# 2004 Moore Prize

The 2004 E. H. Moore Research Article Prize was awarded at the 110th Annual Meeting of the AMS in Phoenix in January 2004. This was the first time the prize was awarded.

The Moore Prize will be awarded every three years for an outstanding research article that appeared in one of the AMS primary research journals: *Journal of the AMS, Proceedings of the AMS, Transactions of the AMS, AMS Memoirs, Mathematics of Computation, Electronic Journal of Conformal Geometry and Dynamics,* and *Electronic Journal of Representation Theory*. The article must have appeared during the six calendar years ending a full year before the meeting at which the prize is awarded. The prize carries a cash award of $5,000.

The prize honors the extensive contributions of E. H. Moore (1862–1932) to the AMS. Moore founded the Chicago section of the AMS, served as the Society's sixth president (1901–02), delivered the Colloquium Lectures in 1906, and founded and nurtured the *Transactions of the AMS*.

The Moore Prize is awarded by the AMS Council acting on the recommendation of a selection committee. For the 2004 prize the members of the selection committee were: Béla Bollobás, Lawrence Craig Evans (chair), Grigorii A. Margulis, George C. Papanicolaou, and Andrew J. Wiles.

The 2004 Moore Prize was awarded to MARK HAIMAN. The text that follows presents the selection committee's citation, a brief biographical sketch, and the awardee's response upon receiving the prize.

**Mark Haiman**

## Citation

"Hilbert schemes, polygraphs, and the Macdonald positivity conjecture", *Journal of the AMS* **14** (2001), 941–1006.

Mark Haiman's groundbreaking paper proves both the $n!$ conjecture and Macdonald's positivity conjecture, both long-standing open problems in algebraic combinatorics, through the development of remarkable new notions in algebraic geometry and a tour-de-force derivation in commutative algebra.

The last step concerns the defining equations of the polygraph, an arrangement of linear subspaces connected with the geometry of the Hilbert scheme of $n$ points in the plane. This is then shown to coincide with the Hilbert scheme of regular orbits of the symmetric group acting on labeled configurations of $n$ points. The key result states that the isospectral Hilbert scheme is normal, Cohen-Macaulay, and Gorenstein.

Haiman's paper has within the last two years already led to numerous other new developments at the interface of combinatorics, algebraic geometry, and representation theory.

These include: M. Haiman, "Vanishing theorems and character formulas for the Hilbert scheme of points in the plane", *Invent. Math.* **149**, no. 2 (2002), 371–407; I. Gordon, "On the quotient ring by diagonal invariants", *Invent. Math.* **153** (2003), 503–518; and J. Haglund, "A proof of the $q,t$-Schröder conjecture", *Internat. Math. Res. Notices* (2004).

## Biographical Sketch

Mark Haiman received the Ph.D. in 1984 from the Massachusetts Institute of Technology, under the direction of Gian-Carlo Rota. He continued at MIT as an applied mathematics instructor and then assistant professor until 1991, when he moved to the University of California, San Diego, becoming full professor in 1997.

Haiman is presently professor of mathematics at the University of California, Berkeley, where he moved in 2001 following a semester there as a visiting Miller professor in fall 2000. He serves on the editorial board of *Algebra Universalis* and on the scientific advisory board of the Centre de Recherches Mathématiques in Montreal, Canada.

Haiman's research interests encompass a mix of combinatorics, algebraic geometry, and representation theory, with an additional occasional interest in lattice theory.

## Response

It is an honor and a special pleasure to be chosen as the first recipient of the E. H. Moore Research Article Prize. The publication activity of the AMS is, I think, the most important of all its contributions to mathematical life. Since the *Journal of the AMS* was started in 1988, I have always thought first of submitting there on those occasions when I believed a paper I had just completed to be one of my best. It's a bit of good fortune that by doing so I became eligible for a prize which did not yet exist.

The cited work bears the name of a sole author, but it was not done alone. The conjectures that started it all came out of a long and rewarding collaboration with Adriano Garsia, which we began in 1991 and have never finished. Adriano taught me a lot of mathematics and even more about how to do mathematics. In 1992 Adriano introduced me to Claudio Procesi, and we told him about our discoveries. The insight that the geometry of the Hilbert scheme should contain the solution to our problems was his. In those days my knowledge of algebraic geometry was rudimentary, and I had never heard of Hilbert schemes. I have Claudio's impetus to thank for whatever more I might know about those subjects today.