

# 2012 Conant Prize

PERSI DIACONIS received the 2012 AMS Levi L. Conant Prize at the 118th Annual Meeting of the AMS in Boston in January 2012.

## Citation

The Levi L. Conant Prize for 2012 is awarded to Persi Diaconis for his article, “The Markov chain Monte Carlo revolution” (*Bulletin Amer. Math. Soc.* 46 (2009), no. 2, 179–205).

This wonderful article is a lively and engaging overview of modern methods in probability and statistics and their applications. It opens with a fascinating real-life example: a prison psychologist



Persi Diaconis

turns up at Stanford University with encoded messages written by prisoners, and Marc Coram uses the Metropolis algorithm to decrypt them. From there, the article gets even more compelling!

After a highly accessible description of Markov chains from first principles, Diaconis colorfully illustrates many of the applications and venues of these ideas. Along the way, he points to some very interesting mathematics and some fascinating open questions, especially about the running time in concrete situations of the Metropolis algorithm, which is a specific Monte Carlo method for constructing Markov chains. The

article also highlights the use of spectral methods to deduce estimates for the length of the chain needed to achieve mixing.

The article is eminently readable, with amply illustrated applications to random permutations and random walks on Cayley graphs, which bring into the picture symmetric function theory, Schur functions, and Jack polynomials. Other examples relate to the connectedness of hard disc arrays, phase transitions in statistical mechanics, and population dynamics with immigration.

Diaconis entertains and educates us at every step of his journey, delightfully convincing us that Markov chains are everywhere. His voice shines through the writing, for example: “I clearly remember my first look at David Wilson’s sample of a  $2000 \times 2000$  Ising model at the critical temperature. I felt like someone seeing Mars for the first time through a telescope.”

After providing helpful instructions for how “grown-up” mathematicians can begin to learn about this field, Diaconis concludes his tour with brief descriptions of connections to group representation theory, algebraic geometry, PDEs,

chemistry, physics, biology, and computer science. He writes, “To someone working in my part of the world, asking about applications of Markov chain Monte Carlo (MCMC) is a little like asking about applications of the quadratic formula. The results are really used in every aspect of scientific inquiry.” His article convinces us that this is so.

## Biographical Sketch

Persi Diaconis graduated from New York’s City College in 1971 and earned a Ph.D. in mathematical statistics from Harvard in 1974. He has taught at Stanford, Cornell, and Harvard. An early MacArthur winner, he is a member of the American Academy of Arts and Sciences, the U.S. National Academy, and the American Philosophical Society. He is always trying to play down his ten years as a professional magician.

## Response from Persi Diaconis

As a regular reader of expository articles, I am thrilled that mine seemed useful. The *Bulletin* does a great service with these. While I have the chance, I want to point to two other recent *Bulletin* articles that I am proud of: “Patterns in eigenvalues” (my Gibbs Lecture, 2002) and “On adding a list of numbers (and other one-dependent determinantal processes)” (with A. Borodin and J. Fulman, 2009). I promise to keep at it. Thank you.

## About the Prize

The Conant Prize is awarded annually to recognize an outstanding expository paper published in either the *Notices of the AMS* or the *Bulletin of the AMS* in the preceding five years. Established in 2001, the prize honors the memory of Levi L. Conant (1857–1916), who was a mathematician at Worcester Polytechnic University. The prize carries a cash award of US\$1,000.

The Conant Prize is awarded by the AMS Council acting on the recommendation of a selection committee. For the 2012 prize, the members of the selection committee were Jerry L. Bona, J. Brian Conrey, and Ronald M. Solomon.

Previous recipients of the Conant Prize are Carl Pomerance (2001); Elliott Lieb and Jakob Yngvason (2002); Nicholas Katz and Peter Sarnak (2003); Noam D. Elkies (2004); Allen Knutson and Terence Tao (2005); Ronald M. Solomon (2006); Jeffrey Weeks (2007); J. Brian Conrey, Shlomo Hoory, Nathan Linial, and Avi Wigderson (2008); John W. Morgan (2009); Bryna Kra (2010); and David Vogan (2011).

— Elaine Kehoe

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