

## **THOMAS BIFANO**

Director, Boston University Photonics Center  
Professor Mechanical Engineering Department  
8 St Mary's St., Boston, MA 02215, Tel: 617-353-8908  
Email: [tgb@bu.edu](mailto:tgb@bu.edu) <http://bifano.bu.edu>

### **Education**

Duke University Mechanical Engineering & Materials Science, BS, 1980  
Duke University Mechanical Engineering & Materials Science, MS, 1983  
North Carolina State University, Mechanical Engineering, Ph.D. 1988  
Dissertation: "Ductile Regime Grinding of Brittle Materials," Thomas A. Dow, advisor

### **Appointments**

*Director*, Boston University Photonics Center, 2006-  
*Professor and Chair*, Manufacturing Engineering Dept., Boston University, 1999- 2006  
*Professor*, Mechanical Engineering Dept., Boston University, 1999-  
*Chief Technical Officer*, Boston Micromachines Corporation, Watertown, MA, 1999-  
*President*, Prism Corporation, Boston, MA, 1995-2000  
*Associate Professor*, Aerospace/Mechanical Eng., Boston University, 1994-1999  
*Assistant Professor*, Aerospace/Mechanical Eng., Boston University; 1988-1994

### **Research**

Microelectromechanical Systems (MEMS); Optomechanical devices; Deformable mirrors; Manufacturing of optical components; Smart structures; Fluidic microsystems; Micromachining; Bioarray synthesis; Networked control systems; Adaptive optics

### **Funded Research**

1/88 – 12/08      PI: \$6.9M    Co-PI: \$9.2M    Center Director PI: \$21.7M

### **Patents, Awards, Honors**

2009 Bepi Colombo Prize, for achievements in research, innovation, and tech. transfer  
2007 R&D 100 Award: Adaptive Optics Scanning Laser Ophthalmoscope (MAOSLO)  
2005 U.S. Patent (#6,929,721) Ion modification of residual stress gradients in thin films  
2004 U.S. Patent (#6,705,345) Micro valve arrays for fluid flow control  
2003 R&D 100 Award: MEMS-based adaptive optics phoropter (MAOP)  
2003 U.S. Patent (#6,529,311) MEMS-based spatial-light modulator  
1998 U.S. Patent (#5,783,371) Process for manufacturing optical data storage disk  
1997 U.S. Patent (#5,503,963) A new method for manufacturing optical disc stampers

### **Professional Service**

Consultant, Army Science Board, 2008-  
Technical session chair, ASPE, ASME, SPIE, SME, OSA  
Board of Directors, Amer. Soc. Precision Eng., 1994-1996  
Chairman 1994, 1995 Annual and Topical ASPE Conferences  
Associate Editor, Journal of Micro/Nanolithography, MEMS, and MOEMS 2006-  
Associate Editor, Int'l J. Mfg. Science and Production 2002-2004  
Associate Editor, SME J. Manufacturing Processes 2000-2004  
National Academy of Science Review Panel: Wright Awards

## University Service

Chair, University Research Council, 2008-  
Chair, Dean Search Committee, College of Engineering, 2005-06  
Chair, Provost's Faculty Advisory Committee on Photonics, 2005-06  
Chair, Faculty Council, Appt., Tenure, and Promotion Policy Comm., 2003-04  
Director, Precision Engineering Research Laboratory (BU-PERL), 1990-  
Presidential University Graduate Fellowship Committee 1994-1999  
Director, Aerospace/Mechanical Eng. graduate programs, 1988-1991  
Faculty advisor to engineering residence hall (Claflin 11), 1990-1995  
Faculty advisor to "In Achord," BU a cappella singing group, 1993-1998

## Activity Highlights

Director, **Boston University Photonics Center**. Dr. Bifano directs this core facility and academic center of excellence comprised of thirty-five faculty members eighty graduate students, and ten staff members from seven academic departments. He leads BUPC programs for education, scholarly research and development of advanced photonic device prototypes for commercial and military applications. He manages a state-of-the-art facility that includes more than a dozen special-purpose and shared research laboratories and a large business incubator.

Co-founder of the Boston University **Freshman Research Opportunity Program (FROP)**, a College of Engineering program that sponsors students in 10 week research projects in the summer before their matriculation. The program ran for more than a decade, until 2004, supporting more than 200 summer interns.

