IN MEMORY OF WOLFGANG KUMMER (1935 – 2007)

Wolfgang Kummer[1], a prominent Austrian theoretical physicist, former CERN Council President (1985–1987) and Vice-President of the Austro-Ukrainian Institute for Science and Technology, passed away on 15 July 2007 in Vienna, Austria, after a long fight with cancer.

W. Kummer was born on 15 October 1935 in Krems, a small town situated on the left bank of the Danube, 75 km to the west from Vienna, where the river leaves the picturesque Wachau valley. His parents, Maria (née Burkhart) and Dr. Friedrich Kummer had moved shortly before from Vienna, together with his father's parents. Wolfgang was the first child, followed by his sister Marianne (1937) and his two brothers Friedrich (1938) and Eberhard (1940). During the war and during the primary school till 1945 Wolfgang had been mostly under the supervision of his grandparents.

During the 1950s, Dr. A. Beck, an enterprising Catholic priest and Gymnasium teacher from Vienna, had started to organize summer trips by special trains to cultural centers of Europe. Participating at such a trip to Italy after his maturity exam (together with all his class mates), Wolfgang Kummer met Lore Pokorny, a student from Vienna. They met again in Vienna when W. Kummer started with his studies at the Technische Hochschule. Taking their studies very seriously, they both finished as early as they could: Wolfgang passed his final diploma (Diplomingenieur) in February 1958, Lore finished her PhD in German literature in 1959, W. Kummer's PhD thesis was accepted in 1960, and the couple married in July of the same year.

All courses in Theoretical Physics, which W. Kummer had taken, were given by Ludwig Flamm, a professor fully in the mathematically oriented 19th-century German tradition (and the son-in-law of Ludwig Boltzmann). So Wolfgang had obtained a solid introduction to partial differential equations, special functions, thermodynamics, statistical physics, Maxwell theory, but there was no course on relativity and no quantum mechanics! A newly appointed professor in theoretical physics, Walter Glaser, offered a "Seminar on Theoretical Physics" where at least special relativity was the subject. After having prepared very carefully lecture on that subject by W. Kummer, Prof. Glaser proposed that W. Kummer should write a diploma thesis on "All known classical solutions to special relativity problems". At least this gave him a nice introduction to special relativity. But the greatest surprise for W. Kummer was Glaser's offer, the day after his diploma exam, to accept a position as one of Glaser's "assistants" on May 1, 1958. So a few weeks before his 23rd birthday, W. Kummer started to give the regular course on theoretical physics. In January 1960, Prof. Glaser died from cancer. The retired predecessor Ludwig Flamm became Acting Head of the Institute for Theoretical Physics again. He accepted Kummer's thesis on the oscillating charge in 1960 and W. Kummer continued to give Glaser's lectures. But the most important development for the level of elementary particle physics in Vienna was the appointment of Walter Thirring at the University of Vienna. During the 1960s, W. Thirring recognized immediately Kummer's isolated situation at the Technische Hochschule and started to give him

[1]See also the book "Wolfgang Kummer" in the Series "Classics of World Science", Vol. 4.- TIMPANI: Kyiv, 2005; it may be ordered by e-mail: mss@bitp.kiev.ua.

invaluable advice on topics W. Kummer should study, encouraging also the publication of his first papers. W. Thirring even provided some financial support from the Ford Foundation so that W. Kummer should be able to spend a few months (Fall 1961) at CERN, the new Mecca of particle physics. This visit brought him into contact with Victor Weisskopf, then Director General of CERN, and Weisskopf invited him to return as a CERN fellow and as his scientific assistant (1963–1964). In 1966, Kummer became the first director of the Institute for High Energy Physics of the Austrian Academy of Sciences, which he led till the end of 1971, in parallel to his professorship at the Technical University in Vienna. Simultaneously, he became the Austrian delegate to the CERN Council where he was soon elected to chair the Finance Committee, overseeing the construction of the ISR. In 1980, Kummer returned to the CERN Council as its Vice-President at the point in time, when the new supercollider SPS was getting into shape, and the job was more suitably filled by a physicist than by a pure diplomat. From 1985 to 1987, Kummer was President of the CERN Council.

