Literature

This list does not claim to be complete. It contains mainly the original literature used in the book. Excellent bibliographies can be found in the book of Pais citePai86 (until ca. 1985) and in the contribution of J. Six and X. Artu in [1] (until ca 1964). A data base for articles since 1984 (and selected older articles) is Spires. `http://www.slac.stanford.edu/spires.hep` The ‚net', an e-print archive, contains nearly all recent publications: `http://www.arXiv.org`

Other important WWW sites for Particle Physics

The home of the WWW: `http://www.cern.ch`

Extremely useful is the homepage of the Particle Data Group: `http://pdg.lbl.gov` Here are not only particle data collected, but also very concise and knowledgable review articles. One can find there also many useful links to conferences, address books, libraries, archives, scientific information (e.g. `http://ParticleAdventure.org/` in 5 languages). Every two years the Particle Data appear as hard copies, last issue [2].

1 The Heroic Time

1.1 Introduction

Antiquity:[3, 4]
[5], book 13 (Eudoxus (?) and Theaitetos (?) ca 400 BC)

Vortex atoms:[6]

Elements made of hydrogen: [7, 8]

1.2 Brave Old World

Cathode rays: [9, 10]
Discovery of the elctron: [11, 12, 13, 14]
Models of the atom [15, 16, 17]
Neutron [18, 19, 20, 21]
Photon: [22, 23] [24, 25]. Early review article:[26]
Neutrino: [27, 28]

1.4 Quantum Physics becomes decisive

Only few early and seminal articles and a small selection of influential monographs and textbooks are quoted.

The foundations of quantum mechanics are given in the the following monographs: [29, 30, 31], even today this books deserve to be read.

An *evergreen* ist [32]; very exhaustive is [33].

One of the oldest monographs on quantum field theory is: [34],similarly set up is [35]. The first monograph emphasizing the problems of perturbation theory is [36]. Gauge theories are extensively treated in [37], axiomatic field theory is treated in [38], a more recent book is [39] XXXXXXXXXX.

Still worth reading is the classic [40] on special relativity, classical texts on general relativity are [**?**] and [41]

A well documented history of quantum field theory is [42], see also the introduction of [39], vol. 1. Extremely interesting are the books of Pais Pais [43, 44] and his review article [45]. Very amusing is the book Gamov [46].

Special and general relativity:[47]
Quantum theory[48, 49, 23, 50, 51, 52]
Quantum field theory:[53, 54]
relativistic quantum field theory:[55]
Antiparticles:[56, 57]
Quantum field theory of beta decay:[58], extension: Gamov-Teller transitions: [59], Majorana neutrinos:[60]
Meson theory:[61, 62, 63]
renormalized quantum field theory (QED):[64, 65, 66, 67]

1.5 Symmetries in Particle Physics

Fundamental, but not easy to read are the books by Weyl [68] and Wigner [69] on group theory and quantum mechanics. Very informative is the more general book by Weyl [70]

Isospin :[71, 72, 62]

1.6 The Discovery of the Positron an Mesotron

Discovery of the positron:[73, 74] (Quotations by Anderson and Blacket from [75])
Discovery of the mesotron (later muon):[76] [77]

1.7 Early accelerators

Cockroft-Walton accelerator [78];
Cyclotron[79, 80], first 'large' cyclotron (60 inch) [81];
Synchrocyclotron, phase stability [82, 83]; 184 inch cyclotron in Berkely [84].

2 The Great Leap Forward

2.1 The Predicted Meson is Found

Charged π-mesons [85, 86, 87, 88]

Neutrale π-meson [89, 90]

muon decay, first hints of universality [91]

2.2 Strange Particles Cause Excitement

V particles [92, 93, 94, 95, 96]

strangeness [97, 98, 99, 100, 101, 102]

2.3 Particles Slightly out of tune

Particle mixture [102, 103]

2.4 Successes and Failures of Quantum Field Theory77

General theorems: [104]

Wightman axioms:[105, 106]

CPT: [107, 108]

Spin and statistics: [109, 110, 111, 112]

Magnetic moments: [113, 114, 115, 116] Review: [117]

2.5 The Beginning of a New Spectroscopy

Contribution of H.L. Anderson in [1], [118]

2.6 Producing More and Seeing Better

Strong focussing : [119]

Bubble chamber: [120]

2.8 The Surprises of Weak Interaction

$\theta - \tau$ puzzle [121, 122, 123]

Parity violation [124] Detection [125, 126, 127]

2.8.1 Digression: Right- and Left-Handed Particles

[128, 68, 129, 130, 131, 132]

2.8.2 Back to Weak Interactions

Conserved and partially conserved currents: [133, 134], [135, 136], [137, 138, 139]

Neutrino: [140, 141, 142]

CP: [143]

3 Up by Their Own Bootstraps

3.1 S-matrix theorie

[144] [145, 146]

3.2Scattering Amplitudes

Dispersion relations: [147]

[148] For a monograph on high energy scattering see [149]

3.3 Bootstraping and Nuclear democracy

[150, 151, 145]

3.4 Rigorous Theorems and Complex Angular Momenta

[152, 153, 154]

4 Composite Elementary particles

4.1 First Attempts

[155, 156, 157]

