Thomas Bifano

Director, Boston University Photonics Center
Professor, Department of Mechanical Engineering, Boston University

8 St. Mary's Street, Boston, MA 02215 | 617-314-4083
tgb@bu.edu | bifanolab.website

EDUCATION

1988	**Ph.D., Mechanical Engineering**, North Carolina State University *Dissertation: "Ductile-Regime Grinding of Brittle Materials." Advisor: Thomas A. Dow*
1983	**M.S., Mechanical Engineering & Materials Science**, Duke University
1980	**B.S., Mechanical Engineering & Materials Science**, Duke University

ACADEMIC AND PROFESSIONAL APPOINTMENTS

2006–present	**Director**, Photonics Center, Boston University
1999–present	**Professor**, Department of Mechanical Engineering, Boston University
2024–2025	**Vice President and Associate Provost ad interim for Research**, Boston University
1999–2025	**Co-founder and Chief Technology Officer**, Boston Micromachines Corporation, Cambridge, MA
1999–2006	**Professor and Chair**, Department of Manufacturing Engineering, Boston University
1995–2000	**President**, Prism Corporation, Boston, MA
1994–1999	**Associate Professor**, Department of Aerospace and Mechanical Engineering, Boston University
1988–1994	**Assistant Professor**, Department of Aerospace and Mechanical Engineering, Boston University

RESEARCH INTERESTS

Microelectromechanical systems (MEMS); optomechanical devices; deformable mirrors; manufacturing of optical components; adaptive optics; microscopy; tissue engineering.

LEADERSHIP HIGHLIGHTS

Director, Boston University Photonics Center. Directs this core facility and academic center of excellence, comprising fifty faculty members and fifteen staff members from eight academic departments. Leads Center programs in education, scholarly research, and technology development, and manages a state-of-the-art facility that includes more than a dozen special-purpose and shared research laboratories and a Business Innovation Center that has housed many startups and university spin-offs, including a biophotonics laboratory funded by the Massachusetts Life Sciences Center. Secured a $500K SPIE endowment gift, matched by Boston University, to establish the $1M SPIE–Boston University Scholarship in Photonics.

Co-founder, Boston Micromachines Corporation. Served as Chief Technology Officer for 26 years (1999–2025) of this university spin-off, formed to commercialize the MEMS deformable mirror technology developed in the Bifano laboratory. The company has sold about 1,600 MEMS deformable mirrors to about 300 customers, with total sales of about $65M. Its mirrors range from compact catalog devices to 4,096-actuator mirrors for astronomy, used in instruments including the Gemini Planet Imager and Subaru SCExAO and in laser communications, retinal imaging, and super-resolution microscopy systems.

HONORS AND AWARDS

2024	Boston University Innovator of the Year
2013	Distinguished Scholar Award, Boston University College of Engineering
2010	R&D 100 Award: MEMS-based adaptive optics optical coherence tomography
2009	Bepi Colombo Prize (€50,000), CISAS "G. Colombo," University of Padua, for achievements in research, innovation, and technology transfer
2007	R&D 100 Award: MEMS-based adaptive optics scanning laser ophthalmoscope (MAOSLO)
2003	R&D 100 Award: MEMS-based adaptive optics phoropter (MAOP)

SELECTED GRANTS AND SPONSORED RESEARCH

2025–2030	**PI** (**Boston University**), "Preparing Future Bioengineers for Careers in Biotechnology and Biomanufacturing," NSF Research Traineeship Institutional Partnership Pilot (NRT-IPP), Wentworth Institute of Technology–Boston University; $4.49M (lead PI: A. Khabari, Wentworth)
2022	**PI**, "Acquisition of a Spinning Disk Confocal Super-Resolution Microscope for Transcriptomics Research at Boston University," NSF Major Research Instrumentation; $615K
2017–2027	**Imaging Thrust Leader**, NSF Engineering Research Center for Directed Multiscale Assembly of Cellular Metamaterials with Nanoscale Precision (CELL-MET); also leads Budget and Strategy; $40M over ten years (PI: D. J. Bishop)
2016–2021	**PI**, "NRT-UtB: Understanding the Brain: Neurophotonics," NSF Research Traineeship; $2.93M; 21 doctoral fellows and 77 trainees
2011–2018	**PI and Founding Director**, NSF Industry/University Cooperative Research Center for Biophotonic Sensors and Systems (CBSS), Boston University–UC Davis; approximately $500K per year in NSF and industry-membership funding; Phase II awarded 2017
2005–2012	**PI**, "Photonics Research and Technology Insertion," U.S. Army Research Laboratory cooperative agreement, Boston University Photonics Center; more than $30M; transitioned the RedOwl sniper-detection and COBRA biological-detection systems

