

About the Authors

Michèle Artigue is a professor in the Mathematics Department and a member of the Doctorate School in Epistemology, Philosophy and Didactics of Sciences at the University Paris 7. After earning a Ph.D. in mathematical logic, she became involved in the activities of the Institute of Research for Mathematics Education at the University Paris 7; her research interests moved progressively towards the new field of didactic research in mathematics. Like most researchers in this area, she worked first at the elementary level on pupils' conceptions of mathematics. However, she soon got involved, jointly with physicists, in experimental programs for undergraduate students at university and thus in didactic research at more advanced levels. Artigue's main contributions deal with the didactics of calculus and analysis, the integration of computer technologies into mathematics education, and the relationships between epistemology and didactics. This research has led to her editing or co-editing of nine books and more than fifty articles or chapters in international journals and books. She is a member of the scientific committee or editorial board of several international journals and a member of the European network of excellence, Kaleidoscope. Since 1998, she has been vice-president of ICMI, the International Commission on Mathematical Instruction.

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Richard Askey retired after teaching mathematics at the University of Wisconsin for forty years. His work in mathematics was on special functions, and this has had an impact on his work in education which can be seen in two papers on Fibonacci numbers in *Mathematics Teacher*. He is interested in curriculum and the knowledge teachers need to be able to teach well. Both of these can be studied by looking at what is done in other countries, and what was done in the United States in the past. His interest in teaching mathematics started early as illustrated by his starting a tutoring program in high school which was run by the Honor Society.

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Deborah Lowenberg Ball is Dean of the School of Education and William H. Payne Collegiate Professor and Arthur F. Thurnau Professor at the University of Michigan. Ball's work draws on her many years of experience as an elementary classroom teacher and teacher educator. Her research focuses on mathematics instruction, and on interventions designed to improve its quality and effectiveness. Her research groups study the nature of the mathematical knowledge needed for teaching and develop survey measures that have made possible analyses of the relations among teachers' mathematical knowledge, the quality of their teaching, and their students' performance. Of particular interest in this research is instructional practice that can intervene on significant patterns of educational inequality in mathematics education. In addition, she and her group develop and study opportunities for teachers' learning. Ball's extensive publications, presentations, and Web site are widely used.

Ball is a co-principal investigator of the Study of Instructional Improvement, a large longitudinal study of efforts to improve instruction in reading and mathematics in high-poverty, urban elementary schools. Ball was a member of the Glenn Commission on Mathematics and Science Teaching for the Twenty-First Century. She is a co-director of the NSF-funded Center for Proficiency in Teaching Mathematics, a research and development center aimed at strengthening professional education of mathematics teachers. She chaired the Rand Mathematics Panel on programmatic research in mathematics education, co-chaired the international Study on Teacher Education sponsored by the International Commission on Mathematical Instruction, and she is a trustee of the Mathematical Sciences Research Institute in Berkeley.

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Hugh Burkhardt is a theoretical elementary particle physicist and educational engineer. He has been at the Shell Centre for Mathematical Education at the University of Nottingham since 1976, as director until 1992. Since then he has led a series of international projects including, in the U.S., Balanced Assessment, Mathematics Assessment Resource Service (MARS), and its development of a Toolkit for Change Agents. He is the Project Director of MARS with particular responsibility for project processes and progress, and a visiting professor at Michigan State University.

He takes an "engineering" view of educational research and development — that it is about systematic design and development to make a complex system

work better, with theory as a guide and empirical evidence the ultimate arbiter. His other interests include making mathematics more functional for everyone through teaching real problem solving and mathematical modeling, computer-aided mathematics education, software interface design, and human-computer interaction.

He remains occasionally active in elementary particle physics.

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Claus H. Carstensen is a research psychologist working principally on the topic of item response theory (IRT) applied to educational research. His publications focus on multidimensional item response models for psychological and educational measurement and applied assessments. His research is carried out mainly in the context of the OECD PISA project. In the past, Professor Carstensen has worked for the international PISA consortium at the Australian Council for Educational Research (Melbourne, Australia), and now is working with the German PISA consortium (Kiel, Germany). In this context, he is mainly involved in the development of assessment instruments, the scaling and linking of data from large-scale-assessment studies, and the analyses of data from complex samples.

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Lily Wong Fillmore recently retired from the faculty of the Graduate School of Education at the University of California, Berkeley. She is a linguist and an educator: much of her research, teaching and writing have focused on issues related to the education of language minority students. Her research and professional specializations are in the areas of second language learning and teaching, the education of language minority students, and the socialization of children for learning across cultures. Over the past thirty-five years, she has conducted studies of second language learners in school settings on Latino, Asian, American Indian and Eskimo children. Her research and publications have focused on social and cognitive processes in language learning, cultural differences in language learning behavior, sources of variation in learning behavior, primary language retention and loss, and academic English learning.

