2005 Whiteman Prize

The 2005 Albert Leon Whiteman Memorial Prize was awarded at the 111th Annual Meeting of the AMS in Atlanta in January 2005.

The Whiteman Prize is awarded every four years to recognize notable exposition and exceptional scholarship in the history of mathematics. The prize was established in 1998 using funds donated by Mrs. Sally Whiteman in memory of her husband, the late Albert Leon Whiteman. The prize carries a cash award of $4,000.

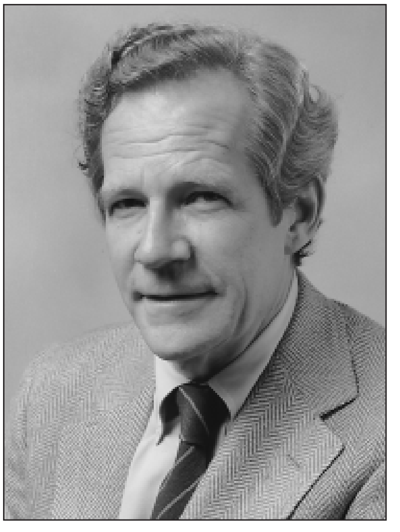
The Whiteman Prize is awarded by the AMS Council acting on the recommendation of a selection committee. For the 2005 prize the members of the selection committee were: Thomas W. Hawkins (chair), Victor J. Katz, and Robert Osserman.

The first recipient of the Whiteman Prize was Thomas Hawkins (2001).

The 2005 Whiteman Prize was awarded to Harold Edwards. The text that follows presents the selection committee's citation, a brief biographical sketch, and the awardee's response upon receiving the prize.

Citation

In awarding the Albert Leon Whiteman Prize to Harold Edwards, the American Mathematical Society pays tribute to his many publications over several decades that have fostered a greater understanding and appreciation of the history of mathematics, especially the theory of algebraic numbers. Edwards' historical work has all been related to the theory of numbers and has been presented mainly in two forms: mathematical expositions that are organized in the historical order of development so as to convey a genetic understanding of the relevant mathematical theory, and traditional scholarly historical papers. Both forms combine clear and careful historical scholarship with an attendant mastery of the underlying mathematics and together constitute a major contribution to our understanding of the history of mathematics in the spirit of the guidelines set for the Whiteman Prize.


Harold Edwards

The first of Edwards' several major genetic expositions was presented in his book *Riemann's Zeta Function* (1974), which provides the reader with a deep mathematical understanding of Riemann's seminal paper and the many investigations that were more or less inspired by it. His second book, *Fermat's Last Theorem: A Genetic Introduction to Algebraic Number Theory* (1977), was also of this type, its goal being to introduce the reader to algebraic number theory by retracing some of the crucial discoveries in their original contexts and with their original motivations. In particular, the careful 177-page exposition of the work of Kummer that it contains provides the reader with a solid understanding of the theory of algebraic numbers as it was perceived by one of the principal founders of the theory. In 1984 Edwards published his third book-length genetic exposition. Bearing the title *Galois Theory*, it focused on a clear exposition of the somewhat cryptic work of Galois, thereby providing the reader with a deeper understanding of the mathematical considerations that gave birth to present-day Galois theory. Any historian or mathematician interested in exploring some aspect of the history of the Riemann zeta function, the theory of algebraic numbers, or Galois theory would be wise to begin by a careful study of one of Edwards' books.

Edwards' more traditional scholarly historical papers have an evident symbiotic relation with his genetic expositions. This is especially true of his book on Fermat's Last Theorem. The masterful account of Kummer's mathematics that it contains has its roots in two important, purely historical papers on "The background of Kummer's proof of Fermat's Theorem for regular primes" (1975, 1977). Based on a careful reading of the relevant publications and the use of unpublished documents, these papers present a clear, accurate, and illuminating account of an important—and previously poorly understood—episode in the history of algebraic number theory. Among the many insights contained in these papers is a critique of the widely accepted view that it was Fermat's conjectured theorem that formed the primary motivation for Kummer's revolutionary theory of ideal factorization. A cogent historical case is made for the view that it was actually the loftier quest for higher reciprocity laws that inspired Kummer.

Much of Edwards' subsequent historical research focuses upon the two men, Kronecker and Dedekind, who in quite different ways sought to develop Kummer's ideas beyond the special number fields he had considered. The first fruits of these efforts are contained in his paper "The genesis of ideal theory" (1980). In his publications Edwards is frank about his preference for Kummer's approach over the now-familiar approach eventually developed by Dedekind. His awareness of his own prejudices and their potential for misrepresentation has resulted in remarkably objective and illuminating accounts of the work of both mathematicians.