Co-founder and Chief Technical Officer, **Boston Micromachines Corporation**, a University spin-off company that was formed to commercialize micromachined deformable mirror technology initially developed through an NSF Small Grant for Exploratory Research (and subsequently funded by DARPA and NASA). This company, now in its 6<sup>th</sup> year of operation, has nine employees. Its synergistic activities include translation of academic intellectual property to commercial products, support of coop students, and employment of three Boston University engineering graduates.

## Collaborators & Other Affiliations

Chief Technical Officer, **Boston Micromachines Corporation**

Collaborators or Co-authors include:

Stephen Burns, University of Indiana  
Alex Cable, Thorlabs Corporation  
B. M. Levine, NASA Jet Propulsion Laboratory  
Charles Lin, Massachusetts General Hospital  
Rob Webb, Schepens Eye Research Institute  
Scot Olivier, Lawrence Livermore National Laboratory  
Joel Kubby, University of California at Santa Cruz

Graduate Advisors and Postdoctoral Sponsors.

Thomas Dow, NC State University  
Ron Scattergood, NC State University

Advising

30 graduate theses supervised, 2 postdoctoral researchers sponsored

## Selected Recent Invited Presentations

2007 OSA Adaptive Optics, Analysis and Methods

2006 SPIE MEMS/MOEMS Components and Their Applications III

2006 SPIE Target-in-the-Loop: Atmospheric Tracking, Imaging, and Compensation II

2005 SPIE Advancements in Adaptive Optics

## Journal Publications

- Diouf, A. Reimann, G. and Bifano, T., "Fabrication of implantable microshunt using a novel channel sealing technique," **J. Micro/Nanolith. MEMS MOEMS** [7], pp. 030501-1:3, 2008
- Stewart, J. B., Diouf, A., Zhou, Y. and Bifano, T. G. , "Open-loop control of a MEMS deformable mirror for large-amplitude wavefront control," **J. Opt. Soc. Am. A** [24], pp. 3827-3833, 2007
- Stewart J.B., Bifano T.G., Cornelissen S., Bierden P., Levine B. M., Cook T., "Design and development of a 331-segment tip-tilt-piston mirror array for space-based adaptive optics," **Sensors and Actuators A- Physical** [138] pp. 230-238, 2007
- Biss, D. P., Sumorok, D., Burns, S. A., Webb, R. H., Zhou, Y., Bifano, T. G., Côté, D., Veilleux, I., Zamiri, P., and Lin, C. P., "In vivo fluorescent imaging of the mouse retina using adaptive optics," **Opt. Lett.** [32], pp. 659-661, 2007
- Chen, F., Cohen, H.I., Bifano, T.G., Castle, J., Fortin, J., Kapusta, C., Mountain, D.C., Zosuls, A., Hubbard, A.E., "A hydromechanical biomimetic cochlea: Experiments and models," **J. Acoust. Soc. Am.** [119], pp.394-405, 2006
- Miller, M. H, Perrault, J. A., Parker, G. G., Bettig B. P., and Bifano T. G., "Simple models for piston-type micromirror behavior," **J. Micromech. Microeng.** [16] pp. 303–313, 2006
- Santiago, LP, Bifano, T. G., "Management of R&D projects under uncertainty: multidimensional approach to managerial flexibility," **IEEE Trans Eng Mgmt** 52(2):269-80, 2004
- Collier, J., Wroblewski, D., and Bifano, T., "Development of a rapid-response flow-control system using MEMS microvalve arrays," **J. Microelectromechanical Systems**, [13](6), pp. 912-922, 2004
- Webb, R., Albanese, M., Zhou, Y., Bifano, T., and Burns, S., "A stroke amplifier for deformable mirrors," **Applied Optics**, [43]12, pp. 5330-5333, 2004
- Lee, H., Miller, M. H., and Bifano, T. G., "CMOS chip planarization by chemical mechanical polishing for a vertically stacked metal MEMS integration." **J. Micromech. Microeng.**, [14] 1, pp. 108-115, 2004
- Bifano, T. G., Johnson, H. T, Bierden, P. and Mali, R. K., "Elimination of Stress-Induced Curvature in Thin-Film Structures" **J. Microelectromechanical Systems**, [11], pp 592-597, 2002
- Perreault, J. A., Bifano, T. G., Levine, B.M., and Horenstein, M., "Adaptive optic correction using microelectromechanical deformable mirrors," **Optical Engineering** [41]3, pp. 561-566, 2002
- Horenstein, M., Pappas, S., Fishov, A.\*, and Bifano, T.G., "Electrostatic Micromirrors for Subaperturing in an Adaptive Optics System," **Journal of Electrostatics**, Vol. 54, pp. 321-332, 2002
- Weyrauch T., Vorontsov M. A., Bifano T. G., Hammer J. A., Cohen M., and Cauwenberghs G., "Microscale adaptive optics: wavefront control with a  $\mu$ -mirror array and a VLSI stochastic gradient descent controller," **Applied Optics**, [40] 24 pp. 4243-4253, 2001