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Linda Fisher is the Director of the Mathematics Assessment Collaborative (MAC). She oversees mathematics performance test development for grades 3–10, helps develop rubrics, and supervises scoring training. Linda also analyzes

student work and misconceptions as demonstrated on the performance assessment; her analysis is included in the teacher resource, *Tools for Teachers*. She was formerly a staff developer for the Middle Grades Mathematics Renaissance and the Mathematics Renaissance K-12 Project. She was also formerly a middle school mathematics teacher in Berryessa School District.

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David Foster is the Mathematics Director of the Robert N. Noyce Foundation. He oversees and directs the Silicon Valley Mathematics Initiative, which comprises thirty-five member districts in the San Francisco Bay Area. Foster is the primary author of *Interactive Mathematics: Activities and Investigations*, an innovative mathematics program for middle school students, grades 6 through 8. His other works included *Exploring Circles*, published by Glencoe in 1996 and *Computer Science One*, published by Coherent Curriculum in 1988. He was a Regional Director for the Middle Grade Mathematics Renaissance, the mathematics component of the California Alliance for Math and Science.

Foster taught mathematics and computer science at middle school, high school, and community college for eighteen years. In 1989 he was selected Outstanding Mathematics Teacher by an affiliate of the California Mathematics Council. He is Co-Director of the Santa Clara Valley Math Project and Co-Chair of the advisory committee of the Mathematics Assessment Resource Service. David was founding member of the California Math Project Advisory Committee and the California Coalition for Mathematics. He was a California Curriculum Consultant and has served on the California Teaching Credential Advisory Committee for Mathematics.

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Jan de Lange is past chairman/director of the Freudenthal Institute and full professor at University of Utrecht in the Netherlands. The Freudenthal Institute is part of the Faculty of Mathematics and Computer Science and has as its task innovation in mathematics education by research, implementation, dissemination and professionalization.

Following graduate work in mathematics at both the University of Leiden in the Netherlands and Wayne State University in Detroit, he received his Ph.D. at the University of Utrecht. His dissertation, "Mathematics, Insight and Meaning," is on the development of a new applications-oriented curriculum for upper secondary mathematics and more specifically the assessment problems that come

with such a curriculum. His research still focuses on modeling and applications and assessment issues and has broadened to multimedia and on issues related to implementation.

De Lange is member of the Mathematical Sciences Education Board. He was a member of the National Advisory Board of the Third International Mathematics and Science Study (TIMSS) and currently chairs the Mathematical Functional Expert Group of the OECD Programme for International Student Assessment (PISA).

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Bernard Madison is a mathematician and mathematics educator with forty years' experience in research, teaching, university administration, and science policy. Following over two decades as department chair or college dean, his recent work has focused on assessment in college mathematics, education for quantitative literacy, and the mathematical education of teachers. He directs two major national NSF-funded college faculty professional development projects for the Mathematical Association of America.

In addition to publishing over twenty mathematics research papers and approximately fifty articles on education and policy issues, he has recently edited two books, one on quantitative literacy and one on assessment. He is now serving as the first President of the National Numeracy Network.

He developed and teaches a course entitled Mathematical Reasoning in a Quantitative World using recent newspaper and magazine articles as source material. He is a native of Kentucky and a first generation college student who began school in one of the last one-room elementary schools in the Commonwealth. He holds a B.S. from Western Kentucky University, and an M.S. and Ph.D. from the University of Kentucky.

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William McCallum is a University Distinguished Professor at the University of Arizona, whose principle interests are arithmetical algebraic geometry and mathematics education. In the latter area he has worked on undergraduate curriculum development, particularly calculus reform, and more recently has become interested in K-12 education. He has worked on a number of projects promoting collaboration between mathematicians and educators, most recently as Director of the Institute for Mathematics and Education at Arizona.

