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Eom is a Harvey D. Spangler Distinguished Professor in the College of Engineering at the University of Wisconsin–Madison. He received his PhD degree from Stanford University in 1991. His research focuses on epitaxial thin-film heterostructures of complex oxides, including ferroelectrics, piezoelectrics, multiferroics, superconductors,

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Aksyuk is a project leader in the Nanofabrication Research Group in the Center for Nanoscale Science and Technology at NIST. He received a BS degree in physics from the Moscow Institute of Physics and Technology and a PhD degree in physics from Rutgers University. Following research as a member of the technical staff and then technical manager at Bell Labs, he joined the

research staff at NIST. Vladimir's research focuses on the design and fabrication of novel optical MEMS systems. He holds more than 30 patents, and has published over 40 papers. In 2000 he received the Bell Labs President's Gold Award, in 2005 was named among MIT *Technology Review* magazine's TR35, and in 2008 received a Distinguished Alumni award for Early Career Accomplishments from Rutgers Graduate School. He is currently developing multiple projects in the use of optical MEMS and NEMS to address fundamental problems in nanomanufacturing.



### Seung-Hyub Baek

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Baek received his BS degree from the Seoul National University, Seoul, Korea, in 2004, and his MS and PhD degrees from the University of Wisconsin–Madison in 2007 and 2010, respectively. He conducted postdoctoral research work at the University of Wisconsin–Madison. Since 2011, he has worked for KIST as a senior research scientist. His research interests include piezo-

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Bedair received her BS degree in applied sciences from the University of North Carolina–Chapel Hill. She received her PhD degree in electrical engineering from Carnegie Mellon University in 2008, where she focused on CMOS-MEMS gas sensors. She has been a researcher at the Army Research Laboratory since 2009. Her research focuses on MEMS-based power devices. She has contributed to over 30 research publications and has received awards, including the 2010

Excellence in Federal Career Award and a 2009 ARL Research and Development Achievement Award.



### Matthijn Dekkers

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Dekkers is the co-founder of the spin-off company SolMateS, which develops the PVD standard for PZT thin-film deposition for the MEMS market. After completion of his graduation assignment on thin-film high  $T_c$  superconductors, Dekkers continued his research in the Inorganic Materials Science group at the University of Twente. In 2007, he received his PhD degree for his work performed on optical and conducting coatings on polymer substrates using pulsed laser depo-

sition. During his postdoctoral work at the Mesa+ Institute for Nanotechnology, his research was focused on the integration of ferroelectric perovskite oxides into silicon technology and in particular on the properties of the piezomaterial  $Pb(Zr,Ti)O_3$  and its applications.



### Bruce G. Elmegeen

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Elmegeen works in the Physical Sciences Department of the Research Division of IBM. In the field of nanotechnology, Elmegeen works to design and model piezoelectronic devices and circuits. He joined IBM in 1984 after holding a faculty position at Columbia University. He received his PhD degree at Princeton University and spent three years as a Junior Fellow at Harvard. Elmegeen has written over 240 scientific

articles and has given 150 invited talks at international conferences. He has served on numerous review panels for NASA and NSF and was Chair of the Publications Board of the American Astronomy Society from 1998 to 2001. In 2001, he received the Dannie Heineman Prize of the American Physical Society. He is currently a member of the NSF Math and Physical Sciences Advisory Committee.



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Felmetzger is a process development manager at OEM Group Inc. Prior to joining OEM, he worked for Metal-Ceramic Devices (Russia), Sputtered Films Inc., and Tegal Corporation. He received a PhD degree in materials science from the Institute of High-Current Electronics (Tomsk, Russia). Felmetzger has more than three decades of wide-ranging experience in physical vapor deposition, particularly in magnetron reac-

tive sputtering, including process development, thin-film characterization, and implementation of leading-edge processes in mass production. His research projects focus on the technology of piezoelectric films for electroacoustic devices, including ultrathin AlN films. He is the author of more than 60 publications and holds 19 patents.

