Dedicated to the Memory of Professor Manfred Kudlek

Preface

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This special volume of Fundamenta Informaticae is dedicated to the memory of Professor Manfred Kudlek, who died on 18th of June 2012. It contains a reminiscent note about Manfred and 13 research papers, selected out of those invited to the volume following a referee process. The papers present original contributions to some areas that theoretical informatics encompasses. They belong to the following topics: (1) theory of concurrency, (2) distributed computer systems, (3) machine learning, (4) timed automata, (5) theory of formal languages, (6) rough set theory, (7) classification problems, (8) mereological methods in computer science, (9) multiagent systems, (10) computer science approaches to economy, (11) formal models of biochemical reaction networks. Obviously, some contributions may be classified as falling into more than one area. The volume contains also a joint paper by Manfred Kudlek and Nils Erik Flick prepared to be published just before the unfortunate June 2012.

Apart from theoretical informatics which was Manfred's primary profession and occupation, what should not be overlooked here was his deep knowledge of Mesoamerican and Near-East history and culture, which manifested itself in his academic and research activity. Fundamenta Informaticae is a journal collecting written works on a vast span of subjects related to the theoretical informatics only. That is why authors of works pertaining to the other area of expertise Manfred was involved in, could not have, unfortunately, been invited to contribute to this volume. In the introductory reminiscent note the readers will find a short outline of his activity not only in theoretical informatics but also in Mesoamerican and Near-East history and culture.

Many thanks go to all the authors who contributed to the preparation of this special volume.

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In Memoriam of Professor Manfred Kudlek

In June 2012 a shocking news reached us and probably entire theoretical computer science community: Professor Manfred Kudlek died of heart attack when participating the Turing Centenary Conference in Cambridge, U.K. Everybody of our community knew that Manfred was an outstanding scientist in theoretical computer science. But perhaps not everybody was aware of his expertness not at all limited to this area only: that he was a professional researcher in Mesoamerican and Near-East history and culture too. So, let me make a short and, of necessity, superficial overview of his educational background, academic positions, of his activity in mathematics and computer science, as well as in fields far from the so-called exact sciences.

After having completed a high school in Hamburg (1959) and one-year military service, Manfred became a student of Department of Physics at Hamburg University (1960). Here he received a Master of Science (diploma) certificate on the ground of thesis: *Streutheorie für relativistische Teilchen mit Spin 1/2* (1966) and a doctoral degree on the ground of Ph.D. thesis: *Das relativistische Dreikörperproblem mit gebundenen Zuständen* (1970) - both in German. During his university studies Manfred took an interest in ancient Mesoamerican languages and culture and received a position as a student's assistant (Studentische Hilfskraft) and a part-time scientific employee (Teilbeschäftigter wissenschaftlicher Angestellter). At that time he also served as an assistant in the Institute of Experimental Physics, Hamburg University and took a strong interest in rapidly developing theoretical informatics. Manfred came to a deep knowledge in almost all of its - at that time - areas and right after his Ph.D. defence, got a position of a lecturer (Dozent) at the Department of Informatics (part of the Faculty of Mathematics, Informatics and Natural Sciences), Hamburg University. In 1977 he became a full professor and worked at this position until his retirement in 2005. It is worth to mention that theoretical informatics at Hamburg University enjoys a remarkable tradition due to scientists and teachers like Carl Adam Petri, Rüdiger Valk, Matthias Jantzen, to mention some. Although Manfred's teaching load after 2005 was lowered, in no case he slowed down his research activity or reduced his ties with the Department (where he retained his office). He was giving lectures, supervising Ph.D. students, published results of his research and participated in numerous scientific events, also as their co-organizer. In 2002 he received a honorary professorship (honoris causa) at the University of Iaşi in Romania.