PATENTS

2026	High throughput screening system for engineered cardiac tissues, US 12,436,317
2022	Reverberation microscopy systems and methods, US 11,226,474
2020	Reverberation microscopy systems and methods, US 10,678,037
2019	Solid immersion microscopy system with deformable mirror for correction of aberrations, US 10,175,476 B2
2018	Adaptive optics for imaging through highly scattering media in oil reservoir applications, US 10,018,817
2011	MEMS-based retroreflector, US 7,929,195
2005	Ion beam modification of residual stress gradients in thin film polycrystalline silicon membranes, US 6,929,721
2004	Micro valve arrays for fluid flow control, US 6,705,345
2003	MEMS-based spatial light modulator with integrated electronics, US 6,529,311
1998	Process for manufacturing optical data storage disk stamper, US 5,783,371

PROFESSIONAL SERVICE

2015–present	**Technical Program Chair**, SPIE Adaptive Optics and Wavefront Control for Biosystems
July 2014	**Chair**, NSF Workshop on Noninvasive Brain Imaging, Arlington, VA
March 2014	**Co-chair (with J. Mertz)**, OSA Incubator Meeting on Controlled Light Propagation through Complex Media
2011–2014	**Member**, Army Science Board
2004–2013	**Technical Program Chair**, SPIE MEMS Adaptive Optics I–IX
2009–2012	**Board of Advisors**, Schott AG
2006–2008	**Associate Editor**, Journal of Micro/Nanolithography, MEMS, and MOEMS
2002–2004	**Associate Editor**, International Journal of Manufacturing Science and Production
2000–2004	**Associate Editor**, SME Journal of Manufacturing Processes
1994–1996	**Board of Directors**, American Society for Precision Engineering (ASPE)
1994, 1995	**Chair**, ASPE Annual and Topical Conferences

PLENARY LECTURES

2011	**Plenary**, OSA Optical MEMS & Nanophotonics, Istanbul, Turkey
2010	**Plenary**, SPIE Photonics West, San Francisco, CA

UNIVERSITY SERVICE

2006–present	Director, Boston University Photonics Center
1990–present	Director, Precision Engineering Research Laboratory (BU-PERL)
2018–present	Chair, University Export Control Committee
2015–present	Member, University Center Directors Committee
2015–present	Member, Research and Scholarly Activities Committee
2024–2025	Vice President and Associate Provost ad interim for Research
2019–2021	Member, University Strategic Planning Task Force
2008–2011	Chair, University Research Council
2005–2006	Chair, Dean Search Committee, College of Engineering
2005–2006	Chair, Provost's Faculty Advisory Committee on Photonics
2003–2004	Chair, Faculty Council Appointment, Tenure, and Promotion Policy Committee
1994–1999	Member, Presidential University Graduate Fellowship Committee
1988–1991	Director, Aerospace and Mechanical Engineering Graduate Programs
1990–1995	Faculty Advisor, Engineering Residence Hall (Claflin 11)
1993–1995	Faculty Advisor, "In Achord," BU a cappella singing group

JOURNAL PUBLICATIONS

82. Li, C., Le, Q., Kimura, J. O., Zhao, B., Li, Y., Zhao, J., **Bifano, T.**, Weissbourd, B., Ngo, J. T. & Mertz, J. Superresolution imaging of live samples by centroid reassignment microscopy. *Nature Methods* (accepted, 2026). Preprint: *bioRxiv*. doi.org/10.1101/2025.08.03.668310

81. Hu, R., Varela, C. E., Karakan, M. Ç., Sanchez, F., Wolking, B., Chen, C. S. & **Bifano, T. G.** A biophysical platform for electromechanical stimulation of engineered cardiac tissues. *bioRxiv* (2026). doi.org/10.64898/2026.08.31.747584

80. Yang, Z., Li, M., Xie, X., Chen, A., **Bifano, T. G.** & Zhang, X. Physics-aware machine-learning-driven inverse design of broadband ultra-open acoustic metamaterials. *Advanced Science* **13**, e76894 (2026). doi.org/10.1002/advs.76894

