CONTENTS

Preface iii
Editor's Note iv

Peter G. O. FREUND
Universality and Symmetry Principles in Hadron Physics
1. Introduction 1
1) A minimal goal for a theory of strong interactions. 1
2. Universality Principles 2
2) Universal vector meson couplings 2
3) Universal pseudoscalar and axial vector couplings 3
4) Universal tensor and scalar meson couplings 4
5) Reggeized Universality 4
3. Symmetries of Strong Interactions 6
6) The $U(6)\times U(6)\times O(3)_L$ rest symmetry and its supermultiplets. . 6
7) The Collinear $U(6)_W\times O(2)_{L_z}$ group. The Kineton Method . . 8
8) Predictions of $U(6)_W\times O(2)_{L_z}$ Symmetry 10
4. Simultaneous use of Symmetry and Universality Principles 12
9) Relation between Universality and Symmetries 12
10) Formulation of Universality for $U(6)\times U(6)\times O(3)$ Multiplets . . 14
11) Consequences of $U(6)\times U(6)\times O(3)$ and Universality 15
12) Conclusions 21
References 22

Yoshio YAMAGUCHI
Chiral Dynamics
Introduction and Summary 24
1. Chiral $SU_2\times SU_2$ dynamics 24
1) A chiral description for pseudoscalar mesons 24
2) Chiral description of nucleons. 29
3) Chiral invariant theory of meson-nucleon system 31
4) Matrix formalism 33
2. Chiral $U_3\times U_3$ Theory 35
5) Representation and transformation of pseudoscalar mesons . . 35
6) Transformation property for quarks 38
7) Strong dynamics including chiral gauge fields 39
References 41

S. M. BERMAN
Soft Pions and Current Algebras
1. Comment 43
2. Introduction 43
1) Reduction Formula 43
2) The Goldberger-Treiman Relation 44
3. Charges, Noether Theorem 48
1) Charges 48

2) Noether Theorem 49
4. Applications 51
1) Kroll-Ruderman Theorem 51
2) The Callan-Treiman Relation 55
3) The K_{e_4} Decays 58
Appendix 1.
Complete Proof of the Divergence Conditions and the Noether Theorem 62
Appendix 2.
Remarks on Isospin Generators and Cabibbo Theory 66
Gell-Mann, Ne'eman Remark on the Cabibbo Theory 66
Appendix 3.
Low-Energy Theorem for Pion Photoproduction from the PCAC Hypothesis 68
1. Introduction 68
2. The Low-Energy Theorem 68
3. Comparison with Experimental Results 71
4. Conclusion 73

T. D. LEE
Algebra of the Observed Current Operators
1. Review 74
1) Introduction 74
2) Current Algebra 75
3) Spectral Representation and the Schwinger Term 76
2. Field-Current Identity 80
1) General Discussion 80
2) Algebra of Fields 80
3) Propagator 82
3. Application to $(J_\mu{}^I)_{I=1}$ 84
1) Spectral Function 84
2) Lagrangian 85
3) Feynman Graphs and ρ-propagator 87
4) Commutation Relations and Sum Rules 89
5) Photon Propagator 90
6) Remarks 91
7) Form Factor 93
8) Algebra of $(J_\mu{}^I)_{I=1}$ 94
4. Iso-scalar Electromagnetic Current 94
1) General Discussions 94
2) $\phi-\omega$ Mixing 96
3) Special Models 98
5. Algebra of the Observed Currents 99
1) U_1 Algebra 99
2) SU_2 Algebra 100
References 101

T. D. LEE
C, P, T Symmetries
1. General Discussion 102
1) Symmetry Principles and Their Violations 102
2) Time Reversal Symmetry 103
3) Implication of Non-conservation 104
4) Group Extension 105
2. Possible Existence of C_{st} and T_{st} Violating Electromagnetic Interaction 107
1) General Discussion 107
2) Some Necessary Properties of K_μ 108
3) Classification 110
4) Some Further Properties of Q_K 111
5) Experimental Consequences of K_μ 113
6) Application of Field Current Identity 114
References 115
K. NISHIJIMA
A Model of *CP* Violation
1. Introduction 116
2. The Primary Interaction 117
3. The Selection Rule $|\Delta S|<2$ and New Constraints 118
4. The *S* Wave Hyperon Decays 123
5. The *CP*-Violating Decay $K_L^0 \to 2\pi$ 127
6. The Electric Dipole Moment of the Neutron 129
References 131
M. GOURDIN
TCP Invariance, Time-reversal Invariance, and *K*-meson Decay
1. Introduction 132
2. Quantum Mechanics 133
3. The *TCP* Invariance 135
4. Time-reversal Invariance 138
5. The 2π-meson Mode 139
6. The 3π-meson Mode 150
7. Conclusion 154
References 154
Figure Captions 156
N. NAKANISHI
Daughter trajectories and Bethe-Salpeter ghosts 161
References 166