4.2 The Eightfold Way

Reprint collection [158]

[159, 160, 161, 162];

Discovery of the Ω^-: [163]

4.3 The Quark Model

Reprint collection: [164],

Recollections: [165], contribution of Gell-Mann in [166]

Quarks: [167, 168]

SU(6): [169, 170]

For current algebra see: [171]

4.4 The Quarks Assume Color

[172]; [173]

Popular evergreen: [174]

5 On the Path to the Standard Model

Books to chapter 5 and 6: [166],[175]

5.1 The Master of the Gauge

Reviews: [176, 177, 178]

Original contributions: [179, 180, 181, 182]; [183, 184, 185, 128, 68], see also [41]

5.2 New Dimensions for the Gauge

[186, 187]

For the long and complicated history of quantization of non-Abelian gauge theories see the review by Veltman, which also contains an exhaustive bibliography [188]. Important original contributions are: [189, 190, 191, 192, 193, 194]

5.3 Spontaneous Symmetry Breaking

In the ferromagnet : [195], in particle physics. [196, 197, 198, 199]

5.4 Higgs-Kibble Dinner

In solid state physics: [200]

In particle physics: [201, 202, 203]

5.5 Anomalies

[204, 205, 206, 207]

5.6 Better Counters, Better Accelerators, and Better Beams

See the contributions of B. Richter, K. Johnson, R. Schwitters, P. Galison and R.R. Wilson und A. Kolb in [166] and [208]

5.7 The Electron Microscopes of Particle Physics

5.8 Deep Inelastic Scattering

Contributions of J. Friedman and J. Bjorken in [166]

Reviews:[209, 210, 211]

Theory: [212, 213, 214, 215]

Experiment: Elektron scattering:[216, 217] ; Neutrino scattering [218]

6 The Standard Model of Particle Physics

6.1 Introduction

Early models: [186, 135, 219, 220];[221]

6.2 A Model for Leptons

[222, 223]

6.3 Weak Currents

Weak currents and symmetry: [224, 225]

GIM-mechanism: [226]

Cancellation of anomalies: [227]

Review on ,,charm": [228]

probable discovery of ,,charm" (unnoticed):[229], discovery of ,,charm" s. 6.6

Older limits for neutral currents: [230]

Discovery of neutral currents:[231, 232, 233]

Background estimates: [234]

6.4 The Strong Interaction Becomes Dynamic

[235, 236, 237]

Many aspects of QCD are treated in [238]

6.5Running Coupling and Asymptotic Freedom

Renormalization group: [239, 240, 36, 241, 242]

Asymptotic freedom: [243, 244] Its curious history: M. Shifman in [238], vol. I, 126

6.6 Quantitative Calculations in Strong Interactions

π^0 decay and $e^+ e^-$ annihilation: [245]

J/ψ: [246, 247]

6.7 Qunatum Chromodynamics on the Lattice

Gauge invariant lattice theory: [248]

Lattice QCD: [249]

6.8 The Consolidation of the Standard Model

Motto by Veltman [188]

Discovery of the gluon: [250]

For high energy reactions see e.g. the monographs [251, 149] and the literature quoted there

Operator product expansion [252, 253, 254, 255] renormalization group see 6.5

Upsilon: [256]

τ lepton: [257]

Mixing of three families: [258]

6.9 Quark Masses an their Consequences

Seminal were the investigations of Gasser and Leutwyler: [259]

see also review in [260]

6.10 The Standard Model in All its Glory

Excerpts of the Einstein-Weyl correspondence (ETH-Archiv) are collected in [176]

7 Storm Clouds or the Dawn of a New Physics

For actual information see tables and review articles of the Particle Data Group [2], http://pdg.lbl.gov

see also [261]

7.1 Neutrinos, Too, Are Out of Tune

Experimentes: Homestake [262]; Gallex [263]; GNO [264]; SAGE (Baksan, Russland) [265]; Kamiokande [266]; Super-Kamiokande [267]; SNO [268], (nucl-ex/03090034).

Solar models: [269, 270]

Neutrino web page: `http:sns.ias.edu/~jnb/`

7.3 The Grand Unification

GUT:[271, 272, 273]

7.4 Supersymmetry

Supersymmetry: [274, 275, 276]; Internal and external symmetries: [277, 278]

SUSY-GUT: [279, 280, 281, 282, 283, 284]

7.5 Monopoles

Dirac monopoles: [57]

In gauge theories: [285, 286] Introduction: [287]

Confinement and monopoles: [288, 289, 290, 291].The model calculation is from :[292]

7.6 The Microcosm and Macrocosm

First proposal for ,,Big bang": [293]

Expansion of the universe: [294]

Books: [295, 296]. Still worth reading [297].

see the revies of the Particle Data Group in section ,,Astrophysics and Cosmology".

7.7 Silent Strings

Beginning: [154] Popular book: [298]

Web page: `http://superstringtheory.com/`

8 Epilog

8.1 Peculiarities of Particle Physics

QED- experiments: [299, 300]

Proton-antiproton scattering: [301, 302]

Relation between quantum field theory and statistical mechanics: [303, 304]

8.2 Philosophy

see e.g. [305, 306, 307, 308]

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