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Funakubo is a professor in the Interdisciplinary Graduate School of Science and Engineering at the Tokyo Institute of Technology. He started his research career as an assistant professor at the Department of Inorganic Materials at the Tokyo Institute of Technology in 1989, working on the preparation of functional films by chemical vapor deposition and their character-

ization, and received his PhD degree in 1993. Funakubo became an associate professor in 1997 and has since studied functional oxide materials, especially ferroelectric and piezoelectric oxide films. His field of research includes growth of high-quality films and their characterization, especially complex oxides by MOCVD.



### Stefano Gariglio

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Gariglio is a researcher in the Condensed Matter Physics Department at the University of Geneva. After his studies in Genoa (Italy), he obtained his PhD in 2003 at the University of Geneva. His research interests are the physics of complex oxides, in particular phenomena occurring at interfaces, and the integration of oxide heterostructures in functional devices. In 2009, he received the Swiss Physical Society Prize for

his achievement of the control of the superconducting transition by the electric field effect.

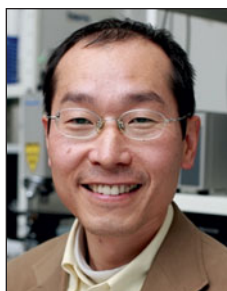


### Tony Ivanov

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Ivanov received MS and PhD degrees in electrical engineering from the University of Central Florida, Orlando, in 1994 and 1997, respectively. From 1997 through 2003, he was with Bell Laboratories (AT&T, Lucent Technologies, Agere Systems), where he worked on SiGe and BiCMOS technology development. Starting in 2003, he joined RFMD's research and development organization, and he was involved with CMOS SOI and RF MEMS technologies for wireless products. Currently he is with the US Army

Research Laboratory, Sensors and Electron Devices Directorate. His research interests cover technologies and circuits for RF/mm-wave applications, with emphasis on high power amplifiers and RF MEMS. He has authored and co-authored more than 40 journal and conference papers and holds 13 US patents.



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Kanno is a professor of mechanical engineering at Kobe University. He received his PhD degree in engineering from Osaka University. He joined Panasonic in 1991 and started the development of piezoelectric MEMS. In 2002, he was an associate professor of micro-engineering at Kyoto University. His areas of interest include functional oxide thin films, piezoelectric MEMS, microfabrication, and vibration mechanics.



### Sang-Gook Kim

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Kim has been a professor at MIT since 2000. He received his BS degree from Seoul National University (1978), a MS degree from KAIST (1980), and a PhD degree from MIT (1985). He has held positions at Axiomatics Co. (1986) and the Korea Institute of Science and Technology from 1986–1991. He was a corporate executive director at Daewoo Corporation, Korea, and directed the Central Research Institute of Daewoo

Electronics Co. until 2000. His research includes carbon nanotube assembly, muscle-inspired micro-actuators, piezoelectric MEMS energy harvesters, piezoelectric micro ultrasonic transducers, and direct printing of PZT MEMS devices.



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Liu earned a PhD degree in engineering from Brown University. He has been working at IBM T.J. Watson Research Center since 1999 after completing postdoctoral work at Princeton University. He is a research staff member in materials and reliability sciences. His research is focused on the mechanical reliability of materials and structures in interconnect technology. He has received the IBM 15th Plateau for Invention

Achievement Award, two IBM Research Awards for Outstanding Technical Achievement, and one for Extraordinary Technical Accomplishment in the area of low-*k* dielectric copper interconnect technology.



### Glenn J. Martyna

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Martyna received his PhD degree from Columbia University and subsequently became an NSF Postdoctoral Fellow in computational science and engineering at the University of Pennsylvania. He was a tenured faculty member at Indiana University, Bloomington, before joining IBM Research. In 2008, Martyna was appointed as an Honorary Professor of Physics at The University of Edinburgh, UK. His research is

focused on the atomistic modeling of soft condensed matter and materials systems as well as novel device physics, in addition to his interest in physics-based computational methodology development. He has more than 120 peer-reviewed scientific papers.