During the entire period of Manfred's activity at Hamburg University, he carried on a research in Mesoamerican and Near-East languages, history and culture. He published results of this research, was teaching on Mesoamerican issues in Mexico and participated in many scientific events devoted to this research area. His fluent Spanish permitted him to give lectures in this language. Manfred was frequent participant and program committee member of many international conference series, like STACS, MFCS, FCT, ICALP, CS&P, to mention some, and of local scientific meetings in numerous countries. At a lot of them he presented his research results. But peculiarity of his involvement in these events was elaborating detailed reports on their course for EATCS, published in the EATCS-Bulletin with a complete photographic documentation. First of all this concerned ICALP: he covered all ICALP editions, with statistics, detailed lists of speakers with titles of talks and photos of all speakers during their presentation. Perhaps no one else like Manfred attended the 38 ICALP meetings, but the ill fortune did not give him a chance to attend the 39th edition (Warwick, U.K., July 9-13, 2012), three weeks only after his death. Manfred participated all the CS&P (Concurrency, Specification and Programming) conferences since 1999 till 2011, also as the EATCS-Bulletin documentalist, the author of papers and PC member. He

co-authored two papers, presented at CS&P'2012 (Berlin, September 26-28, 2012) by Nils Erik Flick, his co-author.

Manfred's research work included a vast part of theoretical informatics. It suffices to see the list of his publications containing over 200 entries. In a summary of subject matters he worked on, one can distinguish the following areas belonging to informatics:

- Formal languages and automata, Lindenmayer's parallel rewriting systems and non-standard Chomsky grammars in their number

- Infinite word languages and processes

- Multiset theory, multiset languages

- Mathematical linguistics - formal models of natural language

- Parsing algorithms

- Modal logic and language closure operators

- Combinatorial systems

- Computability, various types of Turing machines, theory of minimal Turing machines in particular

- Theory of concurrent processing, various types of Petri nets and their extensions, other models (e.g. probabilistic) of concurrency

- Process algebras

- Quantum computation

- Membrane computation

- Molecular computation

Manfred's activity in Mesoamerican and Near-East Studies encompasses a number research fields too:

- Formal aspects of the Maya language

- Simulation Model for the Yucatan Peninsula

- Calendar Systems (Maya, ancient Near-East nations, Ethiopian and others)

- Studies of the Maya's astronomical inscriptions (to determine some dates in their history)

- Numerical systems of Mesoamerican and ancient Near-East nations

- Extinct languages of ancient Near-East nations

- Astronomical Dating of Babylon

Mesoamerica - a geographical area occupied by some ancient cultures sharing religious beliefs, art, architecture, and technology that made them unique in the Americas for three thousand years – from about 1500 B.C. to A.D. 1519 – the time of European contact.

Into this part of Manfred's activity should also be included his lecturing at the Institute for Mesoamerican Studies in Hamburg and making a collection of articles and books on the ancient languages, copies of some manuscripts from the 17th and 18th centuries in their number. He intended to write another book on this subject area but by the misfortune had not time to finish it. There is an interesting sample of review of Manfred's "Calendar Systems" (published in LNCS and other journals):

[It is] *A rare and unusually wide ranging look at calendar systems in a variety of cultures. Explains some of the astronomical issues involved. The author discusses calendars of Egypt, Babylonia, the Roman Empire, Greece (Athens), the Islamic World (especially Persia), India, China (only gives a taste, since more than 50 official calendars were used), Japan and Vietnam (their calendars were connected with China), Java, Bali, Guatamala (by the Cakchiquel Indians), revolutionary France, the Mayas, and in the Jewish tradition. Discusses the computation of the date of Easter. (The computation of Easter was of course one of the primary goals of mathematics instruction in the middle ages). There is information on how to correlate these calendars as well (in terms of Julian dates).*

Let us take a look at variety of journals, books, chapters in books where Manfred's about 211 writings appeared (a sample):

- Lecture Notes in Computer Science

- Theoretical Computer Science

- Fundamenta Informaticae

- Theoretical Informatics and Applications RAIRO

- Pure Mathematics and Applications

- Journal of Applied Non-Classical Logics

- Romanian Journal of Information Science and Technology

- World Scientific

- North Holland Books

- Topics in Computer Mathematics

- Ketzalcalli – Journal on Mesoamerican culture

- Mexicon - The Journal of Mesoamerican Studies

- INNER TRADITIONS/Bear & Company (book series on Mesoamerican culture)

