

David D. Bleecker (1948–2016)

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Mathematics People

Ooguri Receives Chunichi Cultural Award



Hirosi Ooguri

HIROSI OOGURI of the California Institute of Technology has been honored with the 2016 Chunichi Cultural Award. The award carries a cash prize of 2 million yen (approximately US\$20,000).

According to the prize citation, Ooguri was honored for the “development of innovative methods of modern mathematics in high energy theory.” His work involves “creating new theoretical tools in quantum

field theory and superstring theory.” He is especially known for his work on topological string theory, “which has had broad applications ranging from black hole physics to algebraic geometry and knot theory in mathematics.”

Ooguri is a past recipient of the AMS Eisenbud Prize (2008), a Humboldt Research Award (2008), the Nishina Memorial Prize (2009), a Simons Investigator Award (2012), and the Kodansha Prize for Science Books of Japan (2014) for his popular science book, *Introduction to Superstring Theory*. He is a fellow of the AMS and of the American Academy of Arts and Sciences (AAAS). He also served as scientific advisor for a 3D movie, *The Man from the 9 Dimensions*, which tells the story of the quest for the “theory of everything” and premiered in Tokyo. About the film, he says, “We expect a diverse audience, from first graders to senior citizens. Some would be hearing about elementary particles for the first time, and others know something about physics and want to learn more. I wanted to make sure that everyone can enjoy the movie and learn something from it.”

Founded in 1947 by Japanese newspaper *Chunichi Shimbun* to commemorate the enacting of the Japanese constitution, the award celebrates individuals or organizations who have made significant contributions to the arts, humanities, and natural or social sciences.

—From a California Institute of Technology news release

Turaev and Virelizier Awarded Balaguer Prize

VLADIMIR TURAEV of Indiana University and ALEXIS VIRELIZIER of Université Lille 1 have been awarded the 2016 Ferran Sunyer i Balaguer Prize for their monograph *Monoidal Categories and Topological Field Theory*. The monograph introduces monoidal categories and Penrose’s graphical calculus; gives an algebraic description of the center of monoidal categories based on the theory of Hopf monads as developed by Virelizier and coauthors; explains topological quantum field theories, including fundamental earlier work of Reshetikhin-Turaev and Turaev-Viro; and shows how to present ribbon graphs by diagrams on skeletons of 3-manifolds and define graph topological quantum field theories by means of state sums on such skeletons. Their main result interprets such graph theories as surgery theories, thereby proving a conjecture stated by Turaev in 1995.



Vladimir Turaev



Alexis Virelizier

Turaev tells the *Notices*: “I was born in St. Petersburg, Russia, into a family of theatre workers: my father was a puppeteer and a theatre producer, while my mother gave public lectures on literature and theatre. In the age of eleven years, I entered the Russian system of mathematical circles and olympiads, which fostered my interest in mathematics. The choice of mathematics as a job was the smartest decision I made in my life. Among other clever things I did was having three kids (I wish I had more), writing seven books, collaborating with several extraordinary mathematicians, learning three languages, and visiting a number of wonderful countries.”

Virelizier tells the *Notices*: “I was born in Carcassonne in the south of France. My father was an engineer and my mother took care of the family. My passion for

mathematics goes back to my childhood, and I had the chance to make it my job. My wife Chrystelle and I decided to name our son Evariste, a name not well known to the general public but very famous in the mathematical community!"

The prize carries a cash award of 15,000 euros (approximately US\$16,800). It is awarded for a mathematical monograph of an expository nature presenting the latest developments in an active area of research in mathematics in which the recipient has made important contributions. The winning monograph will be published by Birkhäuser Verlag in the series Progress in Mathematics.