- Shanbhag, P. M., Feinberg, M.R., Sandri, G., Horenstein, M. N., and Bifano, T.G., "Ion-Beam Machining of Millimeter Scale Optics," **Applied Optics**, [39] 4 pp. 599 - 611, 2000
- Horenstein, M. N., Perreault, J. and Bifano, T. G., "Differential Capacitive Position Sensor for Planar MEMS Structures with Vertical Motion." **Sensors and Actuators (80)**, pp 53-61, 2000
- Mali, R. K., Bifano, T. and Koester, D. A., "Design-based approach to planarization in multilayer surface micromachining," **J. Micromech. Microeng.** [9] pp. 294–299, 1999
- Horenstein, M., Bifano, T.G., Pappas, S., Perreault J., and Krishnamoorthy-Mali, R., "Real Time Optical Correction Using Electrostatically Actuated MEMS Devices." **Journal of Electrostatics**, Vol. 46, pp. 91-101, 1999
- Bifano, T. G., Perreault, J., Mali, R. K., and Horenstein, M. N., "Microelectromechanical Deformable Mirrors," **Journal of Selected Topics in Quantum Electronics**, [5], pp. 83-90, 1999
- Bifano, T. G., Krishnamoorthy, R., Caggiano, H., and Welch, E., "Fixed-Load Electrolytic Dressing with Bronze-Bonded Grinding Wheels," **ASME J. Manufacturing**, [121], pp. 20-27, 1999
- Vandelli, N, Wroblewski, D. E., Velonis, M., and Bifano, T. G., "Development of a MEMS Microvalve Array for Fluid Flow Control," **J. Microelectromechanical Systems**, [7], pp. 395-403, 1998
- Bifano, T. G., Mali, R., Perreault, J., Dorton, K., Vandelli, N, Horentein, M., and Castanon, D., "Continuous membrane, surface micromachined silicon deformable mirror," **Optical Engineering** [36]5, pp. 1354-1360, 1997
- Bifano, T. G., Caggiano, H., and Bierden, P., "Precision Manufacture of Optical Disc Master Stampers," **J. Precision Eng'g** [20]1, pp. 53-62, 1997
- Bifano, T. G., and Bierden, P., "Fixed Abrasive Grinding of Brittle Hard Disk Substrates," **Intl. J. of Machine Tools**[37]7, pp. 935-946, 1997
- Horenstein, M.N., Bifano, T.G., Mali, R. K., Vandelli, N., "Electrostatic Effects in Micromachined Actuators for Adaptive Optics," **Journal of Electrostatics** [42] , pp. 69-82, 1997
- Krishnamoorthy, R., Bifano, T. G., Vandelli, N., and Horenstein, M., "Development of MEMS deformable mirrors for phase modulation of light," **Optical Engineering** [36]2, pp. 542-548, 1997
- Scagnetti, P. A., Bifano, T. G., Nagem, R. J., and Sandri, G. vH., "Simulation of Micro-Indentation Using Molecular Dynamics Modeling," **ASME J. of Applied Mechanics**, [63], pp. 450-453, 1996
- Drueding, T., Bifano, T. G., and Fawcett, S. C., "Contouring Algorithm for Ion Figuring," **J. Precision Eng'g**, [17]1, pp. 10-21, 1995
- Drueding, T. W., Wilson, S., Fawcett, S. C., and Bifano, T. G., "Contouring Algorithm for Ion Figuring," **Optical Engineering**, [34]12, pp. 3565-3571, 1995
- Bifano, T. G. Kahl, W. K., and Yi, Y., "Fixed-Abrasive Grinding CVD Silicon Carbide Mirrors," **J. Precision Eng'g**, [16]2, pp. 109-116, 1994
- Fawcett, S. C., Bifano, T. G., and Drueding, T., "Neutral Ion Figuring of Chemically vapor Deposited Silicon Carbide," **Optical Engineering**, [33]3, pp. 967-974, 1994
- Bifano, T. G., Golini, D., and DePiero, D., "Chemomechanical Effects in Ductile-Regime Machining of Glass," **J. Precision Eng'g**, [15]4, pp. 238-247, 1993
- Bifano, T. G., and Hosler, J., "Precision Grinding of Ultra-Thin Quartz Wafers," **ASME J. Eng'g for Industry** [115]3, pp. 258-262, 1993
- Bifano, T. G., and Yi, Y. "Acoustic Emission as an Indicator of Material-Removal Regime in Glass Microgrinding," **J. Precision Eng'g** [14]4, pp. 219-228, 1992