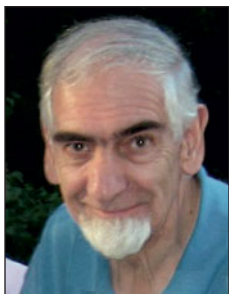
### Paul Muralt

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Muralt is an adjunct professor at the Swiss Federal Institute of Technology EPFL in Lausanne, Switzerland. He leads a group in piezoelectric thin-film, MEMS, and nanotechnology activities at the Ceramics Laboratory of the Materials Science Institute. He has studied solid-state physics and accomplished PhD work in incommensurate structures at the Swiss Federal Institute of Technology ETH in Zurich. His areas of

interest are in piezoelectric thin-film processing and piezoelectric micro- and nano-devices. More recent works also deals with oxygen ion conductors for micro solid oxide fuel cells. He has authored or co-authored more than 200 scientific articles. He is an MRS member and senior member of IEEE. He was co-chair of the MRS spring meeting in 2008, co-organized three MRS or E-MRS symposia, and was also active in program committees of the specialized ferroelectric meetings ISAF 2007 and ISIF 2008.





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News received his PhD degree in physical chemistry from Imperial College, London. He subsequently held research positions at the University of Chicago and Cambridge University, and then held academic positions at Imperial College before joining the research staff of IBM. News' research interests, primarily in condensed matter, include surface science, the Kondo effect and heavy Fermion systems, high-temperature

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Olsson is a principal member of the technical staff at Sandia National Laboratories. He received his PhD degree in electrical engineering from the University of Michigan, Ann Arbor in 2004. He works in the area of piezoelectric MEMS for radio frequency communications, timing, and inertial sensing. He has authored more than 30 technical papers and holds several patents in the area of aluminum nitride microsystems.

Together with the Sandia Microresonator Research Team, he was awarded an R&D100 Award in 2011 for work on microresonator filters and frequency references.



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Piazza is an associate professor at Carnegie Mellon University. Prior to joining CMU, he was at the University of Pennsylvania. Piazza received his PhD degree from UC-Berkeley in 2005. He works in the area of piezoelectric M/NEMS for radio frequency signal processing, mechanical computing, and gravimetric sensing. He has authored more than 100 technical papers and holds several patents in the area of micromechanical resonators, some of which were successfully transferred to industry.

With his students, he has won three best paper awards at the IEEE Frequency Control Symposium.



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Polcawich is a staff researcher in the Micro & Nano Materials & Devices Branch of the US Army Research Laboratory (ARL). He received a BS degree in materials science and engineering from Carnegie Mellon University (1997), a MS degree in materials from Penn State University (1999), and a PhD degree in materials science and engineering from Penn State University (2007). He is currently the team lead for the RF MEMS and mm-scale robotics programs

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Priya is a professor in the department of mechanical engineering at Virginia Tech. He received his PhD degree in materials engineering from Penn State University in 2003. Priya has worked at several companies, including Murata Manufacturing Ltd., Shiga, Japan, and APC International, PA. His areas of interest have been in the fields of high power piezoelectrics, energy harvesting, magnetolectric composites, lead-free piezoelectrics, and bioinspired robotics.



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Pulskamp is a MEMS Design and Mechanical Engineer in the Micro & Nano Materials & Devices Branch of the US Army Research Laboratory (ARL). He received a BS degree in mechanical engineering from the University of Maryland in 2000. His current research interests include RF MEMS devices, electro-mechanical design and modeling of MEMS, and millimeter-scale robotics. He currently holds

eight patents related to piezoelectric MEMS devices and has an additional six patents pending.



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Rijnders finished his PhD work in 2001, after which he became an assistant professor at the Low Temperature Division of the University of Twente. In 2003, he joined the Inorganic Materials Science group at the University of Twente, where he became an associate professor in 2006. Since April 2010, he has been a full professor in nano-electronic materials (NEM). His research focuses on the structure-

property relation of atomically engineered complex (nano) materials, especially thin-film ceramic oxides. The class of investigated materials includes, among others, ferromagnetic, superconducting, ferroelectric, as well as piezoelectric materials. The piezoelectric materials are combined with silicon MEMS technology, resulting in piezo MEMS structures such as cantilevers and membranes. The latter are studied for the realization of sensors and actuators.

