IN MEMORIAM

JULIAN KEILSON
(November 19, 1924 - March 8, 1999)

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This is a brief biographical account on late Julian Keilson, his scientific contributions, and his collaboration with the author.

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Julian was a remarkable man. Tall, slightly bent forward, eager to talk mathematics and ... chess. At first sight he might look a bit reserved, but that stern facade hid enormous intellectual power and a heart of gold. That was my impression when we met first time in 1964 at the now famous Chapel Hill Conference on Queueing organized by Walter Smith. Subsequently, we developed steady friendship which lasted all his life.

   Julian, like Mark Kac, had an exceptional physical intuition, which influenced his mathematics in the best way possible. As he said frequently, a mathematical result, no matter how beautiful, is only important if it is related to meaningful applications. He appreciated such results more than abstract theorems for abstraction's sake. This was Julian's conviction to which he was faithful in his work and in his life. He expressed this eloquently many times in his papers and in his conversations.

   It is my privilege and duty to my friend to describe his contribution to Applied Probability. I restrict myself to areas in which I was associated with Julian, and which, in my opinion, illustrate well his interest in real life-applications supported by good mathematics. Motivated by physical reasoning, Julian observed that a problem of solving state equations for stochastic processes is actually a boundary problem in classical potential theory. This led him to introduce a compensation method based on Green's function. This concept was developed before 1964 and fully described in his book "Green's function methods in Probability Theory," published in 1965 and dedicated to his wife Paula. In essence, the compensation method regards a process of interest as obtained by perturbation of an unrestricted process by insertion of boundaries.

The ergodic distribution for the perturbed process is then the Green's potential of a compensation measure (signed measure of total mass zero) of the unrestricted process (assumed transient).   Julian was indeed an independent forerunner of modern probabilistic potential theory, a field extensively developed by pure mathematicians (who unfortunately do not give Julian proper credit). The fact that compensation measure assumes negative values and that Julian initially worked with compound Poisson processes prevented wide acceptance of the method. However, Julian and his numerous collaborators showed that the method can be extended to a wide class of processes. In our joint paper (SPATA 1973) we extended it to countable Markov chains, and in my paper (SPATA 1976), the method was extended to Markov chains with a continuous time parameter. Comparison with phase-type distributions of Marcel Neuts may be found in my 1982 paper (Z.M., Warsaw). A more complete story appears in my book on Passage Times (IOS, 1992).

It may be mentioned here that a Ph.D. thesis on "Multivariate Markov processes via the Green's function method" written in 1990 by Julian's student Alexandra Svoronou gives a rigorous treatment of the compensation method. Julian was very proud of her work. My own student Ning Liu in 1995 wrote a Ph.D. thesis on "Decomposition theorems for standard processes" where further applicability of the compensation method is discussed. Our joint paper based on that thesis was accepted for publication in a book honoring Julian's work and edited by his former students. The plan was to present this book to Julian at the forthcoming SPATA meeting in May this year. It is sad that he did not live to see it.

Last year Julian organized a special session at the INFORMS Conference in Boca Raton. He was full of vigor and in good spirit. I came late to his session, and, to my embarrassment, he announced my arrival from the chair. He also attended my tutorial session on fluid models where I described some recent abstract work by L.C.G Rogers and S. Asmussen. Julian became interested and told me that the problem can be attacked by the compensation method. Later we decided to write a joint paper on this topic. We took as a starting point his earlier joint paper with S. Subba Rao "On processes with chain dependent growth rate" (*Adv. Appl. Pr.*, 1971) where compensation was used in essentially the same problem.

Our telephone conversation which turned out to be our last - was earlier this year. I knew that Julian was ill previously, but no hint of his impending demise ever crossed my mind. A call from Paula last month came as a great shock and left me speechless. In 1971, Julian organized the Rochester conference on Stochastic Processes and their Applications to fulfill his desire for meaningful applications, and this has become a very successful annual event. At the same meeting the new journal carrying the same name (SPATA) was started, with J. Keilson, W. Cohen, U. Prabhu and R. Syski as the "founding fathers." The rest is history. However, the SPATA Conferences and the Journal gradually changed their character. Instead of following Julian's original idea, the conferences became "occupied" by pure mathematicians, and as a result, Julian and the "old guard" stopped attending.

Julian traveled extensively, and we met at various conference sites. He also traveled frequently to Washington and visited me at the University of Maryland. He was well known to my colleagues in the Mathematics Department who enjoyed his seminars. I also visited Rochester at his invitation; a visit to GTE in Walham, Massachusetts (his nth retirement) remains particularly vivid in my memory. It was there in 1992 where I gave a talk on "Personal View of Queueing Theory" (an updated version was later published in *Frontiers of Queueing Theory*, edited by J.H.

Dshalalow).

My account of Julian's life would be incomplete without mentioning the constant support and love given him by his wife Paula. She was Julian's good angel totally devoted to his well being. In this time of sorrow I send her my condolences. Let the memory of their good times together bring her consolation.