

1. Record Nr.	UNINA9911044017003321
Autore	Cabibbo Nicola
Titolo	An Introduction to Gauge Theories
Pubbl/distr/stampa	Milton : , : Taylor & Francis Group, , 2025 ©2025
ISBN	1-003-56070-9 1-04-037027-6
Edizione	[2nd ed.]
Descrizione fisica	1 online resource (290 pages)
Altri autori (Persone)	MaianiLuciano BenharOmar
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Cover -- Half Title -- Title Page -- Copyright Page -- Contents -- Preface -- The Authors -- CHAPTER 1: INTRODUCTION -- 1.1. QUANTUM ELECTRODYNAMICS -- 1.2. UNITS AND OTHER CONVENTIONS. -- CHAPTER 2: THE FEYNMAN PATH INTEGRAL -- 2.1. CALCULATION OF THE TRANSITION AMPLITUDE -- 2.2. THE LATTICE APPROXIMATION -- 2.3. THE CLASSICAL LIMIT -- 2.4. TIME AS A COMPLEX VARIABLE -- 2.5. STATISTICAL MECHANICS -- 2.6. GREEN'S FUNCTIONS -- CHAPTER 3: TOWARDS A FIELD THEORY -- 3.1. THE GENERATING FUNCTIONAL -- 3.2. THE HARMONIC OSCILLATOR -- 3.3. FREE SCALAR FIELDS: PROPAGATOR AND GENERATING FUNCTIONAL -- 3.4. FREE SCALAR FIELD: ONE-PARTICLE STATES -- 3.5. CREATION AND DESTRUCTION OPERATORS -- CHAPTER 4: EQUATIONS OF MOTION, SYMMETRIES AND WARD'S IDENTITY -- 4.1. SUM OVER PATHS AND OPERATORS -- 4.1.1. Derivatives -- 4.2. THE FUNDAMENTAL IDENTITY -- 4.3. QUANTUM MECHANICS -- 4.3.1. Equations of motion and commutation rules -- 4.3.2. Symmetries -- 4.3.3. The Hamiltonian function -- 4.4. FIELD THEORY -- 4.4.1. Symmetries in field theory -- 4.4.2. Ward's identity -- 4.5. THE SYMMETRIES OF THE VACUUM -- CHAPTER 5: THE ELECTROMAGNETIC FIELD -- 5.1. THE CHOICE OF GAUGE -- 5.2. GENERATING FUNCTIONAL AND PROPAGATOR -- 5.3. SINGLE PHOTON STATES -- 5.4. VIRTUAL PHOTONS -- CHAPTER 6:

FERMION FIELDS -- 6.1. HARMONIC AND FERMI OSCILLATORS -- 6.1.1. Anticommuting variables -- 6.1.2. Sum over paths for the two oscillators -- 6.1.3. Gaussian integrals for commuting and anticommuting variables -- 6.2. QUANTISATION OF THE DIRAC FIELD -- 6.2.1. Fermion propagator -- 6.2.2. The spin-statistics theorem -- 6.2.3. One-particle states of the Dirac field -- CHAPTER 7: SCATTERING PROCESSES AND THE S-MATRIX -- 7.1. "IN" STATES AND "OUT" STATES -- 7.2. SCATTERING AMPLITUDES AND THE S-MATRIX -- 7.3. CONSERVED QUANTITIES -- 7.4. THE LSZ REDUCTION FORMULAE. CHAPTER 8: PERTURBATIVE GREEN'S FUNCTIONS IN 4 -- 8.1. THE PERTURBATIVE GENERATING FUNCTIONAL -- 8.2. FEYNMAN RULES FOR GREEN'S FUNCTIONS -- 8.3. CONNECTED PARTS AND VACUUM DIAGRAMS -- 8.4. PERTURBATIVE TWO-POINT GREEN'S FUNCTION -- CHAPTER 9: S-MATRIX FEYNMAN DIAGRAMS IN 4 -- 9.1. ONE-PARTICLE IRREDUCIBLE DIAGRAMS -- 9.2. FEYNMAN RULES FOR THE S-MATRIX ELEMENTS -- CHAPTER 10: QUANTUM ELECTRODYNAMICS -- 10.1. FEYNMAN DIAGRAMS FOR THE GENERATING FUNCTIONAL -- 10.2. TWO-POINT FUNCTIONS -- 10.3. REDUCTION FORMULAE -- 10.4. FEYNMAN DIAGRAMS FOR THE S-MATRIX -- 10.5. COMBINATORIALS -- CHAPTER 11: RENORMALISATION OF QED -- 11.1. THE PHOTON PROPAGATOR -- 11.2. RENORMALISATION OF THE CHARGE -- 11.3. THE ELECTRON PROPAGATOR -- 11.3.1. The propagator to all orders -- 11.4. THE VERTEX -- 11.5. WARD'S IDENTITY -- CHAPTER 12: APPLICATIONS OF QED -- 12.1. SCATTERING IN AN EXTERNAL FIELD -- 12.2. BREMSSTRAHLUNG AND INFRARED DIVERGENCE -- 12.3. THE LAMB SHIFT -- 12.4. VACUUM POLARISATION -- 12.4.1. Calculation of the tensor $\langle k \rangle$ to one loop -- 12.5. THE ANOMALOUS MAGNETIC MOMENT -- 12.5.1. Preliminaries -- 12.5.2. The calculation -- CHAPTER 13: RENORMALISATION GROUP OF QED -- 13.1. EFFECTIVE ELECTRIC CHARGE -- 13.2. THE GELL.MANN AND LOW EQUATION -- 13.3. THE QED FUNCTION -- 13.4. ASYMPTOTIC VARIATION OF THE EFFECTIVE CHARGE -- CHAPTER 14: QUANTISING A NON-ABELIAN THEORY -- 14.1. FUNDAMENTALS -- 14.2. QUARKS IN QUANTUM CHROMODYNAMICS -- 14.3. THE FADDEEV.POPOV DETERMINANT -- 14.4. FEYNMAN RULES -- CHAPTER 15: UNITARITY AND GHOSTS -- 15.1. THE CUTKOSKY RULE -- 15.2. THE INELASTIC REACTION $u + u \rightarrow d + d$ -- 15.3. THE CASE OF QED -- 15.4. NON-ABELIAN GAUGE THEORIES -- CHAPTER 16: THE FUNCTION IN QCD -- 16.1. VACUUM POLARISATION -- 16.2. CORRECTIONS TO QUARK PROPAGATOR AND VERTEX -- 16.3. ASYMPTOTIC FREEDOM -- 16.4. THE DETERMINATION OF s . 16.5. THE LANDAU POLE AND THE CONTINUUM LIMIT OF GAUGE THEORIES -- CHAPTER 17: LATTICE QCD -- 17.1. QCD FIELDS ON LATTICE -- 17.2. CHIRAL SYMMETRY WITH WILSON FERMIONS -- 17.3. LATTICE GREEN'S FUNCTIONS -- 17.4. LIGHT HADRON MASSES -- 17.5. LATTICE QCD VS. COMPUTING POWER -- CHAPTER 18: THE $I = 1/2$ RULE IN STRANGE PARTICLES NON-LEPTONIC DECAYS -- 18.1. THE $I = 1/2$ RULE IN K DECAYS -- 18.2. OPERATOR BASIS FOR NON-LEPTONIC DECAYS -- 18.3. QUARK STATISTICS AND THE $I = 1/2$ RULE -- 18.4. QCD CORRECTIONS -- 18.5. THE CALLAN SZYMANZIK EQUATION -- 18.6. RELATIVE STRENGTHS OF NON-LEPTONIC OPERATORS -- 18.7. PENGUIN DIAGRAMS -- 18.8. WEAK INTERACTIONS IN LATTICE QCD -- CHAPTER 19: THE WEAK MUON ANOMALY -- 19.1. THE R GAUGE -- 19.2. MUON ANOMALY: W EXCHANGE -- 19.3. Z AND HIGGS BOSON EXCHANGE -- 19.4. COMPARISON WITH DATA -- CHAPTER 20: EFFECTIVE CONSTANTS AT HIGH ENERGY AND IDEAS ABOUT GRAND UNIFICATION -- 20.1. EFFECTIVE CONSTANTS OF THE STANDARD THEORY -- 20.2. GRAND UNIFICATION AND OTHER HYPOTHESES --

CHAPTER 21: LIMITS ON THE MASS OF THE HIGGS BOSON -- 21.1. SCALAR FIELDS IN THE STANDARD THEORY -- 21.2. LIMITS ON THE MASS OF THE HIGGS BOSON -- CHAPTER 22: EFFECTIVE POTENTIAL AND NATURALNESS -- 22.1. EFFECTIVE POTENTIAL -- 22.2. EXPANSION AROUND THE CLASSICAL LIMIT -- 22.3. LOOP EXPANSION OF THE POTENTIAL -- 22.4. ONE LOOP POTENTIAL IN THE STANDARD THEORY -- 22.5. NON-NATURALNESS OF THE STANDARD THEORY -- APPENDIX A: TRANSITION AMPLITUDE CALCULATION -- A.1. TRANSITION AMPLITUDE FOR ZERO POTENTIAL -- APPENDIX B: CONNECTED DIAGRAMMS -- B.1. GENERATING FUNCTIONAL OF CONNECTED DIAGRAMMS -- APPENDIX C: LORENTZ INVARIANCE AND ONE-PARTICLE STATES -- C.1. RENORMALISATION CONSTANTS -- APPENDIX D: REDUCTION FORMULAE -- D.1. REDUCTION FORMULAE FOR THE COMPTON SCATTERING AMPLITUDE -- APPENDIX E: INTEGRALS -- E.1. INTEGRATION IN D DIMENSIONS -- E.2. FEYNMAN PARAMETERS. APPENDIX F: CHIRAL SYMMETRY WITH WILSON FERMIONS: BASIC FORMULAE -- F.1. A USEFUL IDENTITY -- F.2. PARTIAL CONSERVATION OF THE AXIAL CURRENT -- F.3. VACUUM SATURATION -- F.4. SOFT PIONS AND NON-LEPTONIC AMPLITUDES -- F.5. CHIRAL RELATIONS FOR K AND K^* -- APPENDIX G: Γ AND Γ^* FUNCTIONS -- G.1. Γ -- G.2. Γ^* -- Bibliography -- Index.

Sommario/riassunto

Written by world-leading experts in particle physics, this new book from Luciano Maiani and Omar Benhar, with contributions from the late Nicola Cabibbo, is based on Feynman's path integral formulation of quantum field theory.
