Introduction to the Festschrift

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Abstract This Festschrift is a collection of invited research articles on the occasion of Pierre L'Ecuyer's 70th birthday in 2020. During the pandemic, a celebration with friends and colleagues was impossible. When discussing the opportunity to publish a Festschrift instead, support has been enthusiastic. We are grateful to the authors of this volume for their endorsement and their ready willingness to contribute. The works reflect Pierre's influence on the fields of stochastic modeling, simulation, and operations research. It is a real pleasure to present this Festschrift to honor Pierre L'Ecuyer.

Pierre L'Ecuyer is regarded as a top scientist, his leadership in the field of simulation and, in particular, pseudo-random number generation being uncontested. Pierre is not only known for his scientific results, but also for his rigorousness, his dedication to excellence, his dynamism, his enormous working capacity, and his curiosity making an impression on every person who gets to know him. Those in desire of more detail may have a look at Pierre's vita at http://www.iro.umontreal.ca/ lecuyer/cva.pdf.

Zdravko Botev
Name, School of Mathematics and Statistics, The University of New South Wales (UNSW Sydney), Australia, e-mail: botev@unsw.edu.au

Alexander Keller
NVIDIA, Fasanenstr. 81, 10623 Berlin, Germany, e-mail: akeller@nvdia.com

Christiane Lemieux
Department of Statistics and Actuarial Science, University of Waterloo, 200 University Avenue West, Waterloo, ON, N2L 3G1, Canada, e-mail: clemieux@uwaterloo.ca

Bruno Tuffin
Inria, Univ Rennes, CNRS, IRISA, Campus de Beaulieu, 35042 Rennes, France, e-mail: bruno.tuffin@inria.fr

1 Education

Pierre followed an education path from the Université de Montréal, Canada. His first academic degree is a Bachelor in mathematics in 1972, followed by an M.Sc. in Operations Research in 1980 (in between he had been a teacher of mathematics at the CEGEP of Sept-Iles, Québec) and then a Ph.D. in Computer Science with Operations Research orientation in 1983 on Markovian decision processes. From 1982 to 1990 he served as a Professor in the Computer Science Department at Université Laval, and since then has been a Professor in the "Département d'informatique et de recherche opérationnelle" (DIRO) at the Université de Montréal. Pierre has also been spending time visiting colleagues in numerous places worldwide during sabbaticals or long stays, including Stanford University, Université de Nantes, Waseda University, University of Salzburg, North Carolina State University, Université de Savoie, Inria Rocquencourt & Rennes, University of New South Wales, and Google Research.

2 Research Activity and Visibility

As of beginning of November 2021, Pierre has written or co-written 26 book chapters, 125 journal papers (in prestigious journals), 134 referred conference papers. According to Google Scholar his H-index is 68 and he has 16,481 citations. Pierre has a wide range of interests and diverse contributions. Among these, Pierre is a world leader in multiple areas:

- **Dynamic programming and operations research (OR) in general.** Pierre's activity on dynamic programming (starting with his PhD thesis) and a broad range of OR domains, including the computation of derivatives, is still highly referenced in the domain.
- **Variance reduction techniques.** His work on variance reduction, including rare event simulation, has made Pierre one of the most renowned researchers in the domain, both from the theoretical and application (to reliability and queuing) aspects. He contributed to the advances of importance sampling and splitting procedures drastically reducing the simulation time to reach a predefined accuracy.
- **Telephone call centers.** His industrial contracts have led Pierre to work on the modeling, simulation, and optimization of call centers. His activity has led to the development of a software used by several companies and the development of models and specific analysis techniques making him a renowned expert in the area collaborating with the best known other teams in the world. He notably developed new and more realistic models than those existing at the time in which the arrival rate of customers changes with time, is stochastic, and the arrival rates in different time periods are not independent. Novel estimations of parameters have also been designed. He also developed simulation-based optimization algorithms and heuristics for agent's staffing.

- **Quasi-Monte Carlo methods** are deterministic methods, as opposed to the random Monte Carlo ones, having the advantage of converging faster, even if less easy to apply. Again, Pierre has developed a strong and world-leading expertise in the generation of sequences of highly uniformly distributed points used by those methods, their randomization to get a practical estimation of the error, and in their application in finance.
- **Random number generators.** While Pierre's work on all the previously described topics is already impressive, his activity on random number generators, a key issue for simulation, is probably what should be highlighted the most. If one has to give a single name on this topic, Pierre is probably the one that will be mentioned. His random generator `RNGStreams` is widely used, because it is one of the most efficient and portable ones. His extensive test suites is also very popular. Pierre's `TestU01` software library is the standard suite of procedures for empirically testing the performance of random number generators. Among his many publications on the subject the one he has in the *Communications of the ACM* have been cited more than 1,100 times.

