NEHER         |
| Edinburgh, Cambridge and Baffin Bay. . . . .   | H. CARMICHAEL      |

### Part 3 Positron and Mesotron *Early Discoveries of New Particles*

|  |               |
|--|---------------|
| Unraveling the Particle Content of the Cosmic Rays . . . . . | C.D. ANDERSON |
| Cosmic Rays and the Beginning of the Meson Theory . . . . .  | H. YUKAWA     |
| Cosmic Ray Study in Nishina Laboratory. . . . .              | M. TAKEUCHI   |
| The "Magnet House" and the Muon . . . . .                    | J.G. WILSON   |
| When Muons and Pions Were Born . . . . .                     | E.R. BAGGE    |

### Part 4 Sea, Mountain and Underground *Ultra-Penetrating and Extra-Terrestrial Aspects*

|   |              |
|---|--------------|
| Some Recollections of Experiences Associated with<br>Cosmic-Ray Investigations. . . . . | S.E. FORBUSH |
|---|--------------|

|   |              |     |
|---|--------------|-----|
| High Altitude Observatories for Cosmic Rays and<br>Other Purposes . . . . . | S.A. KORFF   | 171 |
| How it started in Budapest . . . . .  | A.J. SOMOGYI | 181 |
| Intensity and Anisotropy of Cosmic Rays . . . . .                           | Y. SEKIDO    | 187 |

**Part 5 Showers: Local and Extensive  
*Terrestrial Generation of Penetrating Radiations***

|  |  |     |
|--|--|-----|
| Personal Recollections of Early Theoretical<br>Cosmic Ray Work . . . . .   | W.H. HEITLER   | 209 |
| Experimental Work on Cosmic Rays. Proof of the<br>Very High Energies Carried by Some of<br>the Primary Particles . . . . . | P. AUGER   | 213 |
| Cosmic Ray School of Osaka University/Osaka City University<br>—for the Memory of Late Professor Yuzuru Watase . . . . .   | M. ODA   | 219 |
| Beginning of High-Energy Physics in Cosmic<br>Rays . . . . .   | N.A. DOBROTKIN, G.T. ZATSEPIN,<br>S.I. NIKOLSKY and S.A. SLAVATINSKY | 225 |
| Air Shower Experiments at MIT . . . . .  | G.W. CLARK   | 239 |

**Part 6 Primaries and Secondary Products  
*Composition of Each Generation***

|  |                              |     |
|--|------------------------------|-----|
| Activités Scientifique de Louis Leprince-Ringuet<br>et de son Groupe de Travail sur les Rayons<br>Cosmiques de 1933 à 1953 . . . . . | L. LEPRINCE-RINGUET          | 249 |
| Cosmic Ray Neutrons, 1934–1959 . . . . .   | S.A. KORFF                   | 255 |
| Reminiscences on Cosmic Ray Research at the<br>University of Minnesota . . . . .   | E.P. NEY                     | 263 |
| Reminiscences of Some Early Cosmic Ray Work<br>in India . . . . .  | D. LAL, Y. PAL and B. PETERS | 277 |

**Part 7 Further in Particle Physics**

|  |                 |     |
|--|-----------------|-----|
| Theoretical Study of Cosmic Rays in Japan . . . . .                                    | M. TAKETANI     | 285 |
| The First International Cosmic Ray Conference . . . . .                                | M. MIESOWICZ    | 295 |
| The Early History of the Strange Particles . . . . .                                   | G. D. ROCHESTER | 299 |
| Discovery of Hypernuclei: The Beginnings . . . . .                                     | J. PNIEWSKI     | 323 |
| Particle Theory —Cosmic Rays— Accelerators,<br>Conflicts and Reconciliations . . . . . | E.L. FEINBERG   | 339 |

**Part 8 Further in Space Physics**

|   |  |     |
|---|--|-----|
| From Balloons to Space Stations . . . . . | S.N. VERNOV, N.L. GRIGOROV,<br>G.B. KHRISTIANSEN, A.N. CHARAKHCHAN and A.E. CHUDAKOV | 357 |
|---|--|-----|

|  |               |     |
|--|---------------|-----|
| Cosmic Ray Intensity Variations and the Manchester School of Cosmic Ray Physics. . . . . | H. ELLIOT     | 375 |
| Cosmic Ray Astrophysics at Chicago (1947–1960) . . . . .                                 | J.A. SIMPSON  | 385 |
| On the Birth and Development of Cosmic Ray Astrophysics. . . . .                         | V.L. GINZBURG | 411 |
| Recollection of Early Cosmic Ray Research . . . . .                                      | H. ALFVÉN     | 427 |
| One Night in 1961 . . . . . ( <i>Epilogue</i> ) . . . . .                                |               | 433 |
| Name Index . . . . .   |               | 435 |