

JOSEPH E. FORD

University of California San Diego, Electrical & Computer Engineering
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ACADEMIC DEGREES

<u>Ph.D. Elec. Eng. / Appl. Physics</u>	University of California San Diego	January 1992
<u>M.Sc. Optical Engineering</u>	University of Rochester	May 1986
<u>M.Sc. Physics</u>	University of British Columbia	September 1985
<u>B.Sc. Physics</u>	University of California Los Angeles	June 1983

RESEARCH EXPERIENCE

- 12/02 to ? Associate Professor, UCSD Department of ECE
Founder and head of the Photonic Systems Integration Lab
- 1/02 to 11/02 Sole Proprietor, Modern Optics
Originated tunable filter design, licensed IP to telecom component manufacturer.
- 3/00 to 1/02 Project Director / Chief Scientist, Optical Micro-Machines
Mid-sized telecom startup manufacturing planar and 3D MEMS switches.
- 3/94 to 3/00 Member of Technical Staff, Bell Laboratories, Lucent Technologies
Initiated and lead WDM-MEMS in Advanced Photonics Research Department.
- 6/93 to 3/94 Research Scientist, Call/Recall Corporation
Small startup: 3-D image storage in two-photon organic polymer materials.
- 1/92 to 6/93 Assistant Research Scientist, UCSD Electrical & Computer Engineering Dept.
Started research on polarization-selective computer generated holograms
- 9/86 to 12/91 Research Assistant, UCSD Electrical & Computer Engineering Department
Ph.D.: "*Reconfigurable array interconnection by photorefractive volume holography.*"
- 9/83 to 9/85 Research Assistant, University of British Columbia Physics Department
M.Sc. thesis: "*Investigations into the XeCl excimer laser.*"

MILESTONES

- 1997 Live public demonstration of first MEMS wavelength add/drop switch
(Lucent Bell Labs Technology Showcase, Murray Hill, NJ)
- 2000 Live public demonstration of first MEMS dynamic spectral equalizer
(Lucent/Agere Technology Exhibit, Optical Fiber Communications Conference)
- 2005/6 Live demonstrations of full and sectioned 8-fold imager prototypes
(Shown to the Director of DARPA, Washington DC)

PROFESSIONAL ACTIVITIES

General Co-Chair, 2008 Optical Fiber Communications Conference (upcoming)

Topical Issue Co-Editor, IEEE Journal of Lightwave Technology (Feb. 2007)

Program Co-Chair, 2006 Optical Fiber Communications Conference,