—From a Balaquer Foundation announcement

2016 Rollo Davidson Prize Awarded

OMER ANGEL of the University of British Columbia,



Omer Angel

JEAN-CHRISTOPHE MOURRAT of ENS Lyon, and HENDRIK WEBER of the University of Warwick have been awarded the 2016 Rollo Davidson Prize. Angel was honored "for his many contributions to stochastic geometry and in particular to random maps and triangulations." Outside of mathematics, Angel enjoys hiking and juggling. Mourrat was recognized "for significant new results in stochastic homogenization and in singular stochastic partial differential equations and associated scaling limits." Weber was honored "for a series of significant new results in the theory of singular stochastic partial differential equations and associated scaling limits." The Rollo Davidson Trust was founded in 1975 and awards the annual prize to young mathematicians working in the field of probability.



Jean-Christophe Mourrat



Hendrik Weber

Three young researchers, nominated by the National Science Foundation, whose work involves the mathematical sciences have received Presidential Early Career Awards for Scientists and Engineers (PECASE) from President Obama.

PECASE Awards Announced

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—From a Davidson Trust announcement

J. ELISENDA GRIGSBY of Boston College was honored for her work on the invariants of 3-manifolds. She was also honored for her services to the mathematics community: for running advanced workshops, training graduate and undergraduate students; for her contributions to increasing participation of women in the mathematical sciences; and for introducing talented middle-school girls to research mathematics. Grigsby is a runner who has done marathons in New York City, San Francisco, and Boston. She hopes to get back into marathoning when her children, now two and five, are older. She also blogs (about math and her children) at eliop.blogspot.com.



J. Elisenda Grigsby

DANIEL KRASHEN of the University of Georgia was honored for his work on local-to-global principles and for his service, including organizing conferences and workshops, training graduate students, and serving as a role model for underrepresented minorities in mathematics. Krashen's main nonmathematical hobby is music. He plays a variety of musical instruments, and played bass, flute and keyboards in a funk band during graduate school. He is married to the algebraic geometer Angela Gibney, and they have two daughters, ages eight and ten, who are considering careers in space exploration (this week at least).



Daniel Krashen

JAKITA NICOLE OWENSBY THOMAS of Spelman College was honored for her outstanding research on variations by which African American middle-school girls develop computational algorithmic thinking through game design and increase their awareness of career applications in industry.

—From a White House announcement

Prizes of the Mathematical Society of Japan

The Mathematical Society of Japan (MSJ) has awarded several prizes for 2016.

The Spring Prize has been awarded to HIROSHI IRITANI of Kyoto University for his outstanding contributions to research on Gromov-Witten invariants and mirror symmetry. The Spring Prize is awarded to mathematicians under the age of forty who have obtained outstanding mathematical results.

The 2016 Algebra Prize has been awarded to HIDENORI KATSURADA of the Muroran Institute of Technology for work on L -functions and periods of automorphic forms of several variables; to KAZUHIKO KURANO of Meiji University for contributions to intersection theory over local rings and its applications to the theory of Cohen-Macaulay modules; and to MASA-HIKO SAITO of Kobe University for

work on moduli spaces of connections and differential equations of Painlevé type.

The Ikushi Prize of the Japan Society for the Promotion of Science (JSPS) has been awarded to KAZUMASA FUJIWARA of Waseda University for his work on mathematical foundations of semirelativistic nonlinear fields. The Ikushi Prize was established to encourage young researchers, particularly PhD students.

The MSJ Prizes for Excellent Young Applied Mathematicians for 2015 have been awarded to: MICHITAKA FURUYA, Tokyo University of Science, for some approaches for comparing rainbow domination numbers; HIDEKI MURAKAWA, Kyushu University, for mathematics of cell-cell adhesion: experiments, modeling, and analysis; TAKESHI GOTODA, Kyoto University, for mathematical analysis of entropy dissipation via triple collapse of point vortices; and HARUNORI MONOBE, Meiji University, for work on condition for existence of traveling wave solutions, composed of convex curves, to an interface equation.