- Scattergood, R. O., Srinivasan, S., Bifano, T. G., and Dow, T. A., "R-Curve Effects for Machining and Wear of Ceramics," **Ceram. Acta** [3]4-5, pp. 53-64, 1991
- Bifano, T. G., and Fawcett, S. C., "Specific Grinding Energy as an In-Process Control Variable for Ductile-Regime Grinding," **J. Precision Eng'g** [13]4, pp. 256-262, 1991
- Bifano, T. G., Dow, T. A., and Scattergood, R. O., "Ductile-Regime Grinding: A New Technology for Machining Brittle Materials," **ASME J. Eng'g for Industry** [113]2, pp. 184-189, 1991
- Blake, P., Bifano, T. G., Dow, T. A., and Scattergood, R. O., "Precision Machining of Ceramic Materials," **Amer. Ceramic Soc. Bulletin** [67]6, pp. 1038-1044, 1988
- Bifano, T. G., and Dow, T. A., "Real Time Control of Spindle Runout," **Optical Engineering** [24]5, pp. 888-892, 1985

### Conference Publications

- Diouf, A., Gingras, M., Stewart, J.B., Bifano, T.G., Cornelissen, S.A. and Bierden, P.A., "Fabrication of single crystalline MEMS DM using anodic wafer bonding," Proc. SPIE 6888, 2008
- Cornelissen, S. A., Bierden, P., and Bifano, T. G., "A 4096 element continuous facesheet MEMS deformable mirror for high-contrast imaging," Proc. SPIE 6888, p.68880V 2008
- Bifano, T. G. Bierden, P., and Cornelissen, S. A. "MEMS deformable mirrors for space and defense applications," Proc. SPIE 6959, p.695914 2008
- Bifano, T. G., Stewart, J. and Diouf, A., "Precise open-loop control of MEMS deformable mirror shape," Proc. SPIE 6888, p.68880P, Jan. 2008
- Castillo, J., and Bifano, T. G., "Adaptive optics calibration for a wide-field microscope," Proc. SPIE 6888, p. 68880E Jan. 2008
- Zhou, Y., Bifano, T. and Lin, C., "Use of adaptive optics to increase nonlinear imaging signal in mouse bone marrow, Proc. SPIE 6888, p.688808, Jan 2008
- Zhou, Y., Bifano, T. and Lin, C., "Adaptive optics two-photon fluorescence microscopy," Proc. SPIE Vol. 6467, MEMS Adaptive Optics, Scot S. Olivier, Thomas G. Bifano, Joel A. Kubby, Editors, p. 646705, Jan. 2007
- Biss, D. P., Webb, R. H., Zhou, Y., Bifano, T. G., Zamiri, P., Lin, C. P., Burns, S. A., "An adaptive optics biomicroscope for mouse retinal imaging," Proc. SPIE Vol 6467, MEMS Adaptive Optics, p. 646703, Jan. 2007
- Cornelissen, S. A., Bierden, P. A., and Bifano, T. G., "Development of a 4096 element MEMS continuous membrane deformable mirror for high contrast astronomical imaging," Proc. SPIE Vol. 6306, Advanced Wavefront Control: Methods, Devices, and Applications IV, Michael K. Giles, John D. Gonglewski, Richard A. Carreras, Editors, Aug, 2006
- Levine, B. M., Aguayo, F., Bifano, T., Fregoso, S. F., Green, J. J., Lane, B. F., Liu, D. T., Mennesson, B., Rao, S., Samuele, R., Shao, M., Schmidlin, E., Serabyn, E., Stewart, J., and Wallace, J. K., "The visible nulling coronagraph: architecture definition and technology development status," Proc. SPIE Vol. 6265, Space Telescopes and Instrumentation I: Optical, Infrared, and Millimeter, John C. Mather, Howard A. MacEwen, Mattheus W. M. de Graauw, Editors, Jun. 2006
- Zhou, Y., and Bifano, T., "Characterization of contour shapes achievable with a MEMS deformable mirror," *Proc. SPIE Vol. 6113*, p. 123-130, MEMS/MOEMS Components and Their Applications III; Scot S. Olivier, Srinivas A. Tadigadapa, Albert K. Henning; Eds., Jan 2006
- Stewart, J. B., Bifano, T., Bierden, P., Cornelissen, S., Cook, T., and Levine, B. M., "Design and development of a 329-segment tip-tilt piston mirror array for space-based adaptive optics," *Proc. SPIE Vol. 6113*, p. 181-189, MEMS/MOEMS

