Foreword by the Editors

The true masters of mathematical physics always knew how to isolate the physical content of complicated mathematical arguments, but unfortunately the majority of theoreticians in Europe are to this day sometimes overfascinated by the mathematical aspects of the physical description of nature. Wolfgang Kummer[1]

Wolfgang Kummer had a rare gift: he recognized good people — while being one himself — and good ideas — while having them himself.

Wolfgang Kummer was born between the two World Wars on October 15, 1935, in Krems near Vienna, Austria. Until his graduation in 1958 at the Vienna University of Technology Wolfgang witnessed the changes from Austro-fascism (1934–1938) via Third Reich (1938–1945) and occupation by the Allied Forces (1945–1955) to a free and neutral Austria (since 1955). In 1960 he finished his PhD in Theoretical Physics under the supervision of Walter Glaser and Ludwig Flamm. In July 1960 he married Lore Kummer, who supported him until his death in 2007.

From 1961 on Wolfgang's career was closely connected with CERN, where he stayed as CERN fellow until 1964. Despite of bleak initial conditions after World War II — especially the brain drain and the latent anti-intellectual environment in Austria — Wolfgang Kummer became quickly one of the youngest full professors ever in 1968 at the age of 33, *after* he spent two years as director of the newly founded Austrian Institute for High Energy Physics of the Austrian Academy of Sciences. He managed to direct that institute simultaneously with his duties as full professor at the Vienna University of Technology until 1971, before leaving for an extended visit to the Pennsylvania University.

The visit to the United States was very inspiring for Wolfgang, and he regretted that he could not return after the turn of the millenium — but

despite of several invitations he refused, partially because he was deeply disappointed by the moral climate in the country, where human rights were sacrificed for a misguided sense of security, and political correctness was gradually replacing the intellectual freedom.

After his inspiring period in the US he produced a work which to this day remains his best-cited paper: his promotion of axial gauge in non-abelian quantum field theories,[2] which led to the avoidance of ghosts.

In the 1980ies Wolfgang returned to the CERN Council as its Vice-President at the point in time when the new supercollider SPS was getting into shape. From 1985 to 1987, Wolfgang was president of the CERN Council, which was only briefly interrupted by the consequences of a terrorist attack at the Vienna airport on December 26 in 1985, where Wolfgang was one of the victims. More about Wolfgang's role at CERN, his amazingly quick recovery through skiing and his cultural activities as pianist and trained tenor are recounted in Part III of this Volume.

While Wolfgang had numerous academic and administrative positions, such as being first Secretary and then President of the High Energy Board of the European Physical Society from 1995–1999, he was especially responsible for building up a group of theoretical high energy physics at the Vienna University of Technology, covering a broad range of research in quantum field theory, string theory, and (mainly two-dimensional) quantum gravity. The stimulating atmosphere in the group which we all enjoyed was entirely due to Wolfgang's leadership. Wolfgang himself had contributed foundational work in quantum gauge field theory. For instance, besides his well-known work on axial gauge that we mentioned already he proposed a lepton number violating neutrino model, now known as "Zee model",[3] and he was very fond of toponium,[4] a bound-state of a top-anti-top-quark pair.

Since the early 1990's Wolfgang has mainly worked on two-dimensional gravity, to which he made pioneering contributions summarized in an extensive review article.[5]

Wolfgang has been unceasingly productive much beyond his official retirement as professor for theoretical physics in 2003, not sparing himself despite the fact that his health was deteriorating sharply. He also remained active as a member of the Austrian Academy of Sciences and chairman of the Advisory Board of the Institute for High Energy Physics (HEPHY), Vienna.

Wolfgang was not a person to idolize others, but if he had something like an idol it would probably be Victor Weisskopf for whom he wrote an obituary in the CERN courier.[1,6] In private discussions he once stated:

"Victor Weisskopf was among the people who I would call a 'good person'. He was honest, modest, friendly, forgiving, humorous and listened to others, but never subscribed to the postmodern 'anything-goes' mentality, was not afraid to make clear decisions and could be relentless in a positive way." We knew another person with these attributes. Wolfgang Kummer.