—From MSJ announcements

Witten Receives Young Investigator Award



Daniela M. Witten

DANIELA M. WITTEN of the University of Washington has been selected the recipient of the 2015 Raymond J. Carroll Young Investigator Award “for her efforts in making seminal contributions to the development and application of statistical machine learning techniques to the analysis of high dimensional data, particularly in the application of these techniques to genomic data.” The Carroll Young Investigator Award is given every two years to a statistician who has made important contributions to the area of statistics.

—From a Texas A&M University announcement

—From a Texas A&M University announcement

Maidorn Awarded PIMS Education Prize



Patrick Maidorn

PATRICK MAIDORN of the University of Regina has been awarded the 2016 PIMS Education Prize of the Pacific Institute for the Mathematical Sciences. According to the prize citation, Maidorn is “very active in mathematics education and outreach. As well as his role in organizing math camps and school visits, he has brought the international Mathematical Kangaroo contest to Regina and played a key role in its organization. He is also a lead exam writer for the Saskatchewan Math Challenge.” He also takes part in the

its organization. He is also a lead exam writer for the Saskatchewan Math Challenge.” He also takes part in the

Problem Solving Workshops, hosted by the University of Regina math department, for students in grades seven through ten who want to improve their math skills. The PIMS Education Prize recognizes individuals within the PIMS community who have played a major role in encouraging activities that enhance public awareness and appreciation of mathematics, as well as fostering communication among various groups concerned with mathematical education at all levels.

—From a PIMS announcement

Hertz Foundation Fellowships Awarded

FELIPE HERNANDEZ of the Massachusetts Institute of Technology and SARAH MCFANN of the University of Alabama are among the 2016 class of Hertz Foundation Fellows. Hernandez works in applied mathematics. McFann’s research is in mathematical and computational modeling of complex biological systems. Hertz Foundation fellowships provide financial and fellowship support to PhD students in the physical, biological, and engineering sciences, free of most traditional restrictions.

—From a Hertz Foundation announcement

AWM Essay Contest Winners Announced

The Association for Women in Mathematics (AWM) has announced the winners of its 2016 essay contest, “Biographies of Contemporary Women in Mathematics.” The grand prize was awarded to PRIYANKA NANAYAKKARA of the University of California Los Angeles for her essay “Engaging with the Ensemble: Alissa Crans’ Journey through Mathematics.” The essay also won first place in the undergraduate category and will be published in the *AWM Newsletter*. First place in the high school category went to EMILY JIA of the Illinois Math and Science Academy in Aurora, Illinois, for her essay “To Count the Natural Numbers,” about Tanya Khovanova of the Massachusetts Institute of Technology. First place in the middle school category was awarded to ADUN OLADEJI, homeschooled, of Alpharetta, Georgia, for her essay “Another Contest Won,” about Laura Zehender of the online mathematics school Art of Problem Solving (AoPS).

—From an AWM announcement

USA Mathematical Olympiad

The 2016 USA Mathematical Olympiad (USAMO) was held April 19–20, 2016. The students who participated in the Olympiad were selected on the basis of their performances on the American High School and American Invitational

Mathematics Examinations. The twelve highest scorers in this year's AMO, listed in alphabetical order, were:

ANKAN BHATTACHARYA, Lawrence Technological University, Southfield, Michigan

RUIDI CAO, Missouri Academy of Science, Mathematics, and Computing, Maryville, Missouri

HONGYI CHEN, University of Colorado, Boulder, Colorado

JACOB KLEGAR, Choate-Rosemary Hall, Wallingford, Connecticut

JAMES LIN, Winchester High School, Winchester, Massachusetts

ALLEN LIU, Penfield Senior High School, Penfield, New York

JUNYAO PENG, Princeton International School of Mathematics and Science, Princeton, New Jersey

KEVIN REN, Torrey Pines High School, San Diego, California

MIHIR SINGHL, Palo Alto High School, Palo Alto, California

KEVIN SUN, Phillips Exeter Academy, Exeter, New Hampshire

ALEC SUN, Phillips Exeter Academy, Exeter, New Hampshire

YUAN YAO, Phillips Exeter Academy, Exeter, New Hampshire

The twelve USAMO winners will attend the Mathematical Olympiad Summer Program (MOSP) at the University of Nebraska, Lincoln, in June 2016. Ten of the twelve will take the team selection test to qualify for the US team. The six students with the highest combined scores from the test and the USAMO will become members of the US team and will compete in the International Mathematical Olympiad (IMO) to be held in Hong Kong in July 2016.

