

Thomas Bifano

Director, Boston University Photonics Center
Professor of Mechanical Engineering
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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 (3) 2003, 2009, 2010
Bepi Colombo Prize 2009

Research

Areas of interest
Microelectromechanical Systems (MEMS); Optomechanical devices; Deformable mirrors; Manufacturing of optical components; Adaptive optics
Funding
1/88 – 7/13: as PI: \$40.3MM, as Co-PI: \$9.2MM

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

Member, Army Science Board 2011-2014
Board of Advisors, Schott AG 2009-2012
SPIE Technical Program Chair, 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

University Service

Director, Boston University Photonics Center	2006 – present
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, Appt., Tenure, and Promotion Policy Comm.	2003-2004
Presidential University Graduate Fellowship Committee	1994-1999
Faculty advisor to "In Achord," BU a cappella singing group	1993-1998
Faculty advisor to engineering residence hall (Claffin 11)	1990-1995
Director, Precision Engineering Research Laboratory (BU-PERL)	1990 – present
Director, Aerospace/Mechanical Eng. Graduate Programs	1988-1991

Synergistic Activities

Director, Boston University Photonics Center.

Serve as PI for \$30MM in Center external funding for programs in education, scholarly research and development of advanced photonic device prototypes. Direct core facility and academic center of excellence comprised of forty faculty members, eighty graduate students, and eight staff members from ten academic departments. Manage a state-of-the-art facility that includes more than a dozen special-purpose and shared research laboratories and a large business incubator.

Collaborators and Affiliations

Collaborators or Co-authors: Kimani Toussaint, UIUC, Jason Fleischer, Princeton Univ., Richard Paxman, General Dynamics Corporation, Stephen Burns, University of Indiana, Alex Cable, Thorlabs Corporation, Charles Lin, Massachusetts General Hospital, Don Gavel, University of California at Santa Cruz

Graduate Advisors and Postdoctoral Sponsors: Thomas Dow, NC State University Ron Scattergood, NC State University

Graduate Students (last seven years): Yang Lu, PhD, 2014, Andrew Legendre, MS 2010, now with Sensada Inc., Alioune Diouf, PhD 2009, now with Intel, Inc., Yaopeng Zhou, PhD 2008, now with Abbott Industries, Inc., Jason Stewart, PhD 2008, now with MIT Lincoln Laboratory, DJ Kim, PhD 2008, now with Boston University, Michael Gingras, MS 2008, now with Pixtronix, Inc, Janice Castillo, MS 2008, now with MIT Lincoln Laboratory, JH Kim, PhD 2007, now with Block MEMS, Inc

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

Journal Publications

1. Lu Y, Bifano T, Unlu S, Goldberg B, "Aberration compensation in aplanatic solid immersion lens microscopy," *Optics Express*, [21], 28189-28197, 2013.
2. Paudel HP, Stockbridge C, Mertz J, Bifano T, "Focusing polychromatic light through strongly scattering media," *Opt. Express*, [21], 17299-17308, 2013.
3. 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.
4. 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.
5. Lu Y, Stockbridge CR, Hoffman SM, Bifano TG, "Variable zoom system with aberration correction capability," *Journal of Modern Optics*, 1-7, 2012
6. 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
7. Bifano T, "Adaptive imaging: MEMS deformable mirrors," *Nature Photonics*, [5], 21-23, 2011
8. 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
9. 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
10. 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
11. 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
12. 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
13. 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
14. 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
15. 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
16. 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
17. 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

18. 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
19. 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
20. 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
21. 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
22. 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
23. 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
24. 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
25. 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
26. 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
27. 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
28. 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
29. 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
30. 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
31. 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
32. 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
33. 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
34. 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
35. 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

36. 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
37. 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
38. 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
39. Drueding, T., Bifano, T. G., and Fawcett, S. C., "Contouring Algorithm for Ion Figuring," *J. Precision Eng'g*, [17]1, pp. 10-21, 1995
40. 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
41. 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
42. 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
43. 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
44. 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
45. 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
46. 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
47. 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
48. 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
49. 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
50. Bifano, T. G., and Dow, T. A., "Real Time Control of Spindle Runout," *Optical Engineering* [24]5, pp. 888-892, 1985

Conference Publications

1. Bifano T, Stockbridge C, Lu Y, Moore J, Hoffman S, Toussaint K, Paxman R, "Focusing through dynamic disordered media using a MEMS spatial light modulator," *Computational Optical Sensing and Imaging*, Optical Society of America, CTu4B.5, (2012).
2. Bifano T, Lu Y, Stockbridge C, Berliner A, Moore J, Paxman R, Tripathi S, Toussaint K, "MEMS spatial light modulators for controlled optical transmission through nearly opaque materials," San Francisco, California, USA, SPIE, [8253], 82530L-82539, (2012).
3. Cornelissen SA, Bifano TG, Bierden PA, "MEMS deformable mirror actuators with enhanced reliability," San Francisco, California, USA, SPIE, [8253], 825306-825307, (2012).
4. Sun W, Lu Y, Stewart JB, Bifano TG, Lin CP, "Critical considerations of pupil alignment to achieve open-loop control of MEMS deformable mirror in nonlinear laser scanning