References

1. W. Kummer, Victor Weisskopf: looking back on a distinguished career. *CERN Cour.* **42N5** (2002) 28–31.
2. W. Kummer, Ghost Free Nonabelian Gauge Theory, *Acta Phys. Austriaca* **41** (1975) 315–334.
3. W. Konetschny and W. Kummer, Nonconservation of Total Lepton Number with Scalar Bosons, *Phys.Lett.* **B70** (1977) 433.
4. W. Mödritsch and W. Kummer, Relativistic and gauge independent off-shell corrections to the toponium decay width, *Nucl.Phys.* **B430** (1994) 3–12.
5. D. Grumiller, W. Kummer and D. Vassilevich, Dilaton gravity in two-dimensions, *Phys.Rept.* **369** (2002) 327–430.
6. W. Kummer, A rich inheritance, *CERN Cour.* **42** (2002) SUPPL29–32.

Brief overview of this volume

Part I of the volume contains ten contributions on gauge field theory and particle physics. We mention here some of them as a guide through the volume, in order of appearance. The first contribution "Noncovariant gauges at zero and nonzero temperature" by P. Landshoff touches one of Wolfgangs main topics, namely ghost-free gauges in non-abelian gauge theory. At finite temperature additional complications arise, which are presented concisely. The contribution by A. Vairo discusses in detail another of Wolfgang's favorite topics, non-relativistic bound states like positronium and quarkonia, and the use of the Bethe–Salpeter equation for describing them. The next contributions deal with topics that were of great interest to Wolfgang, even though he did not contribute to them with research papers: S. Deser introduces various Chern–Simons terms for extensions of QED in three dimensions and P.G.O. Freund discusses dynamical spin, i.e., the possibility to build all particles from spinless constituents, based upon his unpublished results from 1981. The remaining contributions in Part I deal with quantum corrections to solitons (A. Rebhan, P. van Nieuwenhuizen and R. Wimmer), the gauging of noncommutative theories (H. Grosse and M. Wohlgenannt), neutron quantum optics (H. Rauch), σ-models and Wess–Zumino–Courant algebroids (M. Hansen and T. Strobl), some aspects

of gauge-fixing in Yang–Mills theories (D. Blaschke et al.) and, returning to the first contribution of this Memorial Volume, frozen ghosts in thermal gauge theory (P.V. Landshoff and A. Rebhan).

Part II of the volume contains ten contributions on classical and quantum gravity. Again we mention some of them, in order of appearance. The first contribution "Wolfgang Kummer and the Vienna School of Dilaton (Super-)Gravity" by L. Bergamin and R. Meyer provides an extensive review to Wolfgang's main research activities in his last two decades, dilaton gravity in two dimensions. This contribution is followed by related work on order and chaos in 2-dimensional gravity (R. Mann), 2-dimensional midisuperspace models for quantum black holes (J. Gegenberg and G. Kunstatter) and global solutions in Euclidean gravity (M. Katanaev). Then D.J. Schwarz, one of Wolfgang's most successful former students, provides mind-provoking "Thoughts on the Cosmological Principle". W. Thirring, together with C. Faustmann and H. Neufeld, discuss "When time emerges" by studying geodesics in spacetimes which allow for signature change. The simplicity of their 2-dimensional example surely would have appealed to Wolfgang. On a sidenote, this contribution is certainly the one with the biggest age gap between two of its authors: W. Thirring (82) and C. Faustmann (23). The remaining contributions in Part II deal with noncommutative gravity (D.V. Vassilevich), superstrings in $\mathrm{AdS}_5 \times S^5$ superspace (I.A. Bandos), heterotic $(0,2)$ Gepner models (M. Kreuzer) and the constraint analysis of cosmological topologically massive gravity (D. Grumiller, R. Jackiw and N. Johansson).

Some reminiscences on Wolfgang's life within the physics community are scattered throughout the volume. In the final Part III we have collected five contributions that focus almost exclusively on Wolfgang's life and his interests. The first contribution by H. Schopper reports reminiscences of Wolfgang's activities as president of the CERN council in the 1980ies. K. Lane narrates a personal encounter and collaboration with Wolfgang in the 1970ies. J. Steinberger provides an exposition of a topic that was of great personal interest to Wolfgang and his wife Lore, namely the conservation of our environment — more specifically, he writes about fuel consumption, global warming and solar power production in deserts. M. Schweda delivered a speech in honor of Wolfgang on the occasion of his official retirement, which is printed in this volume for the first time. The volume concludes with a personal and perceptual account by P. van Nieuwenhuizen, "Schubert in Stony Brook and Kinks in Vienna".

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