—From *Mathematical Association of America* announcements

Moody's Mega Math Challenge

The winners of the 2016 Mega Math Challenge for high school students have been announced. The topic for this year was "Modeling New Approaches to Mobility."

The Champion Team Prize of US\$20,000 in scholarship money was awarded to a team from Saint John's School in Houston, Texas. The team members were MARGARET TRAUTNER, ERIC GAO, ANIRUDH SURESH, DANIEL SHEBIB, and NANCY CHENG. Their coach was Dwight Raulston.

The First Runner-Up Team Prize of US\$15,000 in scholarship money was awarded to a team from Carmel High School in Carmel, Indiana. The team members were SIMON LANGOWSKI, MILES DAI, JOSEPH PHILLO, and TIGER HUANG. Their coach was Peter Beck.

The Third Place Team Prize of US\$10,000 in scholarship money was awarded to a team from Governor Livingston High School in Berkeley Heights, New Jersey. The team members were NIYANT NARANG, GIANNA MIGGINS, MICHAEL WU, ANNA SONG, and ALEXANDER JU. Their coach was Steven Hess.

Finalist Team Prizes of US\$5,000 in scholarship money were awarded to three teams. The team from La Salle Academy in Providence, Rhode Island, consisted of ALLISON PAUL, JOSHUA RENO, EILEEN PHOU, AUDREY CRYAN, and

ERIC SALISBURY. They were coached by Michael McNamara. The team from Montgomery Blair High School in Silver Spring, Maryland, consisted of RAYMOND LIN, ETHAN HOLLAND, VICTORIA TSAI, JAMIE VINSON, and ESHAN TEWARI. They were coached by William Rose. A team from North Carolina School of Science and Mathematics in Durham, North Carolina, consisted of SIMON MARLAND, VINIT RANJAN, KATHERINE YANG, SUNWOO YIM, and KELLY ZHANG. Their coach was Dan Teague.

The Mega Math Challenge invites teams of high school juniors and seniors to solve an open-ended, realistic, challenging modeling problem focused on real-world issues. The top five teams receive awards ranging from US\$5,000 to US\$20,000 in scholarship money. The competition is sponsored by the Moody's Foundation, a charitable foundation established by Moody's Corporation, and organized by the Society for Industrial and Applied Mathematics (SIAM).

—From a *Moody's Foundation/SIAM* announcement

NCTM Lifetime Achievement Awards

The National Council of Teachers of Mathematics (NCTM) has chosen two educators to receive Lifetime Achievement Awards for 2016. They are EDWIN DICKEY of the University of South Carolina and BARBARA REYS of the University of Missouri.

According to the prize citations, Dickey's "career has been spent encouraging students to become STEM teachers, implementing instructional technology to facilitate learning, and leveraging his abilities to contribute to a multitude of professional organizations" and "has demonstrated an enduring commitment to the professional growth of his students, colleagues, and teachers." He "has always been intrigued by the intersection of mathematics and technology. He was fascinated by the mechanical calculator that his high school teacher had brought into the classroom and later, as teacher himself, purchased his school's first Apple II computer. Dickey was motivated by the opportunities afforded by technology to improve mathematics education." He has presented conference papers in thirteen different countries, "demonstrating his commitment to sharing his expertise with the international community." Dickey is a native of Brazil and was educated in US Dependent Schools in Europe. The father of two grown children, he and his wife, Karen, enjoy traveling, cooking, and eclectic dining often while visiting family and friends around the world. Dickey told the *Notices*: "I failed kindergarten. When I



Edwin Dickey



Barbara Reys

arrived in the US from Brazil, my year in kindergarten... was not recognized and I was required to repeat the grade, this time in English. What better foundation for life than have *two* years of kindergarten in two different languages." He also says "in mathematics and in life, we *all* experience failures and it is from those failures along with some successes that we realize ourselves and our contributions."

