

Contents

Heisenberg and Pauli: Their Program of a Unified Quantum Field Theory of Elementary Particles (1927–1958) by H. Rechenberg	1
--	---

Group 11: Electron Theory of Superconductivity (1946–1948)

Annotation by H. Koppe	23
11.1 Zur Theorie der Supraleitung / On the Theory of Superconductivity	28
11.2 Die Übertragung elektromagnetischer Kräfte im Supraleiter / The Transfer of Electromagnetic Forces in the Superconductor	45
11.3 Das Barlowsche Rad aus supraleitendem Material / The Barlow Wheel Made of Superconducting Material (with M. von Laue)	49
11.4 Das elektrodynamische Verhalten der Supraleiter / The Electrodynamical Behavior of Superconductors	54
11.5 Thermodynamische Betrachtungen zum Problem der Supraleitung / Thermodynamical Considerations on the Problem of Superconductivity	65

Group 12: Meson Showers and Multiparticle Production (1949–1952)

Annotation by R. Hagedorn	75
12.1 Production of Meson Showers	86
12.2 Über die Entstehung von Mesonen in Vielfachprozessen / On the Creation of Mesons in Multiple Processes	88
12.3 Bemerkungen zur Theorie der Vielfacherzeugung von Mesonen / Remarks on the Theory of Multiple Production of Mesons	102
12.4 Mesonenerzeugung als Stoßwellenproblem / Meson Production as a Problem of Shock Waves	103
Appendix to Group 12	118
12.I Vergleichende Übersicht über Theorien der π -Mesonen Produktion in der Ultrastrahlung / Comparative Review of Theories of π -Meson Production in Cosmic Radiation	118
12.IIa Summary of Heavy Meson Data	123
12.IIb Multiple Production of Mesons	125
12.III Discussion of D. I. Blokhintsev's talk	128

Group 13: Unified Field Theory of Elementary Particles I (1950–1957)

Annotation by H.-P. Dürr	133
13.1 Zur Quantentheorie der Elementarteilchen / On the Quantum Theory of Elementary Particles	142
13.2 Stationäre Zustände in der relativistischen Quantentheorie der Wellenfelder / Stationary States in the Relativistic Quantum Theory of Wave Fields	151
13.3 On the Mathematical Frame of the Theory of Elementary Particles	158
13.4 Zur Frage der Kausalität in der Quantentheorie der Elementarteilchen / Causality Problem in the Quantum Theory of Elementary Particles	166
13.5 Paradoxien des Zeitbegriffs in der Theorie der Elementarteilchen / Paradoxes of the Time Concept in the Theory of Elementary Particles	170
13.6 Zur Quantisierung nichtlinearer Gleichungen / On the Quantization of Nonlinear Equations	185
13.7 Zur Quantentheorie nichtrenormierbarer Wellengleichungen / On the Quantum Theory of Nonrenormalizable Wave Equations	202
13.8 Zur Quantentheorie nichtlinearer Wellengleichungen III / On the Quantum Theory of Nonlinear Wave Equations III (with F. Kortel and H. Mitter)	214
13.9 Hilbert Space II and the “Ghost” States of Pauli and Källén	236
13.10 Erweiterungen des Hilbert-Raums in der Quantentheorie der Wellenfelder / Generalizations of Hilbert Space in the Quantum Theory of Wave Fields	241
13.11 Bemerkungen zur “neuen Tamm-Dancoff-Methode” in der Quantentheorie der Wellenfelder / Remarks on the “New Tamm- Dancoff Method” in the Quantum Theory of Wave Fields	249
13.12 Zur Quantentheorie nichtlinearer Wellengleichungen IV. Elektrodynamik / On the Quantum Theory of Nonlinear Wave Equations IV. Electrodynamics (with R. Ascoli)	259
13.13 Lee Model and Quantization of Nonlinear Field Equations	270
13.14 Application of the Tamm-Dancoff Method to the Lee Model	302
Appendix to Group 13	309
13.I Fortschritte und Schwierigkeiten in der Quantentheorie der Elementarteilchen / Advances and Difficulties in the Quantum Theory of Elementary Particles	309
13.II Aus dem Festvortrag von Professor Heisenberg über “Die Physik der Elementarteilchen” / From Heisenberg’s Address on “The Physics of Elementary Particles”	320

