ACRONYMS

μTAS	micro total analysis system
1D	one-dimensional
2D	two-dimensional
3D	three-dimensional
AC	alternating current
AFM	atomic force microscopy
ALE	arbitrary lagrangian eulerian
AlN	aluminum nitride
ANSI	American National Standards Institute
AO	adaptive optics
AOM	acousto-optical modulator
AR	anti-reflective
ASIC	application-specific integrated circuit
ASTM	American Society for Testing and Materials
AWG	arrayed waveguides
AWN	acid waste neutralization
BEM	boundary element method
BPM	beam propagation method
BPSG	boron phosphorus doped silicate glass
CAD	computer-aided design
CAIBE	chemically assisted ion-beam etching
CEM	contactless embossing microlenses
CGH	computer-generated hologram
CMOS	complementary metal-oxide semiconductor
CMP	chemical mechanic polishing
CMS	ciliary motion system
CTE	coefficient of thermal expansion
CVD	chemical vapor deposition
DC	direct current
DDR	double data rate
DEMUX	demultiplexing
DMD	digital micromirror device
DOE	diffractive optical element
DOF	degrees of freedom
DRAM	digital random access memory

DRIE	deep reactive ion etching
DSC	differential scanning calorimetry
DUV	deep ultraviolet
DWDM	dense wavelength division multiplexing
DXRL	deep X-ray lithography
EC	electric circuit
EDFA	erbium-doped fiber amplifier
ELT	extremely large telescope
ETV	electrothermal vibromotor
EUV	extreme ultraviolet
ExAO	extreme adaptive optics
FP or F-P	Fabry-Perot
FD	finite difference
FHD	flame hydrolysis deposition
FIB	focused ion beam
FPA	focal plane array
FSMOS	free-space micro-optical system
FS	face shear
FWHM	full width half maximum
GLV	grating light valve
GRIN	gradient index
HEBS	high-energy beam sensitive (glass)
HOE	holographic optical element
I/O	input/output
IBE	ion beam etching
IC	integrated circuit
ICP	inductive coupled plasma (etching)
IR	infrared
LC	liquid crystal
LIGA	lithography, electroplating, and molding
LPCVD	low-pressure chemical vapor deposition
LVCMOS	low-voltage CMOS
LVDS	low-voltage differential signal
MARS	modulated antireflecting surface
MC	magnetic circuit
MCM	multichip module
MDOF	master degrees of freedom
MEMS	micro-electro-mechanical-systems
MHz	megahertz
MMIC	monolithic microwave integrated circuit
MOEMS	micro-opto-electro-mechanical-systems
MOSMOD	micromachined optical shutter modulation
MUMPS	multi-user MEMS process service
MUX	multiplexing
NA	numerical aperture

OXC	optical crossconnect
PCR	polymerase chain reaction
PDE	partial differential equation
PE	planar expansion
PECVD	plasma-enhanced chemical vapor deposition
PLC	planar lightwave circuit
PLE	parallel length expansion
PMMA	polymethyl methacrylate
PSF	point spread function
PVdF	polyvinylidene fluride
REM	raster electron microscope
REPM	rare earth permanent magnet
RF MEMS	radio-frequency MEMS
RIBE	reactive ion beam etching
RIE	reactive ion etching
rms	root-mean-square
ROM	reduced order modeling
RSD	retinal scanning display
SAM	self-assembled monolayer
SCREAM	single crystalline reactive etching and metallization
SDA	scratch drive actuator
SDR	single data rate
SEM	scanning electron microscope
SLM	spatial light modulator
SMA	shape memory alloy
SME	shape memory effect
SOAC	systems on-a-chip
SOAP	systems on-a-package
SOI	silicon-on-insulator
SRAM	static random access memory
SUMMiT	Sandia's ultraplanar multilevel MEMS technology
SVGA	super video graphics adapter
SWIR	short-wave infrared
SXGA	super-extended graphics adapter
TCR	temperature coefficient of resistance
TE	transverse electric
TE	thickness expansion
TEOS	tetra ethyl orthosilicate
TFAMA	thin-film-actuated mirror array
TLE	transverse length expansion
TM	transverse magnetic
TS	thickness shear
TTD	true time delay
UV	ultraviolet
VCM	variable-capacitance motor

