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Foreword

The international workshop entitled *The Higgs Puzzle—What Can we Learn from LEP2, LHC, NLC, and FMC?* took place on 8–12 December 1996 at Ringberg Castle, which overlooks Lake Tegernsee in the foothills of the Bavarian Alps, one of the most picturesque locations to be found in the whole of Germany. The castle was built during the first half of this century by Duke Luitpold in Bavaria (Herzog Luitpold in Bayern), a member of the Wittelsbach family, who ruled Bavaria over 800 years, and his friend Friedrich Attenhuber, an all-round artist, architect, and interior decorator. The castle is entirely their creation, from the massive Renaissance-inspired exterior right down to the fittings and furniture, which, in every detail, were designed by Attenhuber himself and executed by native craftsmen. Attenhuber also painted every single picture hanging in the castle. He found his models in the farmhouses around Lake Tegernsee. The castle embodies all trends of art and styles which dominated the first half of this century, combined with local Alpine originality and the individual creative power of its constructors. According the the Duke's last will, the castle passed into the hands of the Max Planck Society after his death, in 1973. The castle was then transformed into a conference venue where scientists can exchange their latest ideas and discuss problems with their colleagues from all over the world in beautiful surroundings and in a relaxed mountain atmosphere, high above the daily business activities.

This event has continued a series of Ringberg workshops on electroweak physics in high-energy reactions, which include: *Hadronic Matrix Elements and Weak Decays* on 17–22 April 1988; *Radiative Corrections for e^+e^- Collisions* on 3–7 April 1989; *High Precision versus High Energies in e^+e^- Collisions* on 15–19 April 1991; *Perspectives of the Electroweak Interactions in e^+e^- Collisions* on 4–8 April 1993; *Advances in Non-Perturbative and Perturbative Techniques* on 13–19 November 1994; *Perspectives for Electroweak Interactions in e^+e^- Collisions* on 5–8 February 1995. On the occasion of the 1996 Ringberg workshop, forty-two experts of elementary-particle physics, both theoreticians and experimentalists, from twenty-seven universities and research institutions in ten countries congregated to present their latest results on the various aspects of Higgs phenomenology.

The motivation for this workshop may be summarized as follows. Despite the great success of the standard model of electroweak and strong interactions to describe the phenomena observed in high-energy-physics experiments, the mechanism by which the elementary particles are endowed with their masses is yet to be unraveled. Does nature choose the Higgs mechanism of spontaneous symmetry breaking as predicted by the standard model, or do we need some alternative explanation? The purpose of the workshop was to capture new trends and ideas in this exciting area of fundamental physics, and to explore the potential of recent (CERN LEP1), present (CERN LEP2, DESY HERA, Fermilab Tevatron, SLAC SLC), and future (CERN LHC, Next Linear Collider, First Muon Collider) colliding-beam experiments to shed light on the Higgs puzzle.

There was a total of 35 presentations of 45 minutes each. This proceedings volume is to give a comprehensive account of the novel ideas and results discussed by the speakers. The topics include: experimental and theoretical status reports from LEP1, LEP2, LHC, NLC, and FMC; electroweak precision tests; multi-loop calculus; Callan-Symanzik and renormalization-group equations; lattice field theory; gauge independence and invariance; resonant CP violation; strongly interacting Higgs sector; effective Lagrangians; supersymmetry; extended technicolor; dynamical symmetry breaking; compositeness; grand unification; electroweak phase transition; baryogenesis; and noncommutative geometry. We also hope that the high-energy-physics community at large will find this document useful in their ongoing efforts of solving the Higgs puzzle.

At this point, I should like to thank my friends and colleagues who have contributed their shares to these proceedings. I am indebted to the workshop secretary, Mrs. Renate Saffert, for her assistance before, during, and after the workshop. Last but not least, I am grateful to Wolfgang Hollik and Stefan Pokorski for contributions from their EU budgets towards the cost of catering and lodging, and to the Werner Heisenberg Institute for their generous financial support.

Finally, I wish to express my serious concern against the plan of the Max Planck Society to eliminate 61 positions in the Werner Heisenberg Institute, Germany's second largest high-energy-physics laboratory after DESY, during the next few years. I hope that the responsible persons will reconsider this detrimental measure against the heritage of Max Planck and Werner Heisenberg, and the progress in elementary particle physics, the most fundamental area of research there is in natural sciences.