- Alter Orient und Altes Testament - Sonderreihe, Butzon und Bercker, Kevelaer - *Solar and Lunar Eclipses of the Ancient Near East from 3000 B.C. to 0 with Maps*, a book by Manfred Kudlek and Erich H. Mickler

- Proceedings of numerous conferences

- Complete reports for EATCS-Bulletin of various conferences

Apart from his written output, Manfred astonished us with a deep knowledge of the ancient Middle East history and culture, like Aramaean, Hittite, Egyptian, Assyrian, Persian, Babilonian, Philistine, Phoenician (later Carthage), not speaking of Greek, Roman and Byzantine. This concerned also ancient religious scripts: Persian, Accadian, biblical and Islamic. He was especially interested in the influence of ancient linguistic features on contemporary languages.

I shouldn't overlook here Manfred's engagement in teaching and upbringing of young "brainpower". He was teaching on diverse levels of education at Hamburg University: Bachelor-Studium, Master-Studium, Diplom-Hauptstudium and supervising a number of diploma and M.Sc. theses and Ph.D. dissertations. Manfred was giving lectures (in Spanish) in Mexico and was involved in exams and promotional procedures there. Several times he accepted propositions of short-term teaching of informatics and supervising students at some universities (mainly East-European).

Finally, a few words of my personal acquaintance with Manfred. Our early contacts took place during FCT'1991 (Gosen-Berlin) and FCT'1993 (Szeged) but my closer colleague and friend he became at FCT'1997 (Kraków), when I organized this conference. He was then the EATCS-Bulletin documentalist and heleped me a lot with organizational toil. Manfred joined CS&P in 1999 and attended all the meetings until 2011 as an author of papers, PC member and author of photo and written reports for the EATCS-Bulletin. He prepared two joint papers for CS&P'2012 but was not granted - by ruthless fortune - enough time to present them personally at this edition of the conference. As prof. Andrzej Skowron (one of the founders of CS&P) said at a former meeting: prof. Rasiowa (also one of the founders) was the

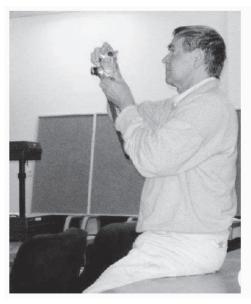CS&P'2005 Ruciane-Nida

CS&P'2010 Helenenau near Berlin

CS&P'2009 Kraków

CS&P'2006 Wandlitz near Berlin

CS&P'2005 Ruciane-Nida

CS&P'2007 Łagów

CS&P'2008 Groß Väter See near Berlin

CS&P'2008 Groß Väter See near Berlin

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first to realize a need of coming to close personal connections betwen Polish and German mathematicians - in spite of long post-war separation; it should be noted that Manfred was a good example of this idea heritage. He was a leader of a long-lasting cooperation agreement between Hamburg and Warsaw University project - since 1998 it resulted in annual meetings and seminars at both universities. During our meetings, each year in Hamburg and Warsaw, I was gradually realizing Manfred's quality as a personality, scientist and also as a man of Renaissance. His desire to experience new regions, sites of interest, cities, etc. often made me go off our planned main roads when we drove to or from various conference sites. Manfred was a real collector of books, maps, coins and uncommon objects he was bringing from his numerous journeys to almost all continents; his apartment was full of them – especially huge library and surprising objects. His hospitality should be noted: many visitors to Hamburg owe him friendly reception and care, also with his appartment to stay in. Apart from his plenty professional activities he was strongly engaged in the family life, especially devoting much time for taking care of his daughter and looking after her educational development. I was always delighted to visit his family: his wife Marina and daughter Natalia. Apart from his fluent Spanish (I heard him chat with my son-in-law – a Spanish native speaker) and English, Manfred could read Arabic and Hebrew texts. Died in the age of 72: 18.06.2012 of a cardiac arrest during the Turing Centenary Conference.

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