

2016 AMS Award for Impact on the Teaching and Learning of Mathematics

MICHAEL GAGE and ARNOLD PIZER have received the 2016 AMS Award for Impact on the Teaching and Learning of Mathematics.



Photo courtesy of Sandra Cherin.

Michael Gage



Photo courtesy of Carol Pizer.

Arnold Pizer

Citation

Michael Gage and Arnold Pizer at the University of Rochester are the mathematicians who created and developed WeBWorK, one of the first web-based systems that assign and grade homework problems in mathematics and science courses and the most successful that is nonprofit, free, open source, and textbook/publisher independent. There are now almost 1,000 institutions (high schools, colleges, large research universities) using WeBWorK, and its Open Problem Library contains more than 30,000 problems: college algebra through linear algebra, complex analysis, probability, and statistics.

Gage and Pizer began working on WeBWorK in the mid-1990s and launched it with the “Calculus

with Foundations” class of twenty-nine students in fall, 1996. They received the first NSF [National Science Foundation] grant for the support of WeBWorK in 1999, the same year that WeBWorK received the International Conference on Technology in Collegiate Mathematics Award for Excellence and Innovation with the Use of Technology in Collegiate Mathematics. Since then, WeBWorK has received three additional NSF grants and is currently supported by the Mathematical Association of America. James Glimm, former president of the AMS, has written about the improvement to student learning that can come from the use of WeBWorK: “The key mechanism for this improvement seems to be that the students find their homework to be far more rewarding and do more of it, and, not surprisingly, do learn more.” Instructors praise its flexibility in terms of the types of questions that can be posed and the benefits of its open source software that make it possible for individuals to add onto its capabilities.

Biographical Sketches

Michael Gage received his bachelor’s degree from Antioch College (1971) and his PhD from Stanford University (1978), where his advisor was Robert Osserman. After five years in postdoctoral and visiting positions, he joined the faculty at the University of Rochester and assumed his present position as professor of mathematics in 1993. In 2014 Gage was a plenary speaker at the conference “WeBWorK and Math Support Center Workshop”, held at the Hong Kong University of Science & Technology. He has served on the AMS Committee on Education (2008–2011).

Arnold Pizer received his bachelor’s degree from Yale University (1967) and his PhD from Yale University (1971), where his advisor was T. Tamagawa. After assistant professor positions at the University of California, Los Angeles, and at Brandeis University, he joined the faculty of the University of Rochester in 1976 and became a full professor in 1989. In 2007 he became a professor emeritus at Rochester.

In 1999 Gage and Pizer received the International Congress on Technology in Collegiate Mathematics (ICTCM) award for creating WeBWorK. This award recognizes an individual or group for excellence and innovation in using technology to enhance the teaching and learning of mathematics.

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ALGEBRAIC GEOMETRY II

David Mumford, *Brown University, Providence, RI*, and Tadao Oda, *Toboku University, Japan*

Several generations of students of algebraic geometry have learned the subject from David Mumford's fabled "Red Book", which contains notes of his lectures at Harvard University. Their genesis and evolution are described by Mumford in the preface:

Initially, notes to the course were mimeographed and bound and sold by the Harvard mathematics department with a red cover. These old notes were picked up by Springer and are now sold as *The Red Book of Varieties and Schemes*. However, every time I taught the course, the content changed and grew. I had aimed to eventually publish more polished notes in three volumes...

This book contains what Mumford had then intended to be Volume II. It covers the material in the "Red Book" in more depth, with several topics added. Mumford has revised the notes in collaboration with Tadao Oda.

The book is a sequel to *Algebraic Geometry I*, published by Springer-Verlag in 1976.

Hindustan Book Agency; 2015; 516 pages; Hardcover; ISBN: 978-93-80250-80-9; List US\$76; AMS members US\$60.80; Order code HIN/70

OPERATORS ON HILBERT SPACE

V. S. Sunder, *Institute of Mathematical Sciences, Chennai, India*

This book's principal goals are: (i) to present the spectral theorem as a statement on the existence of a unique continuous and measurable functional calculus, (ii) to present a proof without digressing into a course on the Gelfand theory of commutative Banach algebras, (iii) to introduce the reader to the basic facts concerning the various von Neumann-Schatten ideals, the compact operators, the trace-class operators and all bounded operators, and finally, (iv) to serve as a primer on the theory of bounded linear operators on separable Hilbert space.

Hindustan Book Agency; 2015; 110 pages; Softcover; ISBN: 978-93-80250-74-8; List US\$40; AMS members US\$32; Order code HIN/69

PROBLEMS IN THE THEORY OF MODULAR FORMS

M. Ram Murty, Michael Dewar, and Hester Graves, *Queen's University, Kingston, Ontario, Canada*

This book introduces the reader to the fascinating world of modular forms through a problem-solving approach. As such, it can be used by undergraduate and graduate students for self-instruction. The topics covered include q -series, the modular group, the upper half-plane, modular forms of level one and higher level, the Ramanujan τ -function, the Petersson inner product, Hecke operators, Dirichlet series attached to modular forms, and further special topics. It can be viewed as a gentle introduction for a deeper study of the subject. Thus, it is ideal for non-experts seeking an entry into the field.

Hindustan Book Agency; 2015; 310 pages; Softcover; ISBN: 978-93-80250-72-4; List US\$58; AMS members US\$46.40; Order code HIN/68

Publications of Hindustan Book Agency are distributed within the Americas by the American Mathematical Society. Maximum discount of 20% for all commercial channels.



Information about hosting WeBWorK is available at webwork.maa.org and about the WeBWorK community at webwork.maa.org/wiki.

Response

We are extremely honored to accept the AMS Award for Impact on the Teaching and Learning of Mathematics for the development of the WeBWorK homework system. We have been gratified by the positive benefit that WeBWorK has had on student homework performance. We, along with our co-principal investigator Dean Vicki Roth, director of the Center for Excellence in Teaching and Learning at the University of Rochester, wish to acknowledge the support of the National Science Foundation and the Mathematical Association of America in helping to create an active open source academic support community around the WeBWorK software. The mathematicians in this community who are augmenting and upgrading the open source software and contributing to and curating the collection of Creative Commons licensed questions in the Open Problem Library continue to improve the resources made freely available for the teaching of mathematics. We are grateful for the recognition that the AMS has given to us for initiating the WeBWorK project and fostering the growth of this WeBWorK community.

About the Award

The Award for Impact on the Teaching and Learning of Mathematics was established by the AMS Committee on Education (COE) in 2013. The Award is given annually to a mathematician (or group of mathematicians) who has made significant contributions of lasting value to mathematics education. Priorities of the award include recognition of (a) accomplished mathematicians who have worked directly with pre-college teachers to enhance teachers' impact on mathematics achievement for all students or (b) sustainable and replicable contributions by mathematicians to improving the mathematics education of students in the first two years of college. The US\$1,000 award is given annually. The endowment fund that supports the award was established in 2012 by a contribution from Kenneth I. and Mary Lou Gross in honor of their daughters, Laura and Karen. The award is presented by the COE acting on the recommendation of a selection subcommittee. The members of the subcommittee were Matt Baker, David Bressoud, Jennifer Taback (Chair), and Karen Vogtmann.

Previous recipients of the Impact Award were Paul J. Sally Jr. (2014) and W. James Lewis (2015).

—AMS Committee on Education