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R. James Milgram is Professor of Mathematics in the Department of Mathematics at Stanford University, a position he has held since 1969. His research in mathematics centers around algebraic and geometric topology, and in recent years his earlier results in these areas have been applied in the areas of robotics and protein folding. His work in mathematics education started with helping to write the 1998 *California Mathematics Standards* with three colleagues at Stanford and the 1999 *California Mathematics Framework* with H.-H. Wu. Since that time he has been involved in helping to write the Achieve, Massachusetts, Michigan, and Georgia Mathematics Standards as well. He is a senior author on a middle school mathematics series, and was the principal investigator on an FIE grant to study the mathematics that pre-service and in-service teachers need to know. More recently he has been developing a course at Stanford with Liping Ma on the mathematics that pre-service elementary school teachers need to know. He is a member of the National Board for Education Science that oversees the Institute of Educational Sciences at the U.S. Department of Education and is on the board that advises Congress on education research. He is a member of the NASA Advisory Council (NAC), and a member of the NAC Committee on Human Capital. He is one of the directors of the Comprehensive National Center for Instruction, and is one of the principal investigators on a recent FIE grant to construct a national arithmetic exam.

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Judit Moschkovich is Associate Professor of Mathematics Education in the Education Department at the University of California Santa Cruz (UCSC). Before joining the faculty at UCSC in 1999, Dr. Moschkovich worked at TERC in Cambridge, Massachusetts, at the Institute for Research on Learning in Menlo Park, California, and was a lecturer in the mathematics and education departments at San Francisco State University. Her research publications examine students' conceptions of linear functions, conceptual change in mathematics, mathematical discourse practices in and out of school, and bilingual mathematics learners. She has conducted research for over ten years in secondary mathematics classrooms with large numbers of Latino students. Spanish is her first language and she immigrated to the U.S. from Argentina as an adolescent. She is a past member of the Journal for Research in Mathematics Education and Journal of the Learning Sciences editorial panels and was Co-Chair of the

Research in Mathematics Education Special Interest Group for the American Educational Research Association from 2004 to 2006. She was the Principal Investigator of the NSF project *Mathematical Discourse in Bilingual Settings: Learning Mathematics in Two Languages* and is one of the principal investigators for the Center for the Mathematics Education of Latinos funded by NSF (2004–2009).

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Pendred Noyce, M.D. was Co-Principal Investigator of the NSF-funded Massachusetts State Systemic Initiative Program and of PALMS, a \$16 million dollar NSF-funded State Systemic Initiative to improve mathematics, science and technology education in Massachusetts. She was also Co-Principal Investigator of the Massachusetts Parent Involvement Project. Currently, Penny serves on the Advisory Board at the Center for Study of Mathematics Curriculum at Michigan State University and the Board of Directors of COMAP. She is actively on the Board of Directors of TERC, Concord Consortium, Massachusetts Business Alliance for Education, and a Trustee for the Boston Plan for Excellence and the Libra Foundation. She is also on the Dean's Council at Radcliffe Institute for Advanced Study. She has been a Trustee of the Noyce Foundation since its inception in 1990.

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Judith A. Ramaley is President of Winona State University (WSU) in Minnesota. Prior to joining WSU, she held a presidential professorship in biomedical sciences at the University of Maine and was a Fellow of the Margaret Chase Smith Center for Public Policy. She also served as a Visiting Senior Scientist at the National Academy of Sciences in 2004. From 2001 to 2004, she was Assistant Director, Education and Human Resources Directorate at The National Science Foundation. Dr. Ramaley was President of the University of Vermont and Professor of Biology from 1997 to 2001. She was President and Professor of Biology at Portland State University in Portland, Oregon for seven years between 1990 and 1997.

Dr. Ramaley has a special interest in higher-education reform and institutional change and has played a significant role in designing regional alliances to promote educational cooperation. She also has contributed to a national exploration of the changing nature of work and has written extensively on civic responsibility and partnerships between higher education and community organizations as well as articles on science, technology, engineering, and mathematics.

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Alan Schoenfeld is the Elizabeth and Edward Conner Professor of Education and an affiliated professor of Mathematics at the University of California, Berkeley. Schoenfeld has served as President of the American Educational Research Association and as Vice President of the National Academy of Education. He is a Fellow of the American Association for the Advancement of Science and a senior advisor to the Educational Human Resources Directorate of the National Science Foundation.

Schoenfeld's research focuses on mathematical thinking, teaching, and learning. His book *Mathematical Problem Solving* characterizes what it means to "think mathematically" and describes a research-based undergraduate course in mathematical problem solving. Schoenfeld led the Balanced Assessment project, which developed alternative assessments for K-12 mathematics curricula. He has worked on modeling the process of teaching, and on issues of equity and diversity in mathematics education.