3 Editorial Activities

Pierre is currently an Associate Editor for three journals: *ACM Transactions on Mathematical Software, Statistics and Computing*, and *International Transactions in Operational Research*. He was previously Associate Editor for five other journals and the Departmental Editor for the Simulation Department of Management Science. He was the Editor-in-Chief for *ACM Transactions on Modeling and Computer Simulation* from 2010 to 2013, a period during which the journal grew in scope and volume of submissions; Pierre was carefully reading all the submitted papers and prescreening submission to alleviate the workload of the editorial team.

Remarkably, Pierre has reviewed articles for 170 *different* journals. That illustrates how well-known he is by people even outside the simulation community. Typically, he has been reviewing between three to four papers *per week* on average.

4 Organizing Conferences

Pierre has already organized seven international events in Montréal, including the *Eighth International Conference on Monte Carlo and Quasi-Monte Carlo Methods in Scientific Computing (MCQMC)* in 2008 and the *INFORMS Simulation Society Workshop* in 2011, or the *Eleventh International Conference on Monte Carlo Methods and Application (MCM)* in 2017. He also co-organized MCQMC 2018 in Rennes, France. Pierre has been serving on many program or steering committees.

5 Simulation Societies

Pierre has been a member of numerous evaluations committees worldwide for grant proposals, promotion and prizes from universities. Among the most notable memberships are the INFORMS Simulation Society Distinguished Service Award, INFORMS Simulation Society Outstanding Publication Award, or INFORMS College on Simulation Outstanding Publication and Outstanding Award committees.

6 Industry and Civil Society

Pierre has received many grants from the industry to successfully apply his simulation and operations research results. For example, Pierre has developed specific modeling and simulation tools for Bell and Hydro-Québec. He has also been contacted to implement his random number generators, or test existing ones, by AMD, Alcatel, LottoQuébec, The Mathworks, Montréal Police Service, to name a few.

Pierre has devoted a lot of time to software development, with all his random generators available in many languages, a Java library for stochastic simulation called SSJ, or a software library called `TestU01` offering a collection of utilities for the empirical statistical testing of uniform random number generators. All these tools are freely available to the scientific community.

7 Mentorship

Pierre has supervised 49 Master and PhD students, as well as 23 postdocs. He has been a member of numerous PhD examination committees all over the world. His courses on simulation at the Université de Montréal and various Summer Schools have also contributed to the widespread dissemination of modeling and simulation knowledge.

8 Recognition

Pierre has been recognized by the scientific community, having received prestigious awards such as a Canadian and an Inria Research Chair, the Award of Merit from the Canadian Operational Research Society, the INFORMS Fellow Award in 2006, the INFORMS Simulation Society Distinguished Service Award in 2011, the INFORMS Simulation Society Outstanding Research Publication Award won three times in 1999 (on Combined Multiple Recursive Random Number Generators), 2009 (on computational finance, by designing efficient algorithms for pricing path-dependent options) and 2018 (on call centers modeling), the SIGSIM Distinguished

Contributions Award in 2016, or INFORMS Simulation Society Lifetime Professional Achievement Award in 2020. On the Canadian scene, to name only a few of the awards and distinctions earned by Pierre, in 1996 he was awarded a prestigious Steacie Fellowship for the period 1995-1997 from the Natural Science and Engineering Research Council of Canada. He received a Killam Research Fellowship from the Canada Council for the Arts for the period 2001-2003. And in 2004 he was awarded a Canada Research Chair on Stochastic Simulation and Optimization for the period 2004-2010, which was renewed in 2011 for another seven years.

9 Personal Achievements

Besides his scientific life, Pierre has had an amazing sport-related life, for which he is also well-known in the respective communities: not only as a competitor but also as a coach. While skilled in many kinds of sport, Pierre is exceptionally competitive and skilled in cross-country skiing and road cycling.

In cross-country skiing, he won the bronze medal at the Canadian championship in 50 km classic in 1994. But his main achievements are probably in road cycling. He was Canadian champion (by age groups) in 2000, 2001, 2011, and 2012 and finished second in 2002 and 2004. He was Quebec champion in road race in 1996, 2000, 2001, 2003, 2012; in time trial in 2002, 2003, 2004, 2005, 2012; and in criterium in 2011 and 2016. Among successful participation in other races, he won the America's cup in 2000 and 2012. He was named cyclist of the year 2012 in masters categories by the Quebec Cycling Federation, another award in another category! Pierre keeps on riding his bicycle all over the world and is known to always bring his bike with him when traveling.

Prior to these accomplishments, Pierre had been a coach in Track & Field between 1970 and 1992. He started by building and training a local team. He became member of the Canadian team at the Olympic Games, World Championships, Commonwealth Games, etc. He was named Quebec's track and field federation's "coach of the year" in 1985 and 1992. He was the coach of the Barcelona Olympic games silver medalist (20 km walk) and world record holder (30 km walk) Guillaume Leblanc, from 1973 to 1992.