79. Liu, X., Yi, A., **Bifano, T.** & Wu, Y. Editorial: Advanced fabrication techniques for high-precision optical components. *Advanced Optical Technologies* **15** (2026). doi.org/10.3389/aot.2026.1837544

78. Man, W. & **Bifano, T.** Electromagnetic deformable mirror fabricated using silicon micromachining and stress-resilient assembly. *Advanced Optical Technologies* **14** (2025). doi.org/10.3389/aot.2025.1511907

77. Ewoldt, J. K., DePalma, S. J., Jewett, M. E., Karakan, M. Ç., Lin, Y.-M., Mir Hashemian, P., Gao, X., Lou, L., McLellan, M. A., Tabares, J., Ma, M., Salazar Coariti, A. C., He, J., Toussaint, K. C., **Bifano, T. G.**, Ramaswamy, S., White, A. E., Agarwal, A., Lejeune, E., Baker, B. M. & Chen, C. S. Induced pluripotent stem cell-derived cardiomyocyte in vitro models: benchmarking progress and ongoing challenges. *Nature Methods* **22**, 24–40 (2024). doi.org/10.1038/s41592-024-02480-7

76. Lou, L., Bacca, N., Ma, M. S., Nautiyal, P., **Bifano, T. G.** & Agarwal, A. Multiscale mechanics of polydimethylsiloxane: A comparison of meso- and micro-cyclic deformation behavior. *Journal of Applied Polymer Science* **141**, e55546 (2024). doi.org/10.1002/app.55546

75. Wu, K., Zhu, X., **Bifano, T. G.**, Anderson, S. W. & Zhang, X. Computational-Design Enabled Wearable and Tunable Metamaterials via Freeform Auxetics for Magnetic Resonance Imaging (Adv. Sci. 26/2024). *Advanced Science* **11**, 2470152 (2024). doi.org/10.1002/advs.202470152

74. Man, W. & **Bifano, T. G.** A design approach to reducing stress and distortion caused by adhesive assembly in micromachined deformable mirrors. *Micromachines* **14**, 740 (2023). doi.org/10.3390/mi14040740

73. Ma, M. S., Sundaram, S., Lou, L., Agarwal, A., Chen, C. S. & **Bifano, T. G.** High throughput screening system for engineered cardiac tissues. *Frontiers in Bioengineering and Biotechnology* **11** (2023). doi.org/10.3389/fbioe.2023.1177688

72. Li, H., Sundaram, S., Hu, R., Lou, L., Sanchez, F., McDonald, W., Agarwal, A., Chen, C. S. & **Bifano, T. G.** Dynamic Control of Contractile Force in Engineered Heart Tissue. *IEEE Transactions on Biomedical Engineering* **70**, 2237–2245 (2023). doi.org/10.1109/TBME.2023.3239594

71. Haber, A. & **Bifano, T.** Dual-update data-driven control of deformable mirrors using Walsh basis functions. *Journal of the Optical Society of America A* **39**, 459–469 (2022). doi.org/10.1364/JOSAA.447879

70. Wu, K., Zhao, X., **Bifano, T. G.**, Anderson, S. W. & Zhang, X. Auxetics-Inspired Tunable Metamaterials for Magnetic Resonance Imaging. *Advanced Materials* **34**, 2109032 (2022). doi.org/10.1002/adma.202109032

69. Sinefeld, D., Xia, F., Wang, M., Wang, T., Wu, C., Yang, X., Paudel, H. P., Ouzounov, D. G., **Bifano, T. G.** & Xu, C. Three-Photon Adaptive Optics for Mouse Brain Imaging. *Frontiers in Neuroscience* **16**, 880859 (2022). doi.org/10.3389/fnins.2022.880859

68. Rodríguez, C., Chen, A., Rivera, J. A., Mohr, M. A., Liang, Y., Natan, R. G., Sun, W., Milkie, D. E., **Bifano, T. G.**, Chen, X. & Ji, N. An adaptive optics module for deep tissue multiphoton imaging in vivo. *Nature Methods* **18**, 1259–1264 (2021). doi.org/10.1038/s41592-021-01279-0

67. Haber, A. & **Bifano, T.** General approach to precise deformable mirror control. *Optics Express* **29**, 33741–33759 (2021). doi.org/10.1364/OE.439306

66. Chen, C., Huang, Y., Wu, K., **Bifano, T. G.**, Anderson, S. W., Zhao, X. & Zhang, X. Polarization insensitive, metamaterial absorber-enhanced long-wave infrared detector. *Optics Express* **28**, 28843–28857 (2020). doi.org/10.1364/OE.403105

