Shigefumi Mori Awarded 1990 Cole Prize in Algebra

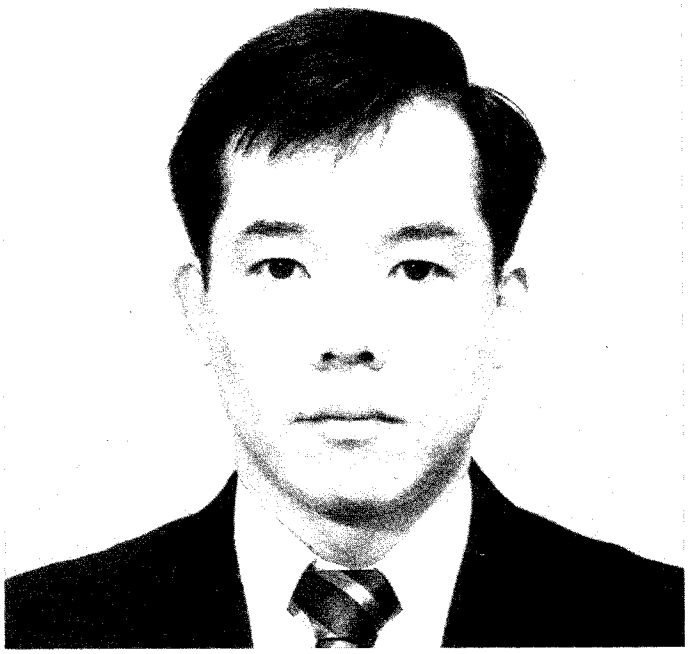
The Frank Nelson Cole Prize in Algebra is awarded every five years for a notable research memoir in algebra which has appeared during the previous five years. This prize, as well as the Frank Nelson Cole Prize in Number Theory, was founded in honor of Professor Frank Nelson Cole on the occasion of his retirement as Secretary of the American Mathematical Society after twenty-five years and as Editor-in-Chief of the Bulletin for twenty-one years. The original fund was donated by Professor Cole from moneys presented to him on his retirement. It has been augmented by contributions from members of the Society, including a gift made in 1929 by Charles A. Cole, Professor Cole's son, which more than doubled the size of the fund. In recent years, the Cole Prizes have been augmented by awards from the Leroy P. Steele Fund and currently amount to $4,000.

The Twenty-Third Cole Prize was awarded to SHIGEFUMI MORI of Nagoya University. The prize was awarded at the Society's ninety-sixth Annual Meeting in Louisville. The Cole Prize was awarded by the Council of the American Mathematical Society, acting through a selection committee consisting of Michael Artin, Walter Feit, and Melvin Hochster (Chairman).

The text below includes the Committee's citation and a brief biographical sketch of the recipient. Professor Mori was unable to attend the Annual Meeting to receive the prize in person. He did, however, send a written response to the award.

Citation

The Committee unanimously recommends that the 1990 Cole Prize in Algebra be awarded to Shigefumi Mori for his outstanding work on the classification of algebraic varieties. Mori took the decisive steps over a ten-year period in extending the classical theory of algebraic surfaces to dimension three: prior to Mori's breakthroughs this problem seemed out of reach. Mori's beautiful work also makes major inroads into the problem in higher dimensions. The committee notes, in particular, his paper, "Flip theorem and the existence of minimal models for 3-folds" in the first issue of the *Journal of the American Mathematical Society*, January, 1988. In this paper Mori proves the existence of minimal models for three-folds, which essentially finishes his program. Consequences include the analogue of Enriques' theorem (that if all plurigenera vanish then the variety is uniruled), the finite generation of the canonical ring (this implies that three-folds of general type with given numerical invariants form a limited family — the first big step in constructing moduli), and the classification of Fano three-folds.



Shigefumi Mori

Response

I am greatly honored to have been awarded the Cole Prize for my paper on the 3-dimensional minimal models, and I feel especially happy because much of my research has been done with the support of the cultural exchange of Japan and U.S.A. I am most grateful to the American Mathematical Society.

The new approach to 3-folds in the last decade originated from two directions; one was the extremal ray theory by myself which goes back to the Hironaka-Kleiman cone, and the other was the notion of terminal and canonical singularities introduced by M. Reid as 3-fold analogue of smooth and Du Val points on a surface. The latter arose naturally in the study of finitely generated canonical rings.

On the basis of these, the theory was developed along the lines of Reid's conjectures by X. Benveniste, Y. Kawamata, J. Kollár, V. V. Shokurov and others. The minimal model theory developed for threefolds actually works in arbitrary dimensions except for one key process called the "flip". For the (important but still special) semistable case of 3-folds, the flip process was done independently by S. Tsunoda, V. V. Shokurov, Y. Kawamata and myself. These approaches were different and my paper cited by the Cole Prize Committee finished the flip process based on Y. Kawamata's approach. At least for 3-folds, we can now start a systematic program of research. Typical results in this direction are the finite generation of canonical rings for 3-folds by T. Fujita, Y. Kawamata and X. Benveniste, the uniruledness of 3-folds with all plurigenera zero by Y. Miyaoka, and the study of surface singularities by J. Kollár and N. Shepherd-Barron.

What amazes me is the role of the anti-canonical divisors in this study, as pointed out by M. Reid in the case of 3-fold terminal singularities. At the current state of our knowledge, however, this role emerges only after a rather detailed classification of the singularities which occur. I hope one can understand this mystery someday and gain more insight in the higher dimensional case.

Biographical Sketch

Shigefumi Mori was born on February 23, 1951 in Nagoya, Japan. He received his B.A. (1973), M.A. (1975), and Ph.D. (1978) all from Kyoto University. He wrote his thesis, "The endomorphism rings of some abelian varieties", under the direction of Masayoshi Nagata.

Professor Mori held the position of assistant at Kyoto University from 1975 to 1980. In 1980 he joined the faculty at Nagoya University as a lecturer and was promoted to associate professor in 1982. In 1988 he was promoted to his current position of full professor at that university. During this time, Mori also held visiting positions at Harvard University (1977-80 and spring, 1981), Institute for Advanced Study (1981-1982), Max Planck Institute (spring, 1982), Columbia University (1985-1987), and the University of Utah (summer, 1987 and fall, 1988). Under the U.S.-Japan cooperative program, he visited the University of Utah in fall, 1989.

Professor Mori is the editor of the *Nagoya Mathematical Journal* and *International Journal of Mathematics* and an associate editor for *Annals of Mathematics* and *Journal of Differential Geometry*.

In 1981, Professor Mori presented the C.I.M.E. Lecture Series, in Varenna, Italy. In 1983, he received the Japan Mathematical Society's Yanaga Prize and was an Invited Speaker at the International Congress of Mathematicians in Warsaw. He received the Chunichi Culture Prize in 1984. In 1988, he shared the Japan Mathematical Society's Fall Prize with Yujiro Kawamata for their "outstanding work in the minimal model theory for algebraic varieties"; and, in 1989, received the Inoue Prize for Science for his "outstanding work in the theory of higher dimensional algebraic varieties and in particular for the proof of existence of minimal models for 3-dimensional algebraic varieties".