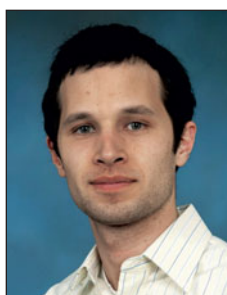


#### Rich Ruby

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Ruby earned his BS, MS, and PhD degrees at the University of California–Berkeley. His PhD work was in superconductivity. After his graduate work, he joined HP Labs (later to become Agilent Labs, and now Avago Technologies) working on superconductivity, e-beam lithography, x-ray lithography, and packaging. In 1993, he started work on free-standing bulk acoustic wave resonator (FBAR) devices and has stayed with that technology since. He has made many

contributions to the commercialization of FBAR filters and duplexers. He was named an Agilent Fellow in 2002 and is also director of technology at Avago. Ruby received the Barney Oliver Prize, the Bill Hewlett Award, and the CB Sawyer Award for his work on FBAR technology. He was named IEEE Fellow in 2010. Ruby has close to 80 patents in the area of FBAR devices and has given numerous invited talks.



#### Ryan Q. Rudy

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Rudy received BSE and MSE degrees in mechanical engineering from the University of Michigan, Ann Arbor, in 2009 and 2010, respectively. Since 2010, he has been part of the MEMS and Microfluidics Laboratory at the University of Maryland, College Park, where he is pursuing a PhD degree with the support of the SMART Program. His current research interests include millimeter-scale robotic actuators with a specific focus on rotary traveling wave ultrasonic motors.



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Rzchowski received his AB degree from Washington University, St. Louis, in 1982, and his PhD degree from Stanford University in 1988. After a postdoctoral position at Harvard University, in 1992 he joined the faculty of the Physics Department at the University of Wisconsin–Madison. His research includes ferroelectric and piezoelectric materials, new states at oxide interfaces, and novel superconducting materials.

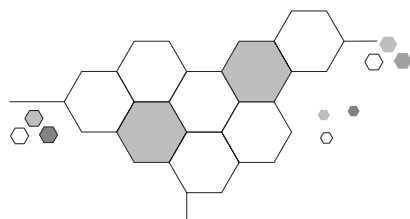


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Sambri received her PhD degree in physics in 2007 from the University of Naples Federico II (Italy). In 2008, she joined the University of Geneva (CH) as a postdoctoral fellow to investigate the epitaxial growth of ferroelectric oxides on silicon for piezo-MEMS applications. In 2011, she moved back to the University of Naples Federico II, where her current research interest is a systematic study of the pulsed laser deposition process for the growth of complex oxides by means of *in situ* optical diagnostic tools.

position process for the growth of complex oxides by means of *in situ* optical diagnostic tools.



#### Igor O. Shklyarevskiy

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Shklyarevskiy received his PhD degree in physics from the High Field Magnetic Laboratory at the University of Nijmegen (The Netherlands) in 2005. After a short postdoctoral stay at the University of Eindhoven (The Netherlands), in 2006 he has joined the research department at Oce-Technologies B.V. His research focuses on modeling and evaluation of thin piezoelectric film-based MEMS actuators for application in print heads.



#### Gabriel L. Smith

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Smith received his BS and MS degrees in mechanical engineering from the University of Maryland, College Park, in 1999 and 2002, respectively. He has worked in MEMS Design for the past 15 years with the US Naval Surface Warfare Systems, US Army Armaments Research Dev. Eng Center, and US Army Research Laboratory. He has developed MEMS devices for safe and arm devices for torpedoes and gun-launched munitions, piezoelectric sensors and

actuators for mm-scale robotic systems, and piezoelectric traveling wave ultrasonic motors. He currently holds six US patents with three patents pending and has authored seven journal and conference papers on MEMS devices.

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