Reys' "early experience teaching mathematics at every grade, from grade 1 to high school, grounded her later work in teacher preparation and instilled in her a great respect for the hard work of classroom teachers.... She was the founder of the University of Missouri Mathematics Teacher Organization (UM2TO—one of the first NCTM Student Affiliates). She and her husband [Robert Reys] also founded the STaR Program—an early-career induction program for mathematics educators working in higher education." Furthermore, "she chaired the commission that developed standards for the preparation of elementary mathematics specialists and created a program in Missouri to certify EMS professionals on the basis of these standards." She has been instrumental in efforts to help schools implement innovative curriculum materials and in advocating for a common set of curriculum standards across states. She also directed the Center for the Study of Mathematics Curriculum, a partnership between the University of Missouri and the Columbia Public Schools. Reys is one of nine children, all of whom live in central Missouri. Her first grandchild was born one month after her retirement from the University of Missouri.

—From an NCTM announcement

National Academy of Sciences Elections

The National Academy of Sciences (NAS) has elected its new members and foreign associates for 2016. Following are the new members whose work involves the mathematical sciences:

IAN AGOL, University of California Berkeley
 CONSTANTINE M. DAFERMOS, Brown University
 VLADIMIR DRINFELD, University of Chicago
 STEVEN N. EVANS, University of California Berkeley
 IGOR R. KLEBANOV, Princeton University
 MARYAM MIRZAKHANI, Stanford University
 SUSAN A. MURPHY, University of Michigan, Ann Arbor
 LARRY A. WASSERMAN, Carnegie Mellon University
 ALEXANDER B. ZAMOLODCHIKOV, Russian Academy of Sciences and Rutgers, The State University of New Jersey

Elected as foreign associates were:

YUVAL PEREZ, Microsoft Research
 HUGH POSSINGHAM, University of Queensland
 NANCY M. REID, University of Toronto
 CLAIRE VOISIN, CNRS, Institut de Mathématiques de Jussieu, France

—From an NAS announcement

2016 Royal Society Elections

The following mathematical scientists have been elected Fellows of the Royal Society of London for the year 2016:

MARTIN BRIDSON, University of Oxford
 MARCUS DU SAUTOY, University of Oxford
 ARTUR EKERT, University of Oxford and National University of Singapore
 LAKSHMINARAYANAN MAHADEVAN, Harvard University
 CAROLINE SERIES, University of Warwick
 Elected as a Foreign Member was GERD FALTINGS, Max Planck Institute for Mathematics.

—From a Royal Society announcement

DAVID D. BLEECKER (1948–2016)

David Bleecker was born in Summit, New Jersey, in 1948. He received his PhD from the University of California at Berkeley under Shiing-Shen Chern in 1973 and spent his career at the University of Hawaii. Chern praised the rigor of Bleecker's exposition and his perspicuous writings.