65. Zhao, X., Wu, K., Chen, C., **Bifano, T. G.**, Anderson, S. W. & Zhang, X. Nonreciprocal Magnetic Coupling Using Nonlinear Meta-Atoms. *Advanced Science* **7**, 2001443 (2020). doi.org/10.1002/advs.202001443

64. Lin, P., Ni, H., Li, H., Vickers, N. A., Tan, Y., Gong, R., **Bifano, T.** & Cheng, J.-X. Volumetric chemical imaging in vivo by a remote-focusing stimulated Raman scattering microscope. *Optics Express* **28**, 30210–30221 (2020). doi.org/10.1364/OE.404869

63. Beaulieu, D. R., Davison, I. G., Kılıç, K., **Bifano, T. G.** & Mertz, J. Simultaneous multiplane imaging with reverberation two-photon microscopy. *Nature Methods* **17**, 283–286 (2020). doi.org/10.1038/s41592-019-0728-9

62. Pollock, C., Barrett, L. K., del Corro, P. G., Stange, A., **Bifano, T. G.** & Bishop, D. J. PWM as a Low Cost Method for the Analog Control of MEMS Devices. *Journal of Microelectromechanical Systems* **28**, 245–253 (2019). doi.org/10.1109/JMEMS.2019.2891205

61. Shain, W. J., Vickers, N. A., Li, J., Han, X., **Bifano, T.** & Mertz, J. Axial localization with modulated-illumination extended-depth-of-field microscopy. *Biomedical Optics Express* **9**, 1771–1782 (2018). doi.org/10.1364/BOE.9.001771

60. Ba, C., Shain, W. J., **Bifano, T. G.** & Mertz, J. High-throughput label-free flow cytometry based on matched-filter compressive imaging. *Biomedical Optics Express* **9**, 6145–6153 (2018). doi.org/10.1364/BOE.9.006145

59. Shain, W. J., Vickers, N. A., Negash, A., **Bifano, T.**, Sentenac, A. & Mertz, J. Dual fluorescence-absorption deconvolution applied to extended-depth-of-field microscopy. *Optics Letters* **42**, 4183–4186 (2017). doi.org/10.1364/OL.42.004183

58. Shain, W. J., Vickers, N. A., Goldberg, B. B., **Bifano, T.** & Mertz, J. Extended depth-of-field microscopy with a high-speed deformable mirror. *Optics Letters* **42**, 995–998 (2017). doi.org/10.1364/OL.42.000995

57. Li, J., **Bifano, T. G.** & Mertz, J. Widefield fluorescence microscopy with sensor-based conjugate adaptive optics using oblique back illumination. *Journal of Biomedical Optics* **21** (2016). doi.org/10.1117/1.JBO.21.12.121504

56. Imboden, M., Chang, J., Pollock, C., Lowell, E., Akbulut, M., Morrison, J., Stark, T., **Bifano, T. G.** & Bishop, D. J. 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). doi.org/10.1109/MCS.2016.2584338

55. Sinefeld, D., Paudel, H. P., Ouzounov, D. G., **Bifano, T. G.** & Xu, C. Adaptive optics in multiphoton microscopy: comparison of two, three and four photon fluorescence. *Optics Express* **23**, 31472–31483 (2015). doi.org/10.1364/OE.23.031472

54. Paudel, H. P., Taranto, J., Mertz, J. & **Bifano, T.** Axial range of conjugate adaptive optics in two-photon microscopy. *Optics Express* **23**, 20849–20857 (2015). doi.org/10.1364/OE.23.020849

53. Mertz, J., Paudel, H. & **Bifano, T. G.** Field of view advantage of conjugate adaptive optics in microscopy applications. *Applied Optics* **54**, 3498–3506 (2015). doi.org/10.1364/AO.54.003498

52. Li, J., Beaulieu, D. R., Paudel, H., Barankov, R., **Bifano, T. G.** & Mertz, J. Conjugate adaptive optics in widefield microscopy with an extended-source wavefront sensor. *Optica* **2**, 682–688 (2015). doi.org/10.1364/OPTICA.2.000682

51. Vigil, K., Lu, Y., Yurt, A., Abanoz Cilingiroglu, T., **Bifano, T.**, Ünlü, M. S. & Goldberg, B. Integrated Circuit Super-Resolution Failure Analysis with Solid Immersion Lenses. *Electronic Device Failure Analysis* **16**, 26–32 (2014). doi.org/10.31399/asm.edfa.2014-2.p026