Munich, March 1997

Bernd A. Kniehl

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List of participants

Z. Berezhiani	Ferrara	BEREZHIANI@AXPFE1.FE.INFN.IT
M. Boutemeur	LMU Munich	MADJID.BOUTEMEUR@CERN.CH
K. G. Chetyrkin	Moscow/MPI Munich	CHET@MPPMU.MPG.DE
S. Davidson	MPI Munich	SACHA@MPPMU.MPG.DE
G. Degrassi	Padua/MPI Munich	DEGRASSI@PADOVA.INFN.IT
A. Djouadi	Montpellier	DJOUADI@LPM.UNIV-MONTP2.FR
H. Dreiner	RAL	DREINER@V2.RL.AC.UK
P. Gambino	MPI Munich	GAMBINO@MPPMU.MPG.DE
J. F. Gunion	Davis	JFGUCD@UCDHEP.UCDAVIS.EDU
H. E. Haber	Santa Cruz	HABER@SCIPP.UCSC.EDU
T. Han	Davis	THAN@UCDHEP.UCDAVIS.EDU
H.-J. He	DESY	HJHE@MAIL.DESY.DE
R. Hempfling	Davis	HEMPF@BETHE.UCDAVIS.EDU
W. Hollik	Karlsruhe	HOLLIK@ITPAXP3.PHYSIK.UNI-KARLSRUHE.DE
K. Jakobs	Mainz	JAKOBS@DHEMZE.PHYSIK.UNI-MAINZ.DE
P. Janot	CERN	PATRICK.JANOT@CERN.CH
C. Jin	LMU Munich	JIN@PHOTON.HEP.PHYSIK.UNI-MUENCHEN.DE
J. Kalinowski	Warsaw/DESY	KALINO@X4U2.DESY.DE
W. Kilian	Heidelberg	KILIAN@THPHYS.UNI-HEIDELBERG.DE
B. A. Kniehl	MPI Munich	KNIEHL@VMS.MPPMU.MPG.DE
J. Körner	Mainz	KOERNER@VIPMZT.PHYSIK.UNI-MAINZ.DE
E. Kraus	Bonn	KRAUS@AVZW02.PHYSIK.UNI-BONN.DE
J. H. Kühn	Karlsruhe	JOHANN.KUEHN@PHYSIK.UNI-KARLSRUHE.DE
Z. Kunszt	ETH Zurich	KUNSZT@ITP.PHYS.ETHZ.CH
B. Lampe	LMU Munich	BOL@MPPMU.MPG.DE
P. G. Langacker	Philadelphia	PGL@LANGACKER.HEP.UPENN.EDU
M. Lindner	TU Munich	MANFRED.LINDNER@PHYSIK.TU-MUENCHEN.DE
I. Montvay	DESY	ISTVAN.MONTVAY@DESY.DE
H.-G. Moser	MPI Munich	MOSER@MPPMU.MPG.DE
E. A. Paschos	Dortmund	PASCHOS@HET.PHYSIK.UNI-DORTMUND.DE
A. Pilaftsis	MPI Munich	PILAFTSI@MPPMU.MPG.DE
S. Pokorski	Warsaw/MPI Munich	POKORSKI@FUW.EDU.PL
M. Quiros	Madrid	QUIROS@ROCA.CSIC.ES
K. Riesselmann	Zeuthen	KURTR@IFH.DE
R. Saffert	MPI Munich	REL@MPPMU.MPG.DE
F. Scheck	Mainz	SCHECK@DIPMZA.PHYSIK.UNI-MAINZ.DE
R. D. Settles	MPI Munich	STS@CERNVM.CERN.CH
M. E. Shaposhnikov	CERN	MSHAPOSH@NXTH04.CERN.CH
E. H. Simmons	Boston University	SIMMONS@BU.EDU
A. Sirlin	New York University	SIRLIN@ACF2.NYU.EDU
M. Spira	CERN	MSPIRA@CERN.CH
M. Steinhauser	MPI Munich	MSTEINH@MPPMU.MPG.DE
R. G. Stuart	Ann Arbor	STUARTR@UMICH.EDU