

# LPAA Acknowledgements

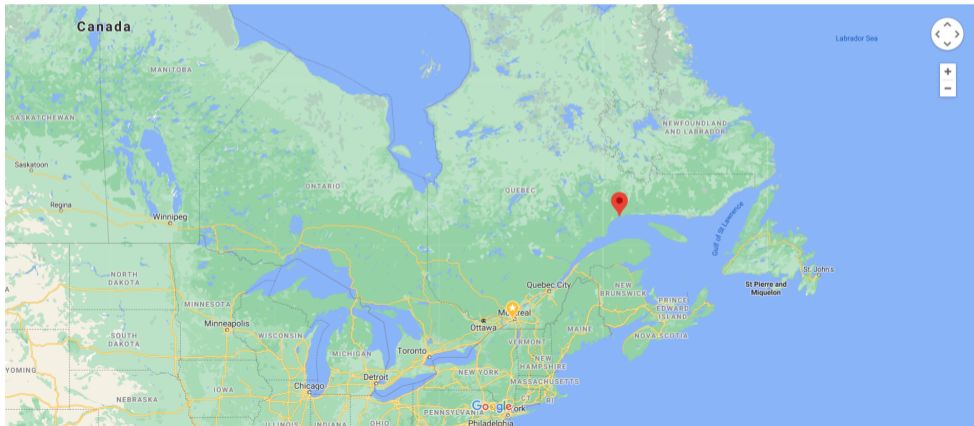
Huge honor to receive this award! Many thanks to:

- ▶ I-SIM and the LPAA selection committee;
- ▶ Those who nominated me (Sylvie Hamel, Pierre Poulin) or wrote support letters;
- ▶ Université de Montréal and my department for their sustained support and confidence;
- ▶ The Canada Research Chair Program, as well as Inria (France);
- ▶ My children Sébastien, Sandrine, and Alexandre, and partner Natana, for their encouragements and for allowing me to spend all that time “playing” simulation;
- ▶ The several other people, teachers, professors, colleagues, students, collaborators, etc., who forged my career. I will mention a few names, but there are many more!



# A random Sample Path

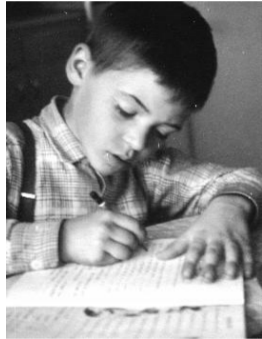
My story is a stochastic process with high volatility, influenced by many people and random events. These influences acted like an importance sampling scheme combined with a stochastic control policy, and created an interesting sample path for my life!



## Sept-Iles, Québec, Canada, around 1925 and 1953



## Also in 1952–1956



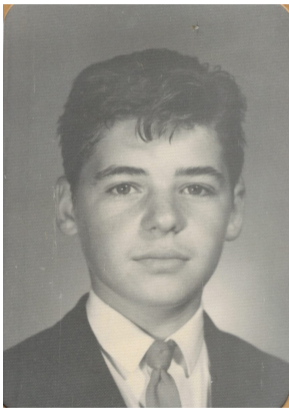
## 1962: I was sent to classical college to make a priest

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**Never happened.**

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Never happened.

I was fascinated by the Olympic Games

Was dreaming of going to the Olympics as an athlete.

Never came close to that.

I settled for a **more reasonable goal**: train young athletes that can perform at the regional level, then perhaps higher. For a few years, this was my main interest.

This time, **it happened!** This thought me how to keep having many smaller achievable goals, work hard to reach them, and not give up.

## Cherry Blossom 10km race in Washington, 1977



## Back to school

Meanwhile, I had graduated in maths and had taken one year of graduate classes in mathematical statistics, and I was still 22. I started teaching in high school for a year, then college for four years.

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In 1978, I decided to go back do a master in computer science, and was later convinced by my advisor Alain Haurie to do a PhD. That's when I got interested in science and research.