50. Lu, Y., **Bifano, T.**, Ünlü, M. S. & Goldberg, B. Aberration compensation in aplanatic solid immersion lens microscopy. *Optics Express* **21**, 28189–28197 (2013). doi.org/10.1364/OE.21.028189

49. Paudel, H. P., Stockbridge, C., Mertz, J. & **Bifano, T.** Focusing polychromatic light through strongly scattering media. *Optics Express* **21**, 17299–17308 (2013). doi.org/10.1364/OE.21.017299

48. Stockbridge, C., Lu, Y., Moore, J., Hoffman, S., Paxman, R., Toussaint, K. & **Bifano, T.** Focusing through dynamic scattering media. *Optics Express* **20**, 15086–15092 (2012). doi.org/10.1364/OE.20.015086

47. Tripathi, S., Paxman, R., **Bifano, T.** & Toussaint, K. C. Vector transmission matrix for the polarization behavior of light propagation in highly scattering media. *Optics Express* **20**, 16067–16076 (2012). doi.org/10.1364/OE.20.016067

46. Lu, Y., Stockbridge, C. R., Hoffman, S. M. & **Bifano, T. G.** Variable zoom system with aberration correction capability. *Journal of Modern Optics* **59**, 1049–1055 (2012). doi.org/10.1080/09500340.2012.681708

45. Goldberg, B. B., Yurt, A., Lu, Y., Ramsay, E., Koklu, F. H., Mertz, J., **Bifano, T. G.** & Ünlü, M. S. Chromatic and spherical aberration correction for silicon aplanatic solid immersion lens for fault isolation and photon emission microscopy of integrated circuits. *Microelectronics Reliability* **51**, 1637–1639 (2011). doi.org/10.1016/j.microrel.2011.07.047

44. **Bifano, T.** Adaptive imaging: MEMS deformable mirrors. *Nature Photonics* **5**, 21–23 (2011). doi.org/10.1038/nphoton.2010.297

43. Diouf, A., Stewart, J. B., Cornelissen, S. A. & **Bifano, T. G.** Development of Through-Wafer Interconnects for MEMS Deformable Mirrors. *International Journal of Optomechatronics* **4**, 237–245 (2010). doi.org/10.1080/15599612.2010.510589

42. Vogel, C., Tyler, G., Lu, Y., **Bifano, T.**, Conan, R. & Blain, C. Modeling and parameter estimation for point-actuated continuous-facesheet deformable mirrors. *Journal of the Optical Society of America A* **27**, A56–A63 (2010). doi.org/10.1364/JOSAA.27.000A56

41. Diouf, A., Legendre, A. P., Stewart, J. B., **Bifano, T. G.** & Lu, Y. Open-loop shape control for continuous microelectromechanical system deformable mirror. *Applied Optics* **49**, G148–G154 (2010). doi.org/10.1364/AO.49.00g148

40. 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** (2009). doi.org/10.1117/1.3158067

39. Diouf, A., Reimann, G. & **Bifano, T.** Fabrication of implantable microshunt using a novel channel sealing technique. *Journal of Micro/Nanolithography, MEMS, and MOEMS* **7** (2008). doi.org/10.1117/1.2955935

38. Stewart, J. B., Diouf, A., Zhou, Y. & **Bifano, T. G.** Open-loop control of a MEMS deformable mirror for large-amplitude wavefront control. *Journal of the Optical Society of America A* **24**, 3827–3833 (2007). doi.org/10.1364/JOSAA.24.003827

37. 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**, 230–238 (2007). doi.org/10.1016/j.sna.2007.04.051

36. Biss, D. P., Sumorok, D., Burns, S. A., Webb, R. H., Zhou, Y., **Bifano, T. G.**, Cote, D., Veilleux, I., Zamiri, P. & Lin, C. P. In vivo fluorescent imaging of the mouse retina using adaptive optics. *Optics Letters* **32**, 659–661 (2007). doi.org/10.1364/OL.32.000659

35. Chen, F. Y., 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. *Journal of the Acoustical Society of America* **119**, 394–405 (2006). doi.org/10.1121/1.2141296

34. Miller, M., Perrault, J., Parker, G., Bettig, B. & **Bifano, T.** Simple models for piston-type micromirror behavior. *Journal of Micromechanics and Microengineering* **16**, 303–313 (2006). doi.org/10.1088/0960-1317/16/2/015

