

2016 E. H. Moore Research Article Prize



Caucher Birkar



Paolo Cascini



Christopher D. Hacon



James McKernan

CAUCHER BIRKAR, PAOLO CASCINI, CHRISTOPHER D. HACON, and JAMES MCKERNAN were awarded the 2016 E. H. Moore Research Article Prize at the 122nd Annual Meeting of the AMS in Seattle, Washington, in January 2016 for their article “Existence of minimal models for varieties of log general type,” which appeared in the *Journal of the American Mathematical Society* in 2010.

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Citation

This article, together with its companion “Existence of minimal models for varieties of log general type II” by Hacon and McKernan in the same issue, which builds on ideas in earlier papers by Kawamata, by Kollár, by Mori, by Reid, by Shokurov, by Siu, and by Hacon and McKernan, has thoroughly transformed higher-dimensional birational geometry.

Given an algebraic variety X , the minimal model program aims to modify X , changing it only in a lower-dimensional locus, to produce a new variety Y that is particularly nice. The cited authors prove,

via an intricate inductive argument, that these nice models Y exist in the most important cases. Their result implies many of the consequences of the minimal model program. In particular it provides an algebraic proof of the long-standing conjecture that the canonical ring of a variety is a finitely generated algebra. Experts agree that the article, together with its companion, marks a watershed in algebraic geometry.

Biographical Sketch of Birkar

Caucher Birkar was born and raised in Kurdistan, where he developed a passion for mathematics. His primary research interests are in algebraic geometry, particularly birational geometry. He is a professor of mathematics at the University of Cambridge, where he has been since 2006. In 2010, he was awarded a Philip Leverhulme Prize and the prize of the Fondation Sciences Mathématiques de Paris. He has been active organizing seminars, workshops, and conferences in various countries.

Biographical Sketch of Cascini

Paolo Cascini was born and raised in Italy. He received his undergraduate degree from the Università degli Studi di Firenze. He obtained his PhD in mathematics from New York University under the supervision of F. A. Bogomolov and was awarded the Wilhelm T. Magnus Prize for significant contributions to the mathematical sciences. He held a postdoctoral position and then a permanent assistant professorship at the University of California Santa Barbara, where he was awarded a Sloan Fellowship. Later on, he moved to the United Kingdom to join the faculty of Imperial College London, where he holds an EPSRC fellowship. His research interests are in algebraic geometry, especially birational geometry.

Biographical Sketch of Hacon

Christopher D. Hacon is a Distinguished Professor at the department of mathematics of the University of Utah. He received his undergraduate degrees from the University of Pisa and the Scuola Normale Superiore di Pisa in 1992 and his PhD from UCLA in 1998 under the direction of Robert Lazarsfeld. His field of research is algebraic geometry, especially the study of higher-dimensional birational geometry and the minimal model program. Hacon is a fellow of the AMS and a recipient of the 2007 Clay Research Award, the 2009 Frank Nelson Cole Prize in Algebra, and the 2011 Antonio Feltrinelli Prize in Mathematics, Mechanics, and Application.

Biographical Sketch of McKernan

James McKernan was born in London, England, in 1964. He received his BA in mathematics from Cambridge University in 1985 while attending Trinity College and his PhD in mathematics from Harvard University under the supervision of Joseph Harris in 1991. He then held temporary positions at the University of Utah (1991–93), the University of Texas at Austin (1993–94), and Oklahoma State University, Stillwater (1994–95). He joined the

faculty at the University of California Santa Barbara in 1995, the faculty at the Massachusetts Institute of Technology in 2007, and the faculty at the University of California San Diego in 2013. He received a Clay Research Award in 2007 and the Cole Prize in Algebra in 2009. He was made a fellow of the Royal Society in 2011. His research interests are in algebraic geometry, especially birational geometry and the classification of algebraic varieties.

Joint Response from Caucher Birkar, Paolo Cascini, Christopher D. Hacon, and James McKernan

We are honored to have been selected to receive the 2016 E. H. Moore Research Article Prize. We are especially happy that the selection committee decided to recognize the recent exciting developments in birational algebraic geometry. We would like to stress that our accomplishments are based on a long series of beautiful results obtained by Y. Kawamata, J. Kollár, S. Mori, M. Reid, V. Shokurov, Y.-T. Siu, and many others. We are also in debt to A. Corti for many useful conversations on the minimal model program.

One of the nicest things about receiving this award is that it gives us an opportunity to publicly acknowledge the invaluable aid, support, and encouragement we have received from co-authors, mentors, and colleagues.

Caucher Birkar would like to thank his family, Tarn, and Zanko for their love and support. He also wishes to thank his brother, Haidar, who taught him to learn and to enjoy mathematics beyond the classroom since childhood. He is indebted to his PhD advisors, Ivan Fesenko and Vyacheslav Shokurov, and his many friends and colleagues for their support throughout his career. He is grateful to Cambridge University, EPSRC, the Leverhulme Trust, and other supporting organizations for giving him the opportunity to focus on research.

Paolo Cascini would like to thank his family for their support and their encouragement all these years. Since the beginning of his studies, he benefited enormously from interacting with many colleagues all over the world. He is especially grateful to his PhD supervisor, F. A. Bogomolov. He would also like to thank the departments of mathematics at New York University, at the University of California Santa Barbara, and at Imperial College for providing excellent environments for research. He is also very grateful to the NSF, the Sloan Foundation, and EPSRC for their financial support.

Christopher Hacon would like to thank his family, Aleksandra, Stefan, Ana, Sasha, Kristina, Daniela, Marko, Derek, Carol, and Giovanni, for their love and support; his mentors, F. Bardelli, F. Catanese, and R. Lazarsfeld, for introducing him to algebraic geometry; the NSF, the AMS, the Sloan Foundation, the Clay Foundation, and the Simons Foundation for financial support; and the University of Utah for providing a great research environment.

James McKernan would like to thank Elham Izadi and his family for their support, love, and encouragement. He would also like to thank his advisor, J. Harris, for inspiring him with so much beautiful projective geometry; J. Kollár and S. Mori for their support and encouragement over the whole of his career; V. Shokurov, who is always so generous with his ideas; and Y. Kawamata and M. Reid for their help. He would like to thank the department of mathematics at the University of California Santa Barbara—where a considerable amount of this work was done—for providing such a great environment to do research, the department of mathematics at the Massachusetts Institute of Technology, and the University of California San Diego. He is also very grateful to the NSF, NSA, and the Clay Foundation for their generous financial support.

About the Prize

The E. H. Moore Research Article Prize is awarded every three years for an outstanding research article that appeared in one of the primary AMS 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*, or *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 US\$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 E. H. Moore Research Article Prize is awarded by the AMS Council acting on the recommendation of a selection committee. For the 2016 prize, the members of the selection committee were the following individuals.

- Ian Agol
- F. Michael Christ
- Howard Masur
- Bjorn Poonen (Chair)
- Ulrike Tillman

The complete list of recipients of the E. H. Moore Research Article Prize follows.

2004 Mark Haiman

2007 Ivan Shestakov, Ualbai Umirbaev

2010 Sorin Popa

2013 Michael Larsen, Richard Pink

2016 Caucher Birkar, Paolo Cascini,

Christopher D. Hacon, James McKernan

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