In Memoriam: Paris C. Kanellakis

On December 20, 1995, Paris C. Kanellakis died unexpectedly and tragically, together with his wife, Maria-Teresa Otoya, and their children, Alexandra and Stephanos. They were heading to Cali, Columbia, for an annual holiday reunion when their airplane crashed in the Andes.

Paris was born in Greece in 1953. He graduated in electrical engineering from the National Technical University of Athens in 1976; his undergraduate thesis was entitled, "Easy-to-Test Criteria for Weak Stochastic Stability of Dynamical Systems," and was supervised by Prof. E. N. Protonotarios. In 1978, Paris received his M.Sc. degree in electrical engineering and computer science from the Massachusetts Institute of Technology. His M.Sc. thesis, "Algorithms for a Scheduling Application of the Asymmetric Traveling Salesman Problem," was supervised by Profs. R. Rivest and M. Athans. In 1982, he was awarded his Ph.D. degree from the same institution; his thesis was supervised by Prof. C. H. Papadimitriou and was entitled "On the Complexity of Concurrency Control for Distributed Databases."

Paris joined the Department of Computer Science at Brown University as Assistant Professor in 1981. He was promoted to Associate Professor with tenure in 1986, and to Full Professor in 1990. He was awarded an IBM Faculty Development Award in 1985 and an Alfred Sloan Foundation Fellowship in 1987. He served as an Associate Editor for the Journal of Logic Programming and for the new journal, Constraints, as well as for Information and Computation, ACM Transactions on Database Systems, SIAM Journal of Computing, and Theoretical Computer Science. He served as Invited Speaker, Program Chair, and Program
Committee Member at many prominent conferences. In the logic programming area, he was an Invited Speaker at the 6th International Conference on Logic Programming in Lisbon, where his talk was entitled, “A Logical Query Language with Object Identity and Strong Typing.” He was on the Program Committees of logic programming conferences in 1989, 1990, 1992, and 1993. He was also Program Chair (together with J.-L. Lassez and V. Saraswat) of the First International Workshop on Principles and Practice of Constraint Programming in 1993.

As a scientist, Paris was a careful thinker, investigating fundamental issues in computer science, opening new technical areas, and challenging conventional belief whenever appropriate. He made numerous contributions to computer science in areas as diverse as databases (relational, object-oriented, and constraint databases, concurrency control), programming languages (lambda calculus, logic programming, rewriting systems, type inference), distributed computing (concurrency and fault tolerance), complexity theory, and combinatorial optimization. Underlying those contributions was a unifying theme: the use of logic, complexity theory, and algorithmics to understand the foundations of practical systems, to analyze their efficiency, and to improve their functionality. This theme was nicely exemplified in his work on object-oriented databases featured at the logic programming conference in Lisbon. Here, his desire to understand the object-oriented database led him to invent, in collaborative work, an object-based data model, a new formalization of object identity, new programming tools, and new indexing algorithms.

A beautiful account of Paris' recent research accomplishments by S. Abiteboul, G. Kuper, H. Mairson, A. Shvartsman, and M. Vardi appeared in the March issue of ACM Computing Surveys. It was a major source of inspiration for this short article, in which only some of Paris' contributions to logic programming can be outlined.

The first issue of the Journal of Logic Programming featured an article by C. Dwork, P. Kanellakis, and J. Mitchell entitled, “On the Sequential Nature of Unification.” The paper shows that the decision problem, “Do two terms unify?”, is complete for PTIME which, informally speaking, means that unification cannot be sped up with a polynomially bounded number of processors. This paper was published during a period of intense activity on the parallelization of Prolog. Together with J. Mitchell, Paris subsequently used the essential idea behind the proof to show that type inference in ML was PSPACE-hard, i.e., as hard as any problem that can be solved in polynomial space. This result contradicted the popular belief at the time that ML typing was efficient. His subsequent joint paper, in collaboration with H. Mairson and J. Mitchell, showed the problem to be complete for EXPTIME. Paris' most recent work on the lambda calculus (in collaboration with G. Hillebrand and H. Mairson) led to a new syntactic characterization of the complexity classes, which emerged from their research on a functional programming foundation for a logic-based database query language.

Paris was a major contributor to the theory of deductive databases. Using tools from complexity theory, he investigated (together with S. Cosmadakis) which classes of Datalog queries could be sped up by parallel computation. Together with S. Cosmadakis, H. Gaifman, G. Hillebrand, H. Mairson, and M. Vardi, he studied the decidability of boundedness problem for various classes of Datalog queries [a Datalog query is bounded if its database complexity is O(1)] showing, in particular, that the boundary between the decidable and the undecidable lies between unary and binary queries. He also studied efficient bottom-up implementation of Datalog in a joint paper with C. Beeri, F. Bancilhon, and R. Ramakrishnan.
Together with G. Kuper and P. Revesz, Paris was the founder of the area of constraint databases, whose essential idea is to replace, in the relational model, the concept of tuples by a conjunction of constraints. They investigated the query complexity of this scheme (which parallels in the database world the area of constraint logic programming) for various classes of constraints. Together with his colleagues and his students, he was also engaged in long-term research to build the implementation technology (in particular, the indexing structures) necessary to make this technology practical.

Those of us who collaborated closely with Paris have lost not only an outstanding scientist, but also an esteemed colleague and a dear friend. As a colleague, Paris had the poise, the personality, and the energy to rally communities behind him and he used these skills to improve our academic and professional environment. We also mourn a friend with a charming and engaging personality and a Mediterranean passion—and a family whose warmth and hospitality will be sorely missed.

In writing these few pages, I came to understand one more time how fortunate I was to collaborate with Paris, to observe him in his daily scientific and family life, and to benefit from his insights, vision, and broad expertise; and, of course, to realize how my life has changed since I met him. He was a very special person.

Pascal Van Hentenryck
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