33. Santiago, L. P. & **Bifano, T. G.** Management of R&D projects under uncertainty: A multidimensional approach to managerial flexibility. *IEEE Transactions on Engineering Management* **52**, 269–280 (2005). doi.org/10.1109/TEM.2005.844465

32. Collier, J., Wroblewski, D. & **Bifano, T.** Development of a rapid-response flow-control system using MEMS microvalve arrays. *Journal of Microelectromechanical Systems* **13**, 912–922 (2004). doi.org/10.1109/JMEMS.2004.838392

31. Webb, R., Albanese, M., Zhou, Y., **Bifano, T.** & Burns, S. Stroke amplifier for deformable mirrors. *Applied Optics* **43**, 5330–5333 (2004). doi.org/10.1364/AO.43.005330

30. Lee, H., Miller, M. & **Bifano, T.** CMOS chip planarization by chemical mechanical polishing for a vertically stacked metal MEMS integration. *Journal of Micromechanics and Microengineering* **14**, 108–115 (2004). doi.org/10.1088/0960-1317/14/1/015

29. Perreault, J. A., **Bifano, T. G.**, Levine, B. M. & Horenstein, M. N. Adaptive optic correction using microelectromechanical deformable mirrors. *Optical Engineering* **41**, 561–566 (2002). doi.org/10.1117/1.1447230

28. **Bifano, T. G.**, Johnson, H. T., Bierden, P. & Mali, R. K. Elimination of stress-induced curvature in thin-film structures. *Journal of Microelectromechanical Systems* **11**, 592–597 (2002). doi.org/10.1109/JMEMS.2002.802908

27. Horenstein, M. N., Pappas, S., Fishov, A. & **Bifano, T. G.** Electrostatic micromirrors for subaperturing in an adaptive optics system. *Journal of Electrostatics* **54**, 321–332 (2002). doi.org/10.1016/S0304-3886(01)00159-0

26. Weyrauch, T., Vorontsov, M. A., **Bifano, T. G.**, Hammer, J. A., Cohen, M. & Cauwenberghs, G. Microscale adaptive optics: wave-front control with a μ-mirror array and a VLSI stochastic gradient descent controller. *Applied Optics* **40**, 4243–4253 (2001). doi.org/10.1364/AO.40.004243

25. Shanbhag, P., Feinberg, M., Sandri, G., Horenstein, M. & **Bifano, T.** Ion-beam machining of millimeter scale optics. *Applied Optics* **39**, 599–611 (2000). doi.org/10.1364/AO.39.000599

24. Horenstein, M. N., Perreault, J. A. & **Bifano, T. G.** Differential capacitive position sensor for planar MEMS structures with vertical motion. *Sensors and Actuators A: Physical* **80**, 53–61 (2000). doi.org/10.1016/S0924-4247(99)00251-4

23. Mali, R. K., **Bifano, T.** & Koester, D. A design-based approach to planarization in multilayer surface micromachining. *Journal of Micromechanics and Microengineering* **9**, 294–299 (1999). doi.org/10.1088/0960-1317/9/4/302

22. Horenstein, M., **Bifano, T.**, Pappas, S., Perreault, J. & Krishnamoorthy-Mali, R. Real time optical correction using electrostatically actuated MEMS devices. *Journal of Electrostatics* **46**, 91–101 (1999). doi.org/10.1016/S0304-3886(99)00015-7

21. **Bifano, T. G.**, Perreault, J., Mali, R. K. & Horenstein, M. N. Microelectromechanical deformable mirrors. *IEEE Journal of Selected Topics in Quantum Electronics* **5**, 83–89 (1999). doi.org/10.1109/2944.748109

20. **Bifano, T.**, Krishnamoorthy, R., Fawcett, H. & Welch, E. Fixed-Load Electrolytic Dressing With Bronze Bonded Grinding Wheels. *Journal of Manufacturing Science and Engineering* **121**, 20–27 (1999). doi.org/10.1115/1.2830570

19. Vandelli, N., Wroblewski, D., Velonis, M. & **Bifano, T.** Development of a MEMS microvalve array for fluid flow control. *Journal of Microelectromechanical Systems* **7**, 395–403 (1998). doi.org/10.1109/84.735347