- Components and Their Applications III; Scot S. Olivier, Srinivas A. Tadigadapa, Albert K. Henning; Eds., Jan 2006
- Kim, D. J., Bifano, T., Cornelissen, S., Hubbard, A., "Chip-scale integrated driver for electrostatic DM control," *Proc. SPIE Vol. 6113*, p. 270-278, MEMS/MOEMS Components and Their Applications III; Scot S. Olivier, Srinivas A. Tadigadapa, Albert K. Henning; Eds. Jan 2006
- Bifano, T. G. and Stewart, J. B. "High-speed wavefront control using MEMS micromirrors," *Proc. SPIE Vol. 5895*, Target-in-the-Loop: Atmospheric Tracking, Imaging, and Compensation II, Michael T. Valley, Mikhail A. Vorontsov, Editors, 58950Q, Sep. 7, 2005
- Burns, S. A., Zhou, Y., Lin, C. P., Bifano, T. G., Veilleux, I., Webb, R. H., "Retinal imaging and wavefront sensing in mice," *Investigative Ophthalmology & Visual Science* 45:U1003-U1003, Suppl. 1., 2005
- Perreault, J. A., and Bifano, T., "High resolution wavefront control using micromirror arrays," *Proc. Solid-State Sensor, Actuator and Microsystems Workshop*, Hilton Head Island, South Carolina, pp. 83-86, 2004
- Bifano, T. G., Bierden, P. A., Zhu, H., Cornelissen, S., and Kim, J. H., Proc. "Megapixel wavefront correctors," *Proc. SPIE Vol. 5490*, Advancements in Adaptive Optics, Domenico Bonaccini Calia, Brent L. Ellerbroek, Roberto Ragazzoni, Editors, pp. 1472-1481, 2004
- Bifano, T. G., Bierden, P. A., and Perreault, J., "Micromachined deformable mirrors for dynamic wavefront control," *Proc. SPIE Vol. 5553*, High-Resolution Wavefront Control: Methods, Devices, and Applications IV, John D. Gonglewski, Editor, pp. 10-13, 2004
- Zhu, H., Bierden, P. A., Cornelissen, S., Bifano, T. G., and Kim, J. H., "Design and fabrication of reflective spatial light modulator for high-dynamic-range wavefront control," *Proc. SPIE Vol. 5553*, Advanced Wavefront Control: Methods, Devices, and Applications II, John D. Gonglewski, Mark T. Gruneisen, Michael K. Giles, Editors, pp. 39-45, 2004
- Becker, T. Bifano, T. G., Lee, H., Miller, M., Bierden, P. A., and Cornelissen, S., "MEMS spatial light modulators with integrated electronics," *Proc. SPIE Vol. 4983*, MOEMS and Miniaturized Systems III, James H. Smith, Editor, pp. 248-258, 2003
- Dimas, C. E., Perreault, J., Cornelissen, S., Dyson, H., Krulevitch, P., Bierden, P. A., and Bifano, T. G., "Large-scale polysilicon surface-micromachined spatial light modulator," *Proc. SPIE Vol. 4983*, MOEMS and Miniaturized Systems III, James H. Smith, Editor, pp. 204-210, 2003
- Lee, H., Miller, M., and Bifano, T. G., "Planarization of a CMOS die for an integrated metal MEMS," *Proc. SPIE Vol. 4979*, Micromachining and Microfabrication Process Technology VIII, John A. Yasaitis, Mary Ann Perez-Maher, Jean Michel Karam, Editors, January 2003, pp. 137-144, 2003
- Krulevitch, P., Bierden, P. A., Bifano, T., Carr, E., Dimas, C., Dyson, H., Helmbrecht, M., Kurczynski, P., Muller, R., Olivier, S., Peter, Y., Sadoulet, B., Solgaard, O., and Yang, E. H., "MOEMS spatial light modulator development at the Center for Adaptive Optics," *Proc. SPIE Vol. 4983*, p. 227-234, MOEMS and Miniaturized Systems III, James H. Smith, Peter A. Krulevitch, Hubert K. Lakner, Eds., 2003.
- Bifano, T. G., Perreault, J., A., Bierden, P. A., and Dimas, C. E., "Micromachined deformable mirrors for adaptive optics," *Proc. SPIE Vol. 4825*, p. 10-13, High-Resolution Wavefront Control: Methods, Devices, and Applications IV; John D. Gonglewski, Mikhail A. Vorontsov, Mark T. Gruneisen, Sergio R. Restaino, Robert K. Tyson; Eds., Nov 2002

