

Thomas Bifano

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Professor of Mechanical Engineering
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Director, Boston University Photonics Center

Lead strategic research initiatives in photonics for forty-five faculty members, eighty graduate students, and ten staff members. Direct a state-of-the-art facility that includes more than a dozen special-purpose and shared research laboratories and a large business incubator. Lead programs in scholarly research, education, and technology translation.

Education

North Carolina State University
Ph.D., Mechanical Engineering 1988
Duke University
B.S., and M.S., Mechanical Engineering and Materials Science 1980, 1983

Employment

Boston University, Boston MA
Professor, Mechanical Engineering 1999 – present
Director, Photonics Center 2006 – present
Chair, Manufacturing Engineering Department 1999 – 2006
Associate Professor, Mechanical and Aerospace Engineering 1994 – 1999
Assistant Professor, Mechanical and Aerospace Engineering 1988 – 1994
Boston Micromachines Corporation, Cambridge MA
Chief Technical Officer 1999 – present

Awards and Honors

BU College of Engineering Distinguished Scholar Award 2013
R&D 100 Awards (4) 2003, 2009, 2010, 2015
Bepi Colombo Prize 2009

Selected Invited/Plenary Lectures

Plenary, OSA Optical MEMS & Nanophotonics, Istanbul, Turkey 2011
Plenary, SPIE Photonics West, San Francisco, CA 2010
LESIA, Adaptive Optics for Extremely Large Telescopes, Paris, France 2009
IEEE/LEOS, The Future of Light, Newport Beach, CA 2008

Professional Service

Conference Chair, SPIE-BIOS AO and Wavefront Control 2014-present
Greater MA 2024 Research Centers of Excellence Panel March 2015
Chair, NSF Workshop on Noninvasive Brain Imaging July 2014
Chair, OSA Workshop Controlled Light through Complex Media March 2014
Member, Army Science Board 2011-2014

Board of Advisors, Schott AG	2009-2012
Conference Chair, SPIE-MOEMS MEMS Adaptive Optics I-IX	2004-2014
Associate Editor, J. of Micro/Nanolithography, MEMS, and MOEMS	2006-2008
Associate Editor, Int'l J. Mfg. Science and Production	2002-2004
Associate Editor, SME J. Manufacturing Processes	2000-2004
Board of Directors, American Society for Precision Engineering	1994-1996
Chairman Annual and Topical ASPE Conferences	1994-1995

Major University Service

Director, Boston University Photonics Center	2006 – present
Oversight Committee: NIEDL	2015-present
University Center Directors Committee	2015– present
Faculty Council Committee on Research and Scholarly Activity	2015– present
Workshop Moderator: Building a Successful Research Program	March 2015
Chair, Biomedical Engineering Chair Search Committee	2014
Chair, University Research Council	2008-2011
Chair, Dean Search Committee, College of Engineering	2005-2006
Chair, Provost's Faculty Advisory Committee on Photonics	2005-2006
Chair, Faculty Council Committee, Appointment, Tenure, and Promotion	2003-2004
Presidential University Graduate Fellowship Committee	1994-1999
Faculty advisor, "In Achord," <i>a cappella</i> Singing Group	1993-1998
Faculty Advisor To Engineering Residence Hall (Claflin 11)	1990-1995
Director, Precision Engineering Research Laboratory (BU-PERL)	1990 – present
Director, Aerospace/Mechanical Eng. Graduate Programs	1988-1991

Patents

- 2011 U.S. Patent (#7,929,195) MEMS Based Retroreflector
- 2005 U.S. Patent (#6,929,721) Ion modification of stress gradients in thin films
- 2004 U.S. Patent (#6,705,345) Micro valve arrays for fluid flow control
- 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 mfg optical disc stampers

Publications

1. Shain WJ, Vickers NA, Goldberg BB, Bifano T, Mertz J, “Extended depth-of-field microscopy with a high-speed deformable mirror,” *Optics Letters*, [42], 995-998, 2017.
2. Li J, Bifano TG, Mertz J, “Widefield fluorescence microscopy with sensor-based conjugate adaptive optics using oblique back illumination,” *Journal of Biomedical Optics*, [21], 121504-121504, 2016.
3. Imboden M, Chang J, Pollock C, Lowell E, Akbulut M, Morrison J, Stark T, Bifano TG, Bishop DJ, “High-Speed Control of Electromechanical Transduction: Advanced Drive Techniques for Optimized Step-and-Settle Response of MEMS Micromirrors,” *IEEE Control Systems*, [36], 48-76, 2016.
4. Sinefeld D, Paudel HP, Ouzounov DG, Bifano TG, Xu C, “Adaptive optics in multiphoton microscopy: comparison of two, three and four photon fluorescence,” *Optics Express*, [23], 31472-31483, 2015.
5. Li J, Beaulieu DR, Paudel H, Barankov R, Bifano TG, Mertz J, “Conjugate adaptive optics in widefield microscopy with an extended-source wavefront sensor,” *Optica*, [2], 682-688, 2015.