18. **Bifano, T. G.**, Mali, R. K., Dorton, J. K., Perreault, J., Vandelli, N., Horenstein, M. N. & Castanon, D. A. Continuous-membrane surface-micromachined silicon deformable mirror. *Optical Engineering* **36**, 1354–1360 (1997). doi.org/10.1117/1.601598

17. **Bifano, T. G.**, Fawcett, H. E. & Bierden, P. A. Precision manufacture of optical disc master stampers. *Precision Engineering* **20**, 53–62 (1997). doi.org/10.1016/S0141-6359(97)89592-X

16. **Bifano, T. G.** & Bierden, P. A. Fixed-abrasive grinding of brittle hard-disk substrates. *International Journal of Machine Tools & Manufacture* **37**, 935–946 (1997). doi.org/10.1016/S0890-6955(96)00089-2

15. Horenstein, M. N., **Bifano, T. G.**, Mali, R. K. & Vandelli, N. Electrostatic effects in micromachined actuators for adaptive optics. *Journal of Electrostatics* **42**, 69–81 (1997). doi.org/10.1016/S0304-3886(97)00138-1

14. Mali, R. K., **Bifano, T. G.**, Vandelli, N. & Horenstein, M. N. Development of microelectromechanical deformable mirrors for phase modulation of light. *Optical Engineering* **36**, 542–548 (1997). doi.org/10.1117/1.601599

13. Scagnetti, P. A., Nagem, R. J., Sandri, G. V. H. & **Bifano, T. G.** Stress and Strain Analysis in Molecular Dynamics Simulation of Solids. *Journal of Applied Mechanics* **63**, 450–452 (1996). doi.org/10.1115/1.2788888

12. Drueding, T. W., **Bifano, T. G.** & Fawcett, S. C. Contouring Algorithm for Ion Figuring. *Precision Engineering* **17**, 10–21 (1995). doi.org/10.1016/0141-6359(94)00002-H

11. Drueding, T. W., Fawcett, S. C., Wilson, S. R. & **Bifano, T. G.** Ion beam figuring of small optical components. *Optical Engineering* **34**, 3565–3571 (1995). doi.org/10.1117/12.215648

10. **Bifano, T.**, Yi, Y. & Kahl, W. K. Fixed Abrasive Grinding of CVD SiC Mirrors. *Precision Engineering* **16**, 109–116 (1994). doi.org/10.1016/0141-6359(94)90195-3

9. Fawcett, S. C., Drueding, T. W. & **Bifano, T. G.** Neutral Ion Figuring of Chemical-Vapor-Deposited SiC. *Optical Engineering* **33**, 967–974 (1994). doi.org/10.1117/12.157687

8. **Bifano, T. G.**, Annear, R. & Golini, D. Chemomechanical Effects in Ductile-Regime Machining of Glass. *Principles of Cutting Mechanics: Applications to Ultra-Precision Machining and Grinding*, 71–78 (1993). doi.org/10.1016/0141-6359(93)90106-K

7. **Bifano, T. G.** & Hosler, J. B. Precision Grinding of Ultra-Thin Quartz Wafers. *Journal of Engineering for Industry* **115**, 258–262 (1993). doi.org/10.1115/1.2901658

6. **Bifano, T. G.** & Yi, Y. Acoustic emission as an indicator of material-removal regime in glass micro-machining. *Precision Engineering* **14**, 219–228 (1992). doi.org/10.1016/0141-6359(92)90019-S

5. Scattergood, R. O., Srinivasan, S., **Bifano, T. G.** & Dow, T. A. Effetti di curva-R nella rettifica ed usura dei ceramici (R-curve effects for machining and wear of ceramics). *Ceramica Acta* **3**, 53–64 (1991). bifanolab.website/files/R_Curve_1991.pdf

4. **Bifano, T. G.** & Fawcett, S. C. Specific Grinding Energy as an In-Process Control Variable for Ductile-Regime Grinding. *Precision Engineering* **13**, 256–262 (1991). doi.org/10.1016/0141-6359(91)90003-2

3. **Bifano, T. G.**, Dow, T. A. & Scattergood, R. O. Ductile-Regime Grinding: A New Technology for Machining Brittle Materials. *Journal of Engineering for Industry* **113**, 184–189 (1991). doi.org/10.1115/1.2899676

2. Blake, P., **Bifano, T.**, Dow, T. & Scattergood, R. O. Precision Machining of Ceramic Materials. *American Ceramic Society Bulletin* **67**, 1038 (1988). bifanolab.website/files/precision_machining.pdf