- fluorescence microscopy,” San Francisco, California, USA, SPIE, [8253], 82530H-82537, (2012).
5. Lu Y, Ramsay E, Stockbridge CR, Yurt A, Koklu FH, Bifano TG, Unlu MS, Goldberg BB, “Spherical aberration correction in aplanatic solid immersion lens imaging using a MEMS deformable mirror,” 23rd European Symposium on the Reliability of Electron Devices, Failure Physics and Analysis (ESREF) Cagliari, ITALY Date: OCT 01-05, (2012).
 6. Mendillo CB, Hicks BA, Cook TA, Bifano TG, Content DA, Lane BF, Levine BM, Rabin D, Rao SR, Samuele R, Schmidlin E, Shao M, Wallace JK, Chakrabarti S, “PICTURE: a sounding rocket experiment for direct imaging of an extrasolar planetary environment,” Space Telescopes and Instrumentation 2012: Optical, Infrared, and Millimeter Wave, Amsterdam, , Netherlands, SPIE, [8442], 84420E-84420E, (2012).
 7. Zhou Y, Bifano T, Lin C, “Adaptive optics two-photon scanning laser fluorescence microscopy,” MEMS Adaptive Optics V, San Francisco, CA, SPIE, [7931], H1-8, (2011).
 8. Lu Y, Hoffman SM, Stockbridge CR, LeGendre AP, Stewart JB, Bifano TG, “Polymorphic optical zoom with MEMS DMs,” MEMS Adaptive Optics V, San Francisco, CA, SPIE, [7931], D1-7, (2011).
 9. Horenstein MN, Sumner R, Miller P, Bifano T, Stewart J, Cornelissen S, “Ultra-low-power multiplexed electronic driver for high resolution deformable mirror systems,” MOEMS and Miniaturized Systems X, San Francisco, CA, SPIE, [7930], M1-8, (2011).
 10. Cornelissen SA, Hartzell AL, Stewart JB, Bifano TG, Bierden PA, “MEMS deformable mirrors for astronomical adaptive optics,” Adaptive Optics Systems II, San Diego, California, USA, SPIE, [7736], 77362D-77361, (2010).
 11. Bifano T, “Shaping light: MOEMS deformable mirrors for microscopes and telescopes,” MEMS Adaptive Optics IV, San Francisco, California, USA, SPIE, [7595], 759502-759508, (2010).
 12. Diouf A, Bifano TG, Legendre AP, Lu Y, Stewart JB, “Open loop control on large stroke MEMS deformable mirrors,” MEMS Adaptive Optics IV, San Francisco, California, USA, SPIE, [7595], 75950D-75957, (2010).
 13. Diouf A, Bifano TG, Stewart JB, Cornelissen S, Bierden P, “Through-wafer interconnects for high degree of freedom MEMS deformable mirrors,” MEMS Adaptive Optics IV, San Francisco, California, USA, SPIE, [7595], 75950N-75912, (2010).
 14. Chu KK, Leray A, Bifano TG, Mertz J, “Two-photon fluorescence microscopy with differential aberration imaging,” SPIE MEMS Adaptive Optics III, San Jose, CA, USA, SPIE, [7209], 720903-720905, (2009).
 15. Bifano T, Schatzberg L, Stewart J, Cornelissen S, ASME, “MEMS Modulated retroreflectors for secure optical communication,” Proceedings of the Asme International Mechanical Engineering Congress and Exposition, Vol 13, Pts a and B, New York, Amer Soc Mechanical Engineers, 395-399, (2009).
 16. Ziph-Schatzberg L, Bifano T, Cornelissen S, Stewart J, Bleier Z, “Deformable MEMS mirrors in secure optical communication system,” Micro- and Nanotechnology Sensors, Systems, and Applications, Orlando, FL, USA, SPIE, [7318], 73180T-73112, (2009).
 17. Ziph-Schatzberg L, Bifano T, Cornelissen S, Stewart J, Bleier Z, “Secure optical communication system utilizing deformable MEMS mirrors,” SPIE MEMS Adaptive Optics III, San Jose, CA, USA, SPIE, [7209], 72090C-72015, (2009).
 18. Chu K, Bifano Thomas G, Jerome M, “Two-Photon Differential Aberration Imaging Using a Modulating Retroreflector Mirror,” Novel Techniques in Microscopy, Optical Society of America, NMD3, (2009).
 19. Chu K, Bifano TG, Mertz J, “Improvements in Two-Photon Fluorescence Microscopy,” Frontiers in Optics, Optical Society of America, FWA2, (2009).

20. Bifano T, "MEMS Wavefront Correctors," Adaptive Optics: Methods, Analysis and Applications, Optical Society of America, AOTD1, (2009).
21. 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
22. 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
23. Bifano, T. G. Bierden, P., and Cornelissen, S. A. "MEMS deformable mirrors for space and defense applications," Proc. SPIE 6959, p.695914 2008
24. Bifano, T. G., Stewart, J. and Diouf, A., "Precise open-loop control of MEMS deformable mirror shape," Proc. SPIE 6888, p.68880P, Jan. 2008
25. Castillo, J., and Bifano, T. G., "Adaptive optics calibration for a wide-field microscope," Proc. SPIE 6888, p. 68880E Jan. 2008
26. 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
27. Bifano, T., Schatzberg, L., Stewart, J., and Cornelissen, S., "MEMS Modulated retroreflector for secure optical communication," Proceedings of IMECE2008, ASME International Mechanical Engineering Congress and Exposition, Boston, Massachusetts, paper # IMECE2008-66795 Nov., 2008
29. 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
30. 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
31. 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
32. 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
33. 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
34. 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
35. 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
36. 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
37. 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
 38. 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
 39. 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
 40. 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
 41. 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
 42. 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
 43. 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
 44. 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
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