An important date during the period 1958–1971 for W. Kummer was the Vienna High Energy Physics Conference 1968, a conference in the famous Rochester series, because W. Kummer was the main organizer. At a time when the member states of CERN were competing for the site of a new accelerator, the Austrian government did its best. A conference fee was unheard of, there were sumptuous receptions at Palais Palffy and even at Schönbrunn Castle. For the latter, physicists were even required to wear tuxedos. Also each participant could choose two tickets from a list of performances at the Vienna State Opera, of course free of charge. The conference went nicely, but with an ominous political background: In the days before the opening, Warsaw Pact troops had invaded Czechoslovakia, terminated the "Spring of Prague". Several participants from Czechoslovakia decided to stay in the West, the Austrian Security Police (very discreetely) watched for unwelcome public demonstrations (which did not occur) – and during a high-level meeting of the International Committee for Future Accelerators (laboratory directors, CERN officials, etc.) Prof. N. Bogolyubov talked about "temporary misunderstandings" which would soon blow over.

In 1971, the Austrian Academy elected W. Kummer as a corresponding member, and in 1985 as a full member.

On December 26, 1985, just after checking in at the Vienna airport for a winter holiday, next to the queue of the EL-AL counter, W. Kummer had the bad luck to get into the middle of a shoot-out between terrorists of the Abu Nidal Group and the airport police. His intestines and lung had to be stitched together, and he was in a rather critical condition for several days. But, after only eleven days in intensive care, Kummer recovered quickly, immediately resuming his job as Council President. He even attended the annual Schladming Winter School, only two months after these events, and he skied as ever.

In the Summer Semester of 1988, W. Kummer took a sabbatical semester at CERN, but as a simple member of the Theory Division. He turned to string-theory, but wanted to formulate it more within the framework of strict quantum-field theoretical methods. In this manner he realized that – despite a large amount of the literature on that subject, mainly pioneered by R. Jackiw (MIT) – two-dimensional gravity formulated in terms of Cartan variables (zweibeine and spin connection rather than by the metric) allowed unexpected new insights. W. Kummer formulated a "gauge theory" model of 2D-gravity (quadratic in torsion and curvature), but just before publication shelved it, when he realized that precisely that model had been proposed shortly before by Katanaev and Volovich (KV). During a stay at DAMTP (Cambridge) in September of 1990, W. Kummer was more interested in strings employing "physical" (axial type) gauges. His main published work at that time still concluded the superaxial gauge studies. When Dominik J. Schwarz became his diploma student in 1989, W. Kummer restarted work on 2D gravity. They first looked at a perturbative quantization of the KV model. When the harmonic gauge did not yield a manageable theory, W. Kummer naturally tried a "time-like axial gauge" with vanishing zero components of the spin connection and one of the Zweibeine ("light cone gauge"). This not only eliminated the Faddeev–Popov ghosts – as in an ordinary gauge theory – but also reduced all perturbative contributions to arbitrary order to just one counter term. After subtracting that counter term, the quantum theory became trivial (classical). This strongly suggested a new look at the purely classical version of the theory which had been solved in a complicated manner by Katanaev and Volovich in the conformal gauge. Again the solution in the light cone gauge was much simpler. Together with his another diploma student (F. Haider) W. Kummer could show

that one could avoid perturbation theory altogether; the path integral for the KV model could be solved exactly, leading to the classical effective action. An analogous result was obtained by his PhD student T. Strobl in the Dirac quantization scheme. Then the Hamiltonian action approach ("first-order formulation") by his assistants Schaller and Strobl allowed them to extend all results obtained so far in the KV-models to 2D theories with arbitrary Lagrangians depending on curvature and torsion. The general solvability of all covariant 2D models was found to be a consequence of the structure as a "Poisson–Sigma model", an expression coined by A. Alekseev (Uppsala). Recently (1999), a Poisson–Sigma model path integral has started to play an important role in the description of strings by noncommutative geometry (Schomerus 1999, Seiberg and Witten 1999). Within a project financed by the Austrian Science Foundation since 1995, the further substantial progress has been made: it includes the classification of all possible global structures in 2D gravity and the discovery of an analog of the Kruskal coordinates for the Reissner–Nordström metric (Klösch and Strobl). Also the local and global equivalence of a dilaton theory (with torsion zero) to the first-order Cartan gravity theory (with torsion) was shown.