Indeed, it is perhaps because the final set-theoretic form of Dedekind's theory is neither as obvious nor as natural to Edwards as it is to most present-day mathematicians that he has succeeded so well in delineating the gradual changes Dedekind made to his theory of ideals, which, as he has shown, actually resembled Kummer's in its initial versions. His paper "Dedekind's invention of ideals" (1982) summarizes cogent historical arguments for the radical nature of Dedekind's eventual approach to ideal theory and for the likely sources of his inspiration.

That Dedekind's theory of ideals won out over the rival generalization of Kummer's theory, namely Kronecker's theory of divisors, is due at least in part to Dedekind's superior expository skill in presenting his work. Kronecker, on the other hand, withheld his ideas on divisor theory from publication for decades as he sought to work them out in a suitable form. Then in a paper of 1882, as a Festschrift in honor of Kummer, Kronecker finally put something into print, but, much to the disappointment of his contemporaries, he did no more than present a sketch of his ideas that was difficult even for experts such as Dedekind to penetrate. One of Edwards' signal achievements has been to reconstruct and expound Kronecker's theory (as well as Dedekind's reaction to it). He began this process in "The genesis of ideal theory" and completed it in his book *Divisor Theory* (1990), which provides the sort of systematic and coherent exposition of divisor theory that Kronecker himself was never able to achieve. Edwards has also used the resultant insights into Kronecker's actual practice of algebraic number theory to provide a more informed interpretation of his scattered—and often misrepresented—remarks on the philosophy of mathematics. (His forthcoming paper "Kronecker's Fundamental Theorem of General Arithmetic" is a good example.) Although Edwards' personal sympathy for an intuitionist view of mathematics seems to have been the motivation for much of his historical work relating to Kronecker, the final products of his efforts are characterized by their studied objectivity. They have laid to rest many unfounded anecdotes about Kronecker and his views that had been promulgated by other historians.

Edwards' combination of historical insights and sound mathematical scholarship make him a worthy recipient of the Whiteman Prize.

Biographical Sketch

Harold M. Edwards was born in Champaign, Illinois, in 1936. He received a B.A. from the University of Wisconsin in 1956, an M.A. from Columbia in 1957, and a Ph.D. from Harvard in 1961. After teaching at Harvard (1961–62) and Columbia (1962–66), he went to New York University in 1966, where he has remained. He is now an emeritus professor. He has published seven books: *Advanced Calculus* (1969, 1980, 1993), *Riemann's Zeta Function* (1974, 2001), *Fermat's Last Theorem* (1977), *Galois Theory* (1984), *Divisor Theory* (1990), *Linear Algebra* (1995), and *Essays in Constructive Mathematics* (2005).

Response

I am deeply grateful to be awarded the Whiteman Prize, especially so because I am only the second recipient, the first having been my esteemed colleague Thomas Hawkins.

I must echo the pleasure Tom Hawkins expressed in his response four years ago at this "manifestation of the importance the AMS attaches to the historical study of mathematics" as well as his recollection that "when I committed myself to a career in history of mathematics, there was in this country no such recognition of historical work by professional mathematical societies."

Hawkins's phrase, "the historical study of mathematics," strikes me as particularly apt. I have always felt that my study was mathematics, not the history of mathematics, but the study of the history has always been for me the easiest—and often the only—point of entry into the study of a given mathematical topic. My book on the zeta function began thirty-five years ago with a wish to understand and, I admit, a wish to prove the Riemann hypothesis. For me, the natural approach was to read Riemann's own words, and after I had studied his cryptic eight-page paper in some detail, I thought that others might profit from an exposition of what I had learned. Publishing a work of this sort did not appear then to be a very promising career choice, but it came from a deeply felt attitude toward the study of mathematics and was more an expression of a need than a career choice. How gratifying it is to have the value of the work done for such a reason confirmed by this prize!

I would like to take advantage of this opportunity to express my gratitude to three individuals who have not been mentioned in the acknowledgements in any of my books, because their influence on any one book was so indirect, but who were each immensely important to my career.

First, to Raoul Bott, who was my thesis advisor more than forty years ago. His plain-spoken, common-sense approach to mathematics has inspired all who have ever heard him lecture, not to mention those of us who had the good luck to start our research careers with him.

Second, to Morris Kline, who would certainly be a prime candidate for this prize if he were still alive. He hired me at NYU, and, being a historian himself, he furthered my historical work in many ways.

And third, to Uta Merzbach, a valued colleague who took a very helpful interest in my work and whose sharing with me of her expertise and experience in historical research was my only education in such work.

Thank you to the AMS, to the selection committee, and to Mrs. Sally Whiteman, who established the prize in memory of her husband, Albert Leon Whiteman.