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Susan Sclafani is a managing partner of the Chartwell Education Group, LLC. She recently retired as U.S. Assistant Secretary of Education for Vocational and Adult Education. She also served as Counselor to the Secretary of Education, where she was the U.S. representative to the Organization for Economic Cooperation and Development, and the Asia-Pacific Economic Cooperation. Among the highlights of Dr. Sclafani's term at the Department was the leadership role she played in the creation of the Mathematics and Science Initiative (MSI) to focus attention on the importance of mathematics and science in the education of all students. MSI emphasized the need for teachers knowledgeable in math and science at every level of schooling and the importance of further research in both areas. Her international work led to her leadership of the joint E-Language Learning Project with the Chinese Ministry of Education. She also led the Department's High School Initiative to better prepare students for twenty-first century education, training and the workplace. Prior to serving at the Department, Dr. Sclafani was Chief Academic Officer of one of the nation's largest urban school districts, and in that capacity perfected her diverse skills focusing on technology, curriculum development and construction management. She also has extensive state education and business experience.

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Ann Shannon is a mathematics educator with two decades of experience specializing in assessment and urban education. She works as an independent consultant helping states, districts, and schools to better serve English learners and others underrepresented in mathematics.

Dr. Shannon was employed as a Research Fellow at the Shell Centre for Mathematical Education, University of Nottingham, England before moving her work to the University of California. At the University of California, she developed performance assessment materials for the NSF-funded Balanced Assessment project and the New Standards Project. Her 1999 monograph, *Keeping Score*, was published by the National Research Council and drew from her work on Balanced Assessment and with New Standards; it addresses a variety of issues that are relevant to developing, administering, and scoring mathematics assessments. Dr. Shannon subsequently directed the mathematics component of the U. S. Department of Education's Office of Educational Research and Improvement-funded Learning to Think, Thinking to Learn curriculum development project at the University of California (Office of the President), provided mathematical guidance in the development of the California State Mathematics Standards for Preschoolers developed at the University of California at Berkeley's Evaluation and Assessment Research Center, and currently provides support as a specialist to the NSF-funded Diversity in Mathematics Education project.

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Sara Spiegel is the Director of Administration at the Palo Alto, California office of the Noyce Foundation. She manages human resources and the office in general. In addition, she supports the programs of the Foundation. She also directs the Silicon Valley Scholars program. Sara was previously a Program Associate at the Bay Area School Reform Collaborative. She joined the Noyce Foundation staff in 2001.

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Elizabeth K. Stage is the Director of the Lawrence Hall of Science at the University of California at Berkeley. With a bachelor's degree in chemistry from Smith College, she taught middle school science and mathematics before earning a doctorate in science education from Harvard University. She then spent ten years at the University of California at Berkeley, primarily at the Lawrence Hall of Science, where she conducted research and program evaluation; led professional development programs; and directed public programs

in mathematics and computer education. Work on California state frameworks, adoptions, and assessments in mathematics and science led to service at the National Research Council, working on the development of the National Science Education Standards. At the University of California Office of the President, she worked on science assessment based on national standards (“New Standards”) and coordinated professional development in mathematics, science, and physical education. She has served on the U.S. Steering Committee for the Third International Mathematics and Science Study and the Science Expert Group for the OECD Program in International Student Assessment; and she currently serves as an advisor to the Center for Assessment and Evaluation of Student Learning. She continues her research interest in understanding the factors that increase the success of students who are underrepresented in the sciences.

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Elizabeth Taleporos is the Director of Assessment for America’s Choice. Prior to joining America’s Choice, she managed large-scale test development projects in English Language Arts and Mathematics for several major national test publishers. Before that, she directed the assessment efforts in New York City, managing the efforts in test development, psychometrics, research, analysis, administration, scoring, reporting, and dissemination of information.

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Mark Wilson is a professor in the Graduate School of Education at the University of California at Berkeley. His interests focus on measurement and applied statistics. His work spans a range of issues in measurement and assessment from the development of new statistical models for analyzing measurement data, to the development of new assessments in subject matter areas such as science education, patient-reported outcomes, and child development, to policy issues in the use of assessment data in accountability systems. He has recently published three books: *Constructing Measures: An Item Response Modeling Approach* (Erlbaum) is an introduction to modern measurement; the second book (with Paul De Boeck of the University of Leuven in Belgium), entitled *Explanatory Item Response Models: A Generalized Linear and Nonlinear Approach* (Springer-Verlag), introduces an overarching framework for the statistical modeling of measurements that makes available new tools for understanding the meaning and nature of measurement; and the third, *Towards Coherence Between Classroom Assessment and Accountability* (University of Chicago Press

and National Society for the Study of Education), is an edited volume that explores the issues relating to the relationships between large-scale assessment and classroom-level assessment. He has recently chaired a National Research Council committee on assessment of science achievement: *Systems for State Science Assessment* (with Meryl Bertenthal of the NRC). He is founding editor of a new journal: *Measurement: Interdisciplinary Research and Perspectives*.

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