- Dimas, C. E., Bifano, T. G., Bierden, P. A., Perreault, J. A., Krulevitch, P. A. Roehnelt, R. T., and Cornelissen, S. A., "Polysilicon surface-micromachined spatial light modulator with novel electronic integration," *Proc. SPIE Vol. 4755*, p. 477-484, Design, Test, Integration, and Packaging of MEMS/MOEMS 2002; Bernard Courtois, Jean Michel Karam, Karen W. Markus, Bernd Michel, Tamal Mukherjee, James A. Walker; Eds., Apr 2002
- Bifano, T. G. Bierden, P. A., Cornelissen, S. A. Dimas, C. E., Lee, H. Miller, M.H., and Perreault, J. A., "Large-scale metal MEMS mirror arrays with integrated electronics," *Proc. SPIE Vol. 4755*, p. 467-476, Design, Test, Integration, and Packaging of MEMS/MOEMS 2002; Bernard Courtois, Jean Michel Karam, Karen W. Markus, Bernd Michel, Tamal Mukherjee, James A. Walker; Eds., Apr 2002
- Reimann, G., Perreault, J., A., Bierden, P. A., and Bifano, T. G., "Compact adaptive optical compensation systems using continuous silicon deformable mirrors," *Proc. SPIE Vol. 4493*, p. 35-40, High-Resolution Wavefront Control: Methods, Devices, and Applications III; John D. Gonglewski, Mikhail A. Vorontsov, Mark T. Gruneisen; Eds., Feb 2002
- Cornelissen, S. A., Bifano, T. G., and Bierden, P. A., "Micro-electromechanical spatial light modulators with integrated electronics," *Proc. SPIE Vol. 4493*, p. 184-190, High-Resolution Wavefront Control: Methods, Devices, and Applications III; John D. Gonglewski, Mikhail A. Vorontsov, Mark T. Gruneisen; Eds., Feb 2002
- Perreault, J. A., Bierden, P. A., Horenstein, M. N., and Bifano, T. G., "Manufacturing of an optical-quality mirror system for adaptive optics," *Proc. SPIE Vol. 4493*, p. 13-20, High-Resolution Wavefront Control: Methods, Devices, and Applications III; John D. Gonglewski, Mikhail A. Vorontsov, Mark T. Gruneisen; Eds., Feb 2002
- Weyrauch, T., Vorontsov, M. A., Gowens, J., and Bifano, T. G., "Fiber coupling with adaptive optics for free-space optical communication," *Proc. SPIE Vol. 4489*, p. 177-184, Free-Space Laser Communication and Laser Imaging; David G. Voelz, Jennifer C. Ricklin; Eds., Jan 2002
- Nee, S. F., DeSandre, L. F., Bifano, T. G., Johnson, L. F., and Moran, M. B., "Optical characterization of micro-mirror array structures," *Proc. SPIE Vol. 4447*, p. 65-76, Surface Scattering and Diffraction for Advanced Metrology; Zu-Han Gu, Alexei A. Maradudin; Eds., Oct 2001
- Bifano, T. G., Perreault, J. A., and Bierden, P. A., "Micromachined deformable mirror for optical wavefront compensation," *Proc. SPIE Vol. 4124*, p. 7-14, High-Resolution Wavefront Control: Methods, Devices, and Applications II; John D. Gonglewski, Mikhail A. Vorontsov, Mark T. Gruneisen; Eds., Nov 2000
- Weyrauch, T. Vorontsov, M. A., Bifano, T. G., Tuantranont, A., Bright, V. M., Karpinsky, J.R., and Hammer, J. A., "Performance evaluation of micromachined mirror arrays for adaptive optics," *Proc. SPIE Vol. 4124*, p. 32-41, High-Resolution Wavefront Control: Methods, Devices, and Applications II; John D. Gonglewski, Mikhail A. Vorontsov, Mark T. Gruneisen; Eds., Nov 2000
- Weyrauch, T., Vorontsov, M. A., Bifano, T. G., Giles, M. K., "Adaptive optics systems with micromachined mirror array and stochastic gradient descent controller," *Proc. SPIE Vol. 4124*, p. 178-188, High-Resolution Wavefront Control: Methods, Devices, and Applications II; John D. Gonglewski, Mikhail A. Vorontsov, Mark T. Gruneisen; Eds. Nov 2000
- Olivier, S. S., Bierden, P. A., Bifano, T. G., Bishop, D. J., Carr, E., Cowan, W. D., Hart, M. R., Helmbrecht, M. A., Krulevitch, P. A., Muller, R. S., Sadoulet, B., Solgaard, O., and Yu, J., " Micro-electro-mechanical systems spatial light modulator development," *Proc. SPIE Vol. 4124*, p. 26-31, High-Resolution Wavefront Control:

- Methods, Devices, and Applications II; John D. Gonglewski, Mikhail A. Vorontsov, Mark T. Gruneisen; Eds., Nov 2000
- Perreault, J. A., Bifano, T. G., Levine, B. M., "Adaptive Optic Correction Using Silicon Based Deformable Mirrors," *Proceedings of SPIE - The International Society for Optical Engineering Proceedings of the 1999 High-Resolution Wavefront Control: Methods, Devices, and Applications* v 3760 1999 Denver, CO, , USA, Sponsored by : SPIE Society of Photo-Optical Instrumentation Engineers Bellingham WA USA p 12-22. Jul 19-Jul 20 1999
- Horenstein, M., Bifano, T., Pappas, S., Perreault, J., Krishnamoorthy-Mali, R., "Real Time Optical Correction Using Electrostatically Actuated MemS Devices," *Journal of Electrostatics Proceedings of the 1998 3rd Joint ESA/IEJ Symposium on Electrostatics* Amsterdam Netherlands p 91-101, Jun 23-Jun 26 1998
- Wroblewski, D., Horenstein, D., Vandelli, D., Velonis, M., and Bifano, T., "MEMS Micro-Valve Arrays for Fluidic Control," *Proceedings of 1998 International Mechanical Engineering Congress and Exposition, ASME DSC-Vol. 66*, pp 145-152, 1998
- Bifano, T. G., Krishnamoorthy, "Surface micromachined deformable mirrors," *Proceedings of the 5th IEEE International Conference on emerging technologies and factory automation*, Vol.2, pp.393-399, Kauai, Hawaii, Nov. 18-21, 1996
- Krishnamoorthy, R., Bifano, T. G., and Sandri, G., "Statistical position repeatability of surface micromachined electrostatic actuators," *Proceedings of the 5th IEEE International Conference on emerging technologies and factory automation*, Vol.2, pp.400-403, Kauai, Hawaii, Nov. 18-21, 1996
- Krishnamoorthy, R., Bifano, T. G., and Sandri, G., "Statistical performance evaluation of electrostatic micro actuators for a deformable mirror," *Proceedings of SPIE Microelectronic Structures and MEMS for Optical Processing II*, Vol. 2881, pp.35-44, Austin TX, Oct. 14-15, 1996
- Krishnamoorthy, R., and Bifano, T., "MEMS arrays for deformable mirrors," *SPIE Volume 2641*, pp. 96-104, 1995
- Bifano, T. G., Krishnamoorthy, R., Caggiano, H. E., and Welch, E., "Fixed load electrolytic dressing with bronze bonded grinding wheels," *ASME ICEME, MED-Vol. 2-1*, pp. 329-348, 1995
- Bierden, P., and Bifano, T. G., "Fixed Abrasive Grinding of Brittle Hard Disk Substrates," *ASME Intl mech eng congress and expo CEME, MED-Vol. 2-1*, pp. 317-328, 1995
- Fawcett, S. C., Drueding, T., and Bifano, T. G., "Development of an Ion Figuring System for Centimeter Scale Optical Components" *SPIE Volume 2263*, San Diego, CA, July 1994
- Bifano, T. G., Caggiano, H., and Krishnamoorthy, R., "Electrolytic Dressing of Bronze-Bonded Grinding Wheels in Fixed-Load Grinding," *Optical Society of America Technical Digest Series [13]*, pp. 49-52, June, 1994
- Drueding, T. W., Bifano, T. G., and Fawcett, S. C., "Deconvolution Algorithm Applied to Ion Figuring," *Optical Society of America Technical Digest Series [13]*, pp. 244-247, June, 1994
- Bifano, T. G., Caggiano, H., and Krishnamoorthy, R., "Electrolytic Dressing Of Bronze-Bonded Grinding Wheels In Fixed-Load Grinding," *Proceedings of the OSA: Workshop on Optical Fabrication and Testing*, OSA, Rochester, NY, June, 1994
- Welch, E., Bifano, T. G., and Yi, Y., "Electrochemical Dressing of Bronze-Bonded Grinding Wheels," *Int'l. Conf. on Machining Advanced Mat'ls*, S. Ja-hanmir, Ed., Nat. Inst. of Standards and Tech., Wash., DC, pp. 333-341, July, 1993