Group 14: Unified Field Theory of Elementary Particles II (1958–1975)

Annotation by H.-P. Dürr	325
14.1 On the Isospin Group in the Theory of the Elementary Particles (with W. Pauli)	337

14.2	Zur Theorie der Elementarteilchen / On the Theory of Elementary Particles (with H.-P. Dürr, H. Mitter, S. Schlieder and K. Yamazaki)	352
14.3	Zur Theorie der "seltsamen" Teilchen / On the Theory of "Strange" Particles (with H.-P. Dürr)	397
14.4	Zur Theorie der seltsamen Teilchen / On the Theory of Strange Particles	419
14.5	The Quantum Numbers of the ω -Meson (with H.-P. Dürr)	424
14.6	Arbeiten zur einheitlichen Feldtheorie der Elementarteilchen / Work on the Unified Field Theory of Elementary Particles	434
14.7	On the "Spurion" Theory of Strange Particles (with H.-P. Dürr)	437
14.8	Strange-Particle Coupling Constants (with H.-P. Dürr)	478
14.9	Quantum Electrodynamics in the Nonlinear Spinor Theory and the Value of Sommerfeld's Fine-Structure Constant (with H.-P. Dürr, H. Yamamoto and K. Yamazaki)	502
14.10	Zur Theorie der Leptonenmassen / On the Theory of Lepton Masses	525
14.11	Magnons in a Model with Antiferromagnetic Properties (with H. Wagner and K. Yamazaki)	528
14.12	Magnons in a Model with Antiferromagnetic Properties. – II (with K. Yamazaki)	543
Appendix to Group 14		556
14.I	Fortschritte in der Theorie der Elementarteilchen / Advances in the Theory of Elementary Particles	556
14.IIa	Discussion des rapports de Heitler et Feynman / Discussion of the Reports of Heitler and Feynman	559
14.IIb	Discussion du rapport de Källén / Discussion of the Report of Källén	565
14.IIc	Discussion du rapport de Goldberger / Discussion of the Report of Goldberger	571
14.IId	Discussion du rapport de Yukawa / Discussion of the Report of Yukawa	574
14.III	Fortschritte in der einheitlichen Feldtheorie der Elementarteilchen / Progress in the Unified Field Theory of Matter	579
14.IV	Die Theorie der Elementarteilchen / The Theory of Elementary Particles	581
14.V	Kosmologie, Elementarteilchen, Symmetrie / Cosmology, Elementary Particles, Symmetry	582
14.VI	Program for the 2nd Edition of the Book <i>Introduction to the Unified Field Theory of Elementary Particles</i>	584
14.VII	Facsimile of the "Preface to the Second Edition" of the Book <i>Introduction to the Unified Field Theory of Elementary Particles</i>	586

Appendix

A.1	Léon Brillouin, Les Statistiques Quantiques et leurs applications (Book review)	591
A.2	Quantum Mechanics	593
A.3	Anlage (Bisherige und zukünftige Quantenelektrodynamik) / Addendum on Present and Future Quantum Electrodynamics	597

A.3	Anlage (Bisherige und zukünftige Quantenelektrodynamik) / Addendum on Present and Future Quantum Electrodynamics	597
A.4	Ist eine deterministische Ergänzung der Quantenmechanik möglich? / Can Quantum Mechanics Be Completed Deterministically?	604
A.5	Die Verhältnisse in der deutschen Physik / The Situation of Physics in Germany	614
A.6	Über die Uranbombe / Lecture on the Uranium Bomb	618
A.7	Untersuchungen zur Quantenlogik / Investigations on Quantum Logics (Report on a paper by P. Mittelstaedt)	637
	Bibliographical Citation List	639
	Werner Heisenberg – Bibliography by H. Rechenberg	645