6. Paudel HP, Taranto J, Mertz J, Bifano T, "Axial range of conjugate adaptive optics in two-photon microscopy," *Optics Express*, [23], 20849-20857, 2015.
7. Mertz J, Paudel H, Bifano TG, "Field of view advantage of conjugate adaptive optics in microscopy applications," *Applied Optics*, [54], 3498-3506, 2015.
8. Vigil K, Lu Y, Yurt A, Cilingiroglu TB, Bifano TG, Ünlü MS, Goldberg BB, "Integrated Circuit Super-Resolution Failure Analysis with Solid Immersion Lenses," *Electronic Device Failure Analysis*, [16], 26-32, 2014.
9. Lu Y, Bifano T, Unlu S, Goldberg B, "Aberration compensation in aplanatic solid immersion lens microscopy," *Optics Express*, [21], 28189-28197, 2013.
10. Paudel HP, Stockbridge C, Mertz J, Bifano T, "Focusing polychromatic light through strongly scattering media," *Opt. Express*, [21], 17299-17308, 2013.
11. Stockbridge C, Lu Y, Moore J, Hoffman S, Paxman R, Toussaint K, Bifano T, "Focusing through dynamic scattering media," *Opt. Express*, [20], 15086-15092, 2012.
12. Tripathi S, Paxman R, Bifano T, Toussaint KC, "Vector transmission matrix for the polarization behavior of light propagation in highly scattering media," *Opt. Express*, [20], 16067-16076, 2012.
13. Lu Y, Stockbridge CR, Hoffman SM, Bifano TG, "Variable zoom system with aberration correction capability," *Journal of Modern Optics*, 1-7, 2012
14. Goldberg BB, Yurt A, Lu Y, Ramsay E, Koklu FH, Mertz J, Bifano TG, Ünlü MS, "Chromatic and spherical aberration correction for silicon aplanatic solid immersion lens for fault isolation and photon emission microscopy of integrated circuits," *Microelectronic Reliability*, [51], 1637-1639, 2011
15. Bifano T, "Adaptive imaging: MEMS deformable mirrors," *Nature Photonics*, [5], 21-23, 2011
16. Diouf A, Stewart JB, Cornelissen SA, Bifano TG, "Development of Through-Wafer Interconnects for MEMS Deformable Mirrors," *International Journal of Optomechatronics*, [4], 237 - 245, 2010
17. Vogel C, Tyler G, Lu Y, Bifano T, Conan R, Blain C, "Modeling and parameter estimation for point-actuated continuous-facesheet deformable mirrors," *J. Opt. Soc. Am. A*, [27], A56-A63, 2010
18. Diouf A, Legendre AP, Stewart JB, Bifano TG, Lu Y, "Open-loop shape control for continuous microelectromechanical system deformable mirror," *Appl. Opt.*, [49], G148-G154, 2010
19. Cornelissen, S. A., Bierden, P. A., Bifano, T. G., Lam, C. V., "4096-element continuous face-sheet MEMS deformable mirror for high-contrast imaging," *Journal of Micro/Nanolithography, MEMS and MOEMS* 8, pp. 031308-031308, 2009
20. 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
21. 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
22. 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
23. 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
24. 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

25. 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
26. 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
27. 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
28. 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
29. 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
30. 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
31. 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
32. 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
33. Weyrauch T., Vorontsov M. A., Bifano T. G., Hammer J. A., Cohen M., and Cauwenberghs G., "Microscale adaptive optics: wavefront control with a μ -mirror array and a VLSI stochastic gradient descent controller," Applied Optics, [40] 24 pp. 4243-4253, 2001
34. 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
35. 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
36. 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
37. 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
38. 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
39. 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
40. 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
41. Bifano, T. G., Mali, R., Perreault, J., Dorton, K., Vandelli, N, Horenstein, M., and Castanon, D., "Continuous membrane, surface micromachined silicon deformable mirror," Optical Engineering [36]5, pp. 1354-1360, 1997

42. 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
43. 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
44. 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
45. 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
46. 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
47. Drueding, T., Bifano, T. G., and Fawcett, S. C., "Contouring Algorithm for Ion Figuring," *J. Precision Eng'g*, [17]1, pp. 10-21, 1995
48. 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
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51. 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
52. 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
53. 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
54. 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
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56. 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
57. 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
58. Bifano, T. G., and Dow, T. A., "Real Time Control of Spindle Runout," *Optical Engineering* [24]5, pp. 888-892, 1985