- Scagnetti, P. A., Bifano, T. G., Nagem, R. N., and Sandri, G. vH., "Constitutive Modeling of Material Deformation Using Molecular Dynamics Modeling on the Connection Machine," *Proc. 6th SIAM Conf. on Parallel Processing for Sci. Computing*, Norfolk, VA, March 1993
- Hosler, J. B., and Bifano, T. G., "Ultra-Precision Grinding of Thin Quartz Wafers," *Precision Machining: Technology and Machine Development and Improvement*, M. Jouaneh & S. S. Rangwala, eds., ASME PED Volume 58, pp. 21-28, 1992
- Bifano, T. G., Dow, T. A., and Scattergood, R. O., "Ductile-Regime Grinding of Brittle Materials: Experimental Results and the Development of a Model," *SPIE Volume 966*, pp. 108-115, 1988
- Bifano, T. G., Blake, P., Dow, T. A., and Scattergood, R. O., "Precision Finishing of Ceramics," *SPIE Volume 803*, pp. 12-22, 1987
- Shaughnessy, E. J., and Bifano, T. G., "Measurement of the Energy Spectrum in a Tidal Channel Using a Submersible Laser Doppler Anemometer," *Proc. 7th Symp. on Turbulence*, U. Missouri, Rolla, pp. 282-292, 1984
- Bifano, T. G., and Dow, T. A., "Real Time Control of Spindle Runout," *Production Aspects of Single Point Machined Optics*, D. Brehm, ed., *SPIE Volume 508*, pp. 38-45, 1984

### **Graduate Students & Postdoctoral Researchers Supervised**

- 2008 Y. Zhou, PhD MfgE Dissertation: AO two photon fluorescence microscopy
- 2008 J. Stewart, PhD EE Dissertation: Segmented DM for astronomical imaging
- 2008 D.J. Kim, PhD EE Dissertation: Integrated Drivers for Large Scale MEMS Arrays
- 2008 M. Gingras, MSMfgE
- 2008 J. Castillo, MSEE
- 2007 J. H. Kim, PhD MfgE Dissertation: Manufacture of a Reflective Spatial Light Modulator
- 2007 G. Thompson, MSMfgE
- 2007 M. Lewis, MSME
- 2005 S. Kratz, MSMfgE
- 2005 J. Perreault PhD EE Dissertation: High Resolution MEMS Deformable Mirrors
- 2005 D. Sumorock, MSEE
- 2005 Y. Zhou, MSME
- 2004 G. Reimann, MSMfgE
- 2003 M. Albanese, MSEE
- 2002 T. Evans, MSME
- 2002 J. Collier, MSME
- 2002 S. Cornelissen, MSME
- 2001-02 Hocheol Lee, Postdoctoral Researcher
- 2001 C. Reherman, MSMfgE
- 2000 C. Hodge, MSME
- 2000 M. Bancu, MSME
- 2000 D. Malkani, MSME
- 1999 N. Vandelli, Ph.D.ME Dissertation: MEMS Microvalve Arrays for Flow Control
- 1999 P. Shanbhag, MSME
- 1999 M. Feinberg, MSME
- 1998-99 Nicholas Rosen, Postdoctoral Researcher
- 1998 R. K. Mali, PhD, ME Dissertation: Surface Micromachined Deformable Mirrors
- 1997 H. E. Caggiano, PhD ME Dissertation: New method of Mfg CD Masters
- 1995 T. W. Drueding, PhD, ME Dissertation: Ion Figuring of Centimeter-Scale Optics
- 1994 P. A. Bierden, MSME

1994 R. Krishnamoorthy, MSME  
1993 Y. Yi, PhD, ME Dissertation: Ultraprecision Grinding of Ceramic Mirrors  
1993 E. Welch, MSME  
1992 P. A. Scagnetti, MSME  
1992 J. B. Hosler, MSME  
1991 D. K. Depiero, MSME