2008 Doob Prize

The 2008 Joseph Doob Prize was awarded at the 114th Annual Meeting of the AMS in San Diego in January 2008.

This prize was established by the AMS in 2003 and endowed in 2005 by Paul and Virginia Halmos in honor of Joseph L. Doob (1910–2004). Paul Halmos (1916–2006) was Doob's first Ph.D student. Doob received his Ph.D. from Harvard in 1932 and three years later joined the faculty at the University of Illinois, where he remained until his retirement in 1978. He worked in probability theory and measure theory, served as AMS president in 1963–1964, and received the Steele Prize in 1984. The Doob Prize recognizes a single, relatively recent, outstanding research book that makes a seminal contribution to the research literature, reflects the highest standards of research exposition, and promises to have a deep and long-term impact in its area. The book must have been published within the six calendar years preceding the year in which it is nominated. Books may be nominated by members of the Society, by members of the selection committee, by members of AMS editorial committees, or by publishers. The prize of US$5,000 is given every three years.

The Doob Prize is awarded by the AMS Council acting on the recommendation of a selection committee. For the 2008 prize, the members of the selection committee were Andrew Granville, Robin Hartshorne, Steven G. Krantz, Dale P. Rolfsen (chair), and Bhama Srinivasan.

The previous recipient of the Doob Prize is William P. Thurston.

The 2008 Doob Prize was awarded to ENRICO BOMBIERI and WALTER GUBLER. The text that follows presents the selection committee's citation and, for each awardee, a brief biographical sketch and the awardee's response upon receiving the prize.

Citation

Heights in Diophantine Geometry, by Enrico Bombieri and Walter Gubler (Cambridge University Press, 2006).

The book is a research monograph on all aspects of Diophantine geometry, both from the perspective of arithmetic geometry and of transcendental number theory. The key emphasis is on the (delicate) theory of heights, which is developed with extraordinary precision and elegance.

The choice of subjects is broad and gives the sense of a powerful body of ideas. The great results of arithmetic geometry, the theorems of Mordell-Weil, Roth, Siegel, and Faltings, are all proved with a consistent, remarkably accessible point of view.

Enrico Bombieri

Walter Gubler

The book also develops the extraordinary work of Zhang and others on the Bogomolov conjecture, puts forward an elegant approach to Hilbert irreducibility, and includes a detailed discussion of the Nevanlinna-Vojta theory. There is a lovely exposition of the important theory of unit equations and a most brilliant discussion of the Subspace Theorem of Schmidt and Schlickewei, as well as the possibilities afforded by the abc-conjecture and further developments along these lines.

The book is self-contained, yet surprisingly accessible given the depth of the material. Links between classical Diophantine arithmetic and modern arithmetic geometry are emphasized throughout the text in an appealing way. There are well-constructed appendices on key technical issues such as basic algebraic geometry, algebraic ramification theory, and the geometry of numbers (a subject which is going through a revival at the moment).

One gets the sense that every lemma, every theorem, every remark has been carefully considered, and every proof has been thought through in every detail. There are well-chosen illuminating examples throughout every chapter. The book is a masterpiece in terms of its original approach, its unrivaled comprehensiveness, and the sheer elegance of the exposition. There can be no doubt that this book will become the basis for the future development of this central subject of modern mathematics.

Biographical Sketch: Enrico Bombieri

Enrico Bombieri was born in Milan, Italy, in 1940. He started studying mathematics, and in particular number theory, at an early age with Giovanni Ricci. He graduated from the University of Milan in 1963 and became assistant professor there immediately after. He spent the next year in Cambridge, England, working with Davenport and Swinnerton-Dyer, studying geometry over finite fields and the distribution of prime numbers. He became a full professor in 1965, with his first appointment at the University of Cagliari and in 1966 at the University of Pisa. In 1975 he moved to the Scuola Normale Superiore in Pisa and in 1977 joined the School of Mathematics of the Institute for Advanced Study in Princeton as a full professor. He became a U.S. citizen in 1994.