The flux to infinity from the Hawking radiation calculated directly from an effective spherically reduced action was found to agree with the D=4 result, and a contradicting result by Bousso and Hawking was shown to be wrong. Perhaps, the results W. Kummer was most satisfied are the ones involving 2D gravity interacting with matter: At the classical level, an absolute conservation law, valid in two dimensions only and apparently overlooked in the past, was discussed thoroughly. It turned out to be related to a novel type of "two-stage" Noether symmetry. By W. Kummer's work on 2D quantum gravity, the original program of 1991 of the Princeton Group on the quantization of the interacting dilaton black hole has found a solution with a nonperturbative "quantum" treatment of the geometric part of the action and a loopwise perturbation in terms of matter.

Although W. Kummer had to be the Head of the Institute for Theoretical Physics since 1995 and although he was elected to the HEPP Board of the European Physical Society in the same year and became its chairman (1997–1999), he had to feel very lucky to have found such a fertile field of research and such excellent collaborators just in those last years: This is, however, also the point to note the outstanding achievements of the older (Manfred Schweda on quantum field theory and supersymmetry) and somewhat younger (Max Kreuzer on string theory and Toni Rebhan on thermal quantum field theory and many other fields) members of his Vienna group for "Fundamental Physics" at the Institute for Theoretical Physics of Vienna University for Technology.

In passing, it should also be mentioned that Prof. W. Kummer was a person of high culture and a leader in humanity. He has been engaged in fighting disgraceful trafficking of Ukrainian orphan children, on the one hand, and in providing financial resources for the support of a universitarian education of talented orphan children in Ukraine, on the other hand. In another case, when Ukrainian state officials refused to give an access to clean drinking water to an 80 years' old Ukrainian woman for 25 days, W. Kummer wrote a letter to the Prime-Minister of Ukraine. He referenced to the Universal Declaration of Human Rights of 1948, article 3: "...The right to life is contignent on free access to clean drinking water in adequate quantities...". W. Kummer stressed that the legitimation of a state is derived from the fact that it offers protection to the individual. As Kant, in particular, points out, the acknowledgement of human rights provides this legitimation and the basis for a state. So the violation of the human rights in case of the 80 years' old Ukrainian woman showed that the reference to "Ukrainian democratic values" typically camouflages corruptness, crimes, and repressions of Ukrainian state officials.

W. Kummer was a recipient of the Culture-Award of the Federal Country of Lower Austria (Kulturpreis des Landes Niederösterreich) 1971, of Cardinal-Innitzer-Award 1981, of the Schrödinger-Prize 1988 (together with F. Paschke) of the Austrian Academy of Sciences, of the Walter Thirring-Prize 2000 (together with L. Faddeev) of the Austro-Ukrainian Institute for Science and Technology. He was also a recipient of the Honorary Doctorate of the National Academy of Sciences of the Ukraine in 2005.

His international cooperation with N. Bogolyubov Institute for Theoretical Physics of the National Academy of Sciences of Ukraine, in Kyiv, and with the respected Walter Thirring Institute for Mathematical Physics, Astrophysics, and Nuclear Investigations in the Transcarpathian Region of Ukraine had an effect clearly transgressing scientific policy: it helped to establish contacts of Ukrainian scientific institutions

with Western European scientific institutions. Also in the emerging field of brane physics W. Kummer had the pleasure to find excellent collaborators centered around the famous Volkov scientific school in Kharkiv (Ukraine). This international cooperation in the frame of Bogolyubov–Volkov and Kummer–Wess scientific schools have helped to guarantee a stimulating atmosphere which continues to attract the bright students which the community of physicists in Europe needs to accomplish its further scientific goals.

The community of scientists from Austria and Ukraine will always keep the memory of Wolfgang Kummer in highest esteem.

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