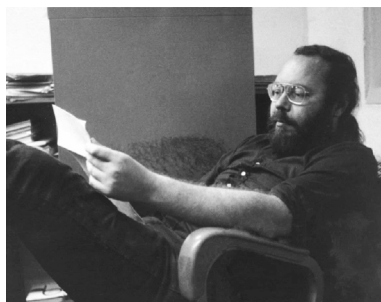
David Bleecker

Bleecker was as a mathematician distinctive in his painstaking precision and thoroughness, which was accompanied by an almost religious fervor about the possibility of explaining even the most intricate mathematical constructions to colleagues and students. Young learners could grasp basic ideas of geometric analysis from his article on the optimal bending of a flat taco to yield maximal filling, which gained him, jointly with Lawrence J. Wallen, the George Pólya Award of the Mathematical Association of America in 1999. According to David, everyone interested in modern physics should be able to understand the underlying variational principles. So David wrote a very successful monograph, *Gauge Theory and Variational Principles* (Addison-Wesley 1981, Dover 2005). Jointly with George Csordas he wrote an almost encyclopedic rigorous introduction, *Basic partial differential equations* (Van Nostrand 1992). In the same vein, the thin atmosphere of the heights of the Atiyah-Singer index theory and its meaning in gauge-theoretic physics and low-dimensional geometry were made breathable and enjoyable for a wider circle of readers in joint work with Bernhelm Booss-Bavnbek in the monumental *Index Theory with Applications in Mathematics and Physics* (International Press 2013).

Due to health issues, David retired in 2010. We can only imagine what he would have accomplished with more time.

—Bernhelm Booss-Bavnbek (Roskilde, Denmark)
 and George Csordas (Hawaii, USA)

Between the Lines, Horst Elmar Winkelkemper (1940–2016)



Winkelkemper in his office in his early days at the University of Maryland.

Horst Elmar Winkelkemper was born in Germany and grew up in Mexico. He attracted the attention of Solomon Lefschetz and entered graduate school at Princeton in the early 1960s. Elmar tried to understand the robust activity of Bill Browder's school at the time: constructing and controlling closed

manifolds above dimension four via geometric constructions called surgery. Elmar formulated mantras such as, "A manifold is like a quadratic form," and "Transversality unlocks the secrets of the manifold." When these mantras were expressed in lectures at MIT, Is Singer thought "Winkelkemper" was an invented author of these mathematical insights.

A first result of Elmar was that if the signature of its quadratic form were nonzero, then the degree of a self mapping of a manifold must be a perfect square. Later his thesis showed that the cobordism groups of manifolds with self diffeomorphisms had infinitely many linearly independent invariants. Elmar then used diffeomorphisms of manifolds with boundary which are the identity on the boundary to describe "Open Book" decompositions of closed manifolds of one dimension higher. Elmar and Bill Thurston used open book decompositions to show that each three-manifold has a contact structure. In the next period Giroux showed that all contact structures in dimension three are approximated by Elmar's open books. One may speculate that a signed version of this approximation result could provide a picture of the moving vorticity of three-dimensional fluid, a currently intractable problem.

Elmar's "Graph of a Foliation" clarified the holonomy structure of foliations, allowing noncommutative geometry to enter that area.

In recent work, Elmar defied the logic result that many questions about finitely presented groups are undecidable. He showed that each positive definite symmetric integer matrix with determinant one which is not equivalent over the integers to the identity matrix determines an Artin presentation of a nontrivial perfect group. The proof is a remarkable combination. Elmar constructs a four-manifold whose boundary would be a homotopy three-sphere if the group were trivial. This four-manifold, materializing the quadratic form, is impossible by Taubes' augmentation of Donaldson's theory of instantons. Elmar felt strongly the depth of these connections.

To many Elmar Winkelkemper passionately shared deep convictions and intuition even in areas outside his expertise, and it seemed to this author he could find veins

of gold by an uncanny, almost mystical intuition, reminiscent of the great Israel Gelfand.

—Dennis Sullivan, professor of mathematics,
State University of New York, Stony Brook
and Einstein Chair, CUNY Graduate Center
dennis@math.sunysb.edu

Credits

Photo of Omer Angel, courtesy of David Tsabar.
Photo of Hendrik Weber, courtesy of Annette Anderson.
Photo of Elisenda Grigsby, courtesy of Puneet Batra.
Photo of Daniel Krashen, courtesy of Max S. Gerber.
Photo of Daniella M. Witten, courtesy of Ari Steinberg.
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AMERICAN MATHEMATICAL SOCIETY

MSRI

Mathematical Circles Library

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