He was elected a member of the U.S. National Academy of Sciences in 1965 and of the Accademia Nazionale dei Lincei, Italy, in 1976; fellow of the American Academy of Arts and Sciences in 1979; foreign member of the Institut de France, Académie des Sciences in 1984; foreign member of the Royal Swedish Academy of Sciences in 1982; honorary member of the London Mathematical Society 1977; Chevalier de l'Ordre des Palmes Académiques, France, in 1993; Doctor Honoris Causa, University of Pisa, in 2001; and Cavaliere di Gran Croce al Merito della Repubblica, Italy, in 2002. He received the Fields Medal at the International Congress of Mathematicians in 1974 in Vancouver, the Feltrinelli Prize in 1976, and the Balzan Prize in 1980. His first studies in number theory were with Giovanni Ricci and Davenport and in algebraic geometry with Swinnerton-Dyer and Aldo Andreotti. During his tenure in Pisa he was initiated into the theory of partial differential equations and minimal surfaces by Guido Stampacchia and Ennio De Giorgi.

His main interests in number theory are prime number theory, zeta functions, Diophantine geometry, and Diophantine approximation; in analysis, complex function theory in one and several variables, minimal surfaces, and geometric measure theory; in algebraic geometry, geometry over finite fields, arithmetic geometry, and classification problems.

He is the author of two short monographs, a comprehensive monograph (with Walter Gubler) on the theory of heights in Diophantine geometry, and over 160 research papers published in leading mathematical journals. After mathematics his main activities are painting and drawing.

Response: Enrico Bombieri

It is indeed a great surprise for me, and certainly a great honor, to receive the Doob Prize for my book with Walter Gubler on the theory of heights in Diophantine geometry. The origin of this book goes back to 1992 after I found a simplification of Vojta's landmark new proof of the Mordell conjecture. I had been invited to give a series of lectures to graduate students and young researchers in Pisa, and I thought it appropriate to give a short course on Diophantine geometry, culminating with the proof of the Mordell conjecture. This course was well received, so when a little later I was asked by Wüstholz to give a *Nachdiplom* course to students at the ETH in Zürich, we quickly agreed that the same topic would be fine. There was a little condition, namely, to develop all the material from scratch. Walter Gubler, who was then just finishing his Ph.D. thesis with Professor Wüstholz, was given the job of taking notes in the best old-fashioned European style.

To my great surprise, Walter's notes were absolutely superb: well organized, clearly written, amplified in places, and correcting the inaccuracies and mistakes I had made during my lectures.

They formed an excellent basis for an introductory course, so it was decided to expand them to book form. Walter collaborated enthusiastically in the writing, and after a short while when the rough notes expanded well beyond the initial text in order to include more and more foundational material as well as complements to the main theory, he became a coauthor. The unifying theme would be the theory of heights and its application to Diophantine geometry on commutative groups.

Without Walter, this book could not have been written.

It was a long task to write up and organize the material, and in the meantime the subject itself kept growing and we had to play a catch-up game. So it took almost twelve years to write and revise the book. It was not the first one on the subject, and there were already several other excellent monographs where one could learn the subject. So why one more book? For me, writing this book was like preparing carefully a series of lectures to bright students, and I received a lot of satisfaction doing it. Now it is time for it to go out and establish its little place in the mathematical world, with the hope that it will be well received and prove itself to be useful to young mathematicians entering the beautiful subject of Diophantine geometry and arithmetic geometry.

Biographical Sketch: Walter Gubler

Walter Gubler was born October 30, 1965, in Olten, Switzerland. He received his diploma in mathematics at the Eidgenössisches Technische Hochschule Zürich in 1989. At the same place, he earned his Ph.D. in 1992 under Gisbert Wüstholz. For his thesis, *Heights of subvarieties*, he won the silver medal of the ETH. From 1992 to 1993 he visited the Institute for Advanced Study in Princeton. Then he held postdoc positions at the ETH Zürich and at the Humboldt University in Berlin. In 2003 Walter Gubler received the *venia legendi* at the ETH for his habilitation thesis. From 2003 to 2007 he was a lecturer at the University of Dortmund. Currently he is BMS substitute professor at the Humboldt University in Berlin.

Response: Walter Gubler

It is an honour for me to receive the Doob Prize 2008 together with my coauthor, Enrico Bombieri. Our book project started with a lecture by Enrico at the ETH Zürich. I had not anticipated that we would have to invest more than ten years of hard work to finish this book. On the one hand, new results came from research, and on the other hand, a lot of efforts were necessary to make the book self-contained. From my point of view, the time was well invested, as I learned so much about the subject and it was great fun to work with Enrico. I wish to thank him for giving me the opportunity to collaborate. I am very gratified to receive this prize for all the effort. Thank you.