VCSEL	vertical cavity surface emitting laser
VLSI	very large scale integration
VOA	variable optical attenuator
WDM	wavelength division multiplexing
WLP	wafer-level packaging
XGA	extended graphics adapter

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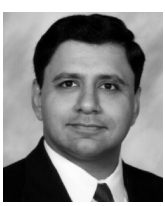

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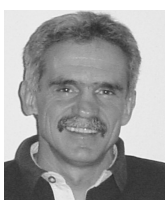
Ridha Hamza graduated from the University of Grenoble in 1998 with a degree in Electrical Engineering. His graduate work was in the area of interface electronics for sensors. He joined MEMSCAP in 1999, where he was in charge of cooperative programs on CAD. He then took over the management of the development of MEMSCAP's UNIX based MEMS Design Platform MEMS Xplorer and MEMSCAP's foundry design kits. After two years as a Marketing Manager for CAD tools at MEMSCAP, he is now VP of European and Asian Operations at SoftMEMS. His main interests are in MEMS design methodologies.



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Jean-Michel Karam holds a Ph.D. in Microelectronics from the French Institut National Polytechnique de Grenoble, a Masters from Paris VII University, and an Engineering degree from the French ESIEE. After having started and developed the MEMS applied research group at TIMA Laboratory, he founded MEMSCAP in November 1997. In less than three years, he took the company public for half a billion dollars. He grew his organization to be the first independent and listed MEMS group in the world. MEMSCAP today is present in 5 countries with over 200 employees. MEMSCAP acquired Capto (Norway), Cronos from JDS Uniphase (USA), and GalayOr (Israel), and is widely recognized as the MEMS leader. Jean Michel Karam holds more than 25 patents, is author or co-author of more than two hundred publications, is the guest Editor of many scientific magazines and chairman or co-chairman of several conferences.

Ernst-Bernhard Kley received his diploma and Ph.D. in physics from the Friedrich-Schiller University Jena in 1974 and 1987 respectively. After he received his diploma in physics and before he started his doctoral work, he earned three years of industrial experience. Dr. Kley's general fields of research are micro- and nanolithography, various e-beam writers, and scanning electron microscopes applied to micro-optics, integrated optics, and cryogenic electronics. He made essential contributions to the physics of the proximity effect and the development of variable-dose writing in e-beam lithography, including the combination of e-beam and gray-tone lithography. Currently he is the head of the Microlithography and Micro-optics Group at the Institute of Applied Physics of Friedrich-Schiller-University Jena. This group is well known for long-term experience with the ZRM 12, ZBA 21P, ZBA 23H, and LION LV1 e-beam systems. Dr. Kley is author and co-author of more than 80 scientific papers and was involved in the organization of several conferences. Since the beginning of the 1990s, he was a partner of more than 30 European and national projects and established the cooperation of many international partners.

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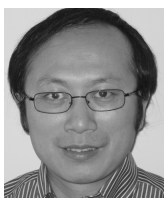
Scot S. Olivier currently leads the Adaptive Optics Group in the Physics and Advanced Technologies Directorate at Lawrence Livermore National Laboratory (LLNL). He joined LLNL in 1991 as a postdoctoral researcher, after receiving his Ph.D. in Physics from the University of California, Santa Cruz and his B.S. from Princeton University in Electrical Engineering, Computer Science, and Engineering Physics. In 1994, he assumed a staff position as an optical physicist in the LLNL Laser Programs Directorate working as the project scientist on the Lick Observatory laser guide star adaptive optics system, which was the first system to successfully utilize a sodium-layer laser beacon. He subsequently served as the LLNL project manger for the Keck Observatory adaptive optics wavefront control and laser guide star systems. His current activities span a broad range of applications, including astronomy, human vision science, high power laser beam control, optical communications, surveillance, and remote sensing. He leads several projects in the development and application of advanced adaptive optics based on MOEMS technology. He also serves as an Associate Director of the NSF Science and Technology Center for Adaptive Optics. Dr. Olivier is a member of SPIE, OSA, and AAS, and has published over 40 papers on adaptive optics.



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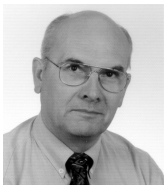

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