My thesis was on [approximate dynamic programming](#) for Markov decision processes in continuous state spaces. I was approximating value functions with least-squares splines and finite element methods.



## What got me into simulation?

January 1983: started as a professor in Computer Science at Université Laval, Québec city.

Had to teach an undergraduate Simulation class, but had never taken one myself before.

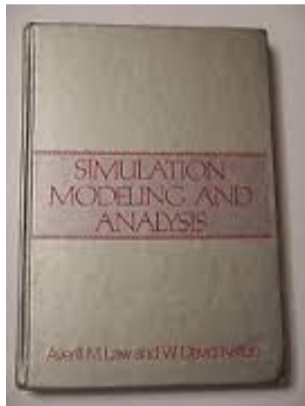
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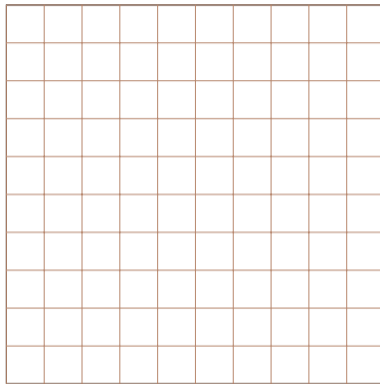
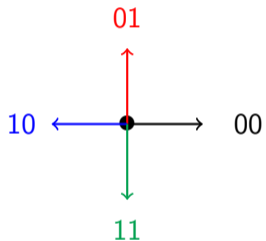
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Used the brand new silver book:  
[Law and Kelton \(1982\)](#)



## A question from a colleague

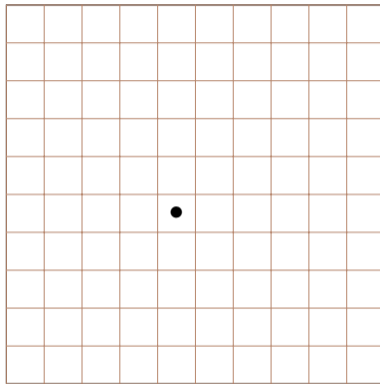
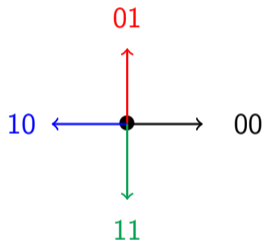
Random walk on a square grid