1. **Bifano, T. G.** & Dow, T. A. Real-Time Control of Spindle Runout. *Optical Engineering* **24**, 888–892 (1985). doi.org/10.1117/12.7973594

GRADUATE STUDENTS AND POSTDOCTORAL RESEARCHERS SUPERVISED

Doctoral Students

2026 — Ruifeng Hu, Ph.D., ME
Dissertation: *Electrical and mechanical stimulation of engineered cardiac tissue*

2024 — Wenkuan (Kevin) Man, Ph.D., MSE
Dissertation: *Stress-resilient electromagnetically actuated deformable mirror*

2023 — Marshall Ma, Ph.D., ME
Dissertation: *High-throughput screening system for 3D engineered cardiac tissue*

2020 — Devin Beaulieu, Ph.D., EE
Dissertation: *Reverberation multiphoton microscopy for volumetric imaging in scattering media*

2018 — Will Shain, Ph.D., Physics
Dissertation: *Solutions to linear problems in aberrated optical systems*

2015 — Hari Paudel, Ph.D., EE
Dissertation: *Coherent beam control through inhomogeneous media in multi-photon microscopy*

2014 — Yang Lu, Ph.D., ME
Dissertation: *Adaptive optics wavefront compensation for solid immersion microscopy in backside imaging*

2009 — Alioune Diouf, Ph.D., ME
Dissertation: *Fabrication processes for MEMS deformable mirrors in the next-generation telescope instruments*

2008 Yaopeng Zhou, Ph.D., MfgE
Dissertation: *Adaptive optics two-photon scanning laser fluorescence microscopy for retinal imaging*

2008 Jason Stewart, Ph.D., EE
Dissertation: *Development and control of a new class of segmented deformable mirrors for advanced astronomical imaging applications*

2008 Duk Joong Kim, Ph.D., EE
Dissertation: *Integrated CMOS electronic drivers for large-scale metal MEMS mirror arrays using linearization techniques*

2007 Jin Hong Kim, Ph.D., MfgE
Dissertation: *Manufacture of a reflective spatial light modulator integrated directly onto CMOS electronics*

2005 Julie Perreault, Ph.D., EE
Dissertation: *Development and control of kilopixel MEMS deformable mirrors and spatial light modulators*

1999 Nelsimar Vandelli, Ph.D., ME
Dissertation: *Development of MEMS microvalve arrays for fluid flow control*

1998 Raji Krishnamoorthy Mali, Ph.D., ME
Dissertation: *MEMS deformable mirrors for adaptive optics*

1997 Helen Fawcett, Ph.D., ME
Dissertation: *Precision manufacturing of optical disc stampers*

1995 Thomas Drueding, Ph.D., ME
Dissertation: *Precision ion figuring system for optical components*

1993 Yuan (Allen) Yi, Ph.D., ME
Dissertation: *Ultraprecision grinding of ceramic mirrors*

Master's Students

2016 Devin Beaulieu, M.S., EE
2008 Mike Gingras, M.S., MfgE
2007 Guy Thompson, M.S., MfgE
2005 Stephan Kratz, M.S., MfgE
2005 Yaopeng Zhou, M.S., ME
2003 Marc Albanese, M.S., EE
2002 John Collier, M.S., ME
2001 Clay Reherman, M.S., MfgE
2000 Mirela Bancu, M.S., ME
1999 Prashant Shanbhag, M.S., ME
1994 Paul Bierden, M.S., ME
1993 E. Welch, M.S., ME
1992 Joseph Hosler, M.S., ME

2010 Andrew LeGendre, M.S., ME
2008 Janice Castillo, M.S., EE
2007 Matt Lewis, M.S., ME
2005 Daniel Sumorok, M.S., EE
2004 Gregory Reimann, M.S., MfgE
2002 Thomas Evans, M.S., ME
2002 Steven Cornelissen, M.S., ME
2000 Christopher Hodge, M.S., ME
2000 Dhiraj Malkani, M.S., ME
1999 Michael Feinberg, M.S., ME
1994 Raji Krishnamoorthy Mali, M.S., ME
1992 Paul Scagnetti, M.S., ME
1991 Doug DePiero, M.S., ME

Degree field abbreviations: ME, Mechanical Engineering; EE, Electrical Engineering; MfgE, Manufacturing Engineering; MSE, Materials Science and Engineering.

Postdoctoral Researchers

2001–2002 Hocheol Lee
1998–1999 Nicholas Rosen