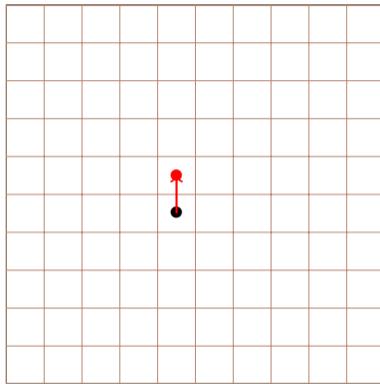
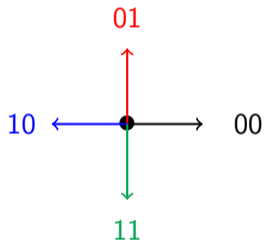
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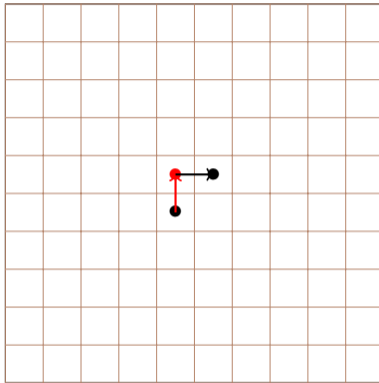
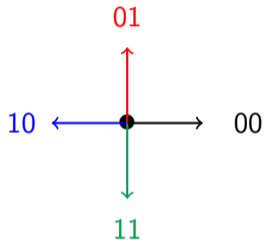
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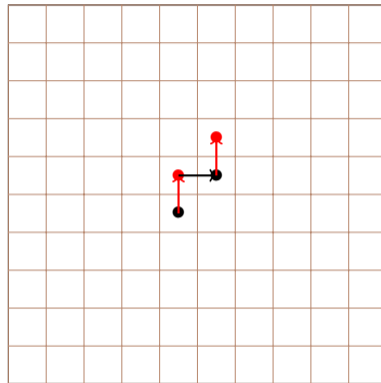
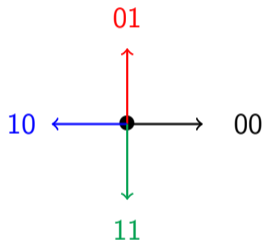
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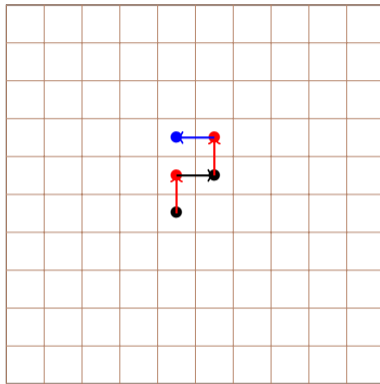
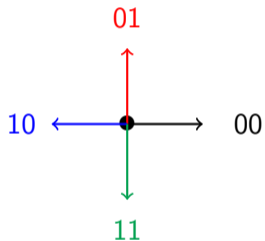
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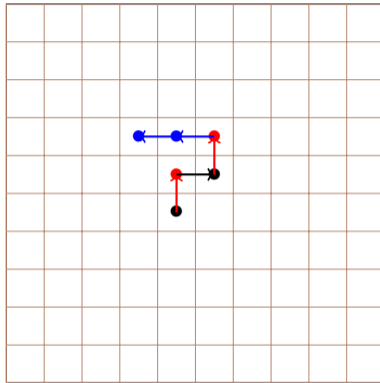
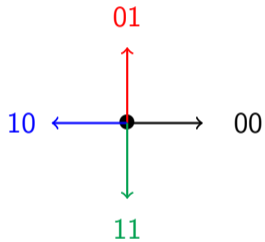
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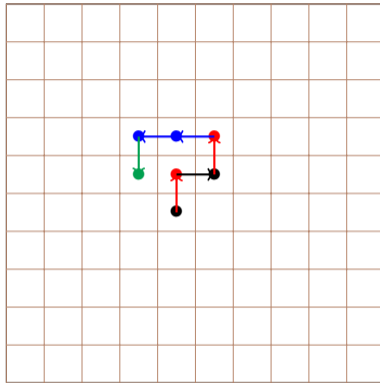
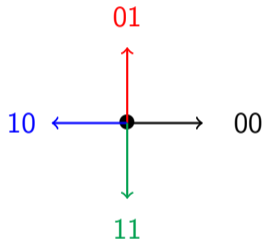
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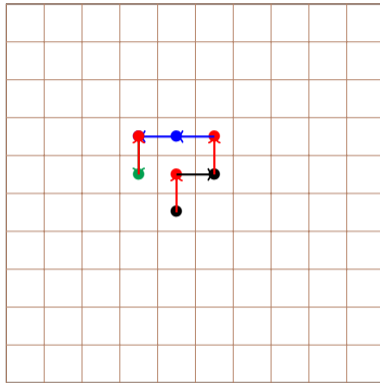
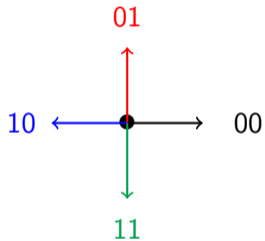
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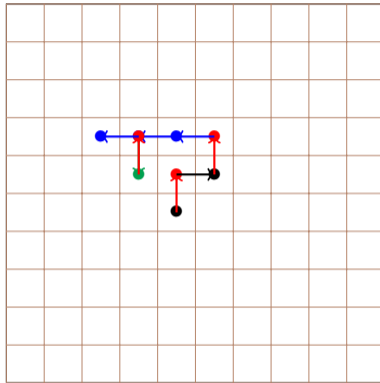
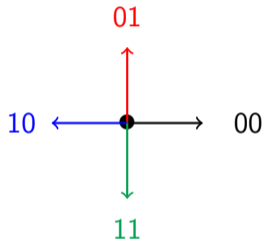
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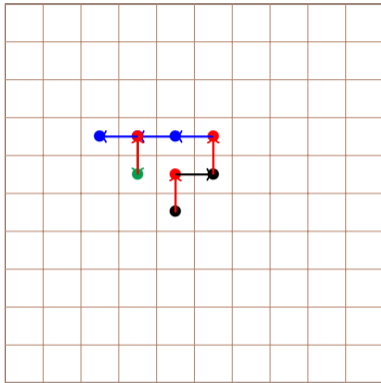
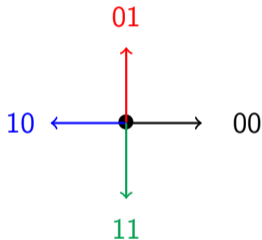
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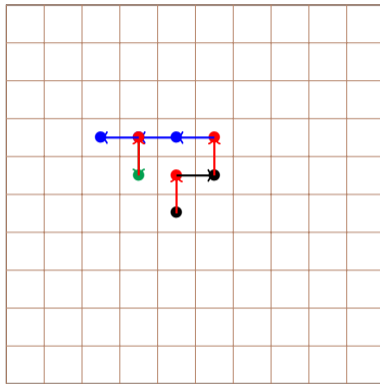
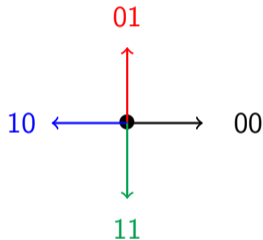
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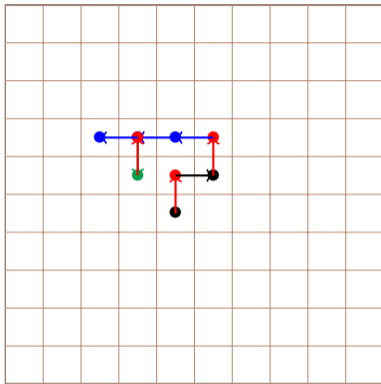
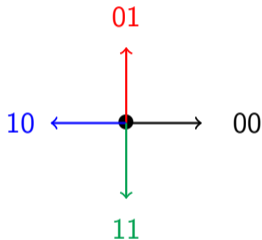
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**He asked me Why.**

I had not yet reached the RNG chapter in the book, but I spent the next night over it ...

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The RNG used:  $x_n = (1140671485x_{n-1} + 12820163) \bmod 2^{24}$ .

	base 10		base 2
$x_0$	= 15151640	=	111001110011001000011000
$x_1$	= 1337467	=	000101000110100001111011
$x_2$	= 14029138	=	110101100001000101010010
$x_3$	= 15020749	=	111001010011001011001101
$x_4$	= 2849372	=	001010110111101001011100
$x_5$	= 11378607	=	101011011001111110101111
$x_6$	= 1588150	=	000110000011101110110110
$x_7$	= 3490721	=	001101010100001110100001
$x_8$	= 3643360	=	001101111001011111100000
$x_9$	= 13915939	=	110101000101011100100011

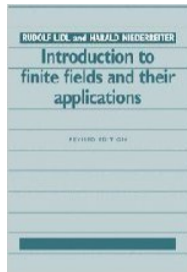
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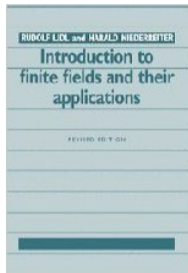
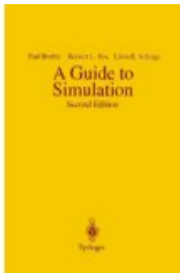
$y_n = x_n \bmod 4 = (1140671485x_{n-1} + 12820163) \bmod 4$

has period 4: 00, 11, 10, 01, 00, 11, 10, 01, ...

This convinced me that **RNGs are important** and the **most commonly used were very poor!** 12  
I got interested in RNGs, read and learned more about them, theory, implementations, ...



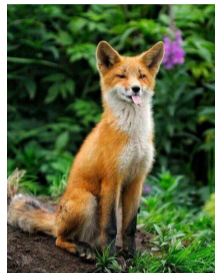
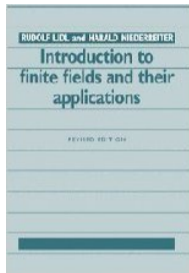
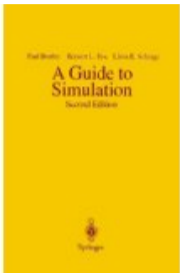
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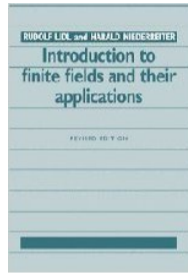
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*Efficient and Portable Combined Random Number Generators, Commun. of the ACM, 1988.*

Other RNG papers followed and this became my prime topic.

## Quality requirements for RNGs?

High speed, very long period, passes statistical tests, ..., and more!

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Much of my work has been targeted at understanding the structure of the vectors of outputs values such as  $(u_n, u_{n+1}, \dots, u_{n+s-1})$ , produced by the RNG.

Also constructing RNGs with multiple streams and substreams.

# My journey in simulation research

**I have worked on various “simulation” topics, including:**

random number generation; derivative estimation; stochastic optimization via simulation; quasi-Monte Carlo; variance reduction; rare-event simulation; stochastic modeling; applications in production, reliability, finance, service systems, etc.

**Main co-authors:**

Alain Haurie, Peter W. Glynn, Raymond Couture, Shu Tezuka, Christiane Lemieux, François Panneton, Richard Simard, Thanos Avramidis, Eric Buist, Wyeon Chan, Bruno Tuffin, Christian Lécot, Zdravko Botev, David Munger, Florian Puchhammer.

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**Had a tremendous journey so far in learning from this community.**

**Great people. Many exciting ideas, knowledge, results, tools, applications.**

**It is a privilege to be part of it.**



# Thank you for your support during my sabbaticals

**Peter Glynn** (Stanford, 1988);

**Peter Hellekalek** (Salzburg, 1997); **Jim Wilson** (Raleigh, 1998);

**Bruno Tuffin** (Inria Rennes, 2006–2007 and 2013–2014).





## Did I ever dreamed of the LPAA?

Yes. Since 1998, watching the LPAA “ceremony” at WSC gave me lots of inspiration. Reitman, Pritsker, Schreiber, Sargent, Fishman, Kleijnen, Nance, Law, Rubinstein, Lewis, Iglehart, Welch, Schmeiser, Zeigler, Cheng, Schruben, Henriksen, Wilson.



...



It gives me an incredible feeling to joint this chain.

## Personnal life: Three wonderful children and fabulous partner



Sébastien

Sandrine

Alexandre



Natana

I finally made it to the Olympics (84, 88, 92) as a coach!

Guillaume Leblanc



**After learning how to train, I found my sport!**



Dans le col du Galibier Life can hardly be better than this.



# What next?

## Refocus on the design, analysis, and testing of RNGs.

- ▶ Fast RNGs for GPUs and TPUs (arrays and tensors).  
Improve and distribute software tools to analyze and test RNGs.  
Make good RNG facilities more easily available in all popular programming environments.

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## Other dreams:

- ▶ Age-group world championship in cycling? One-hour record on track?
- ▶ After Covid: visit more of the world, discover, and learn.
- ▶ See you again at **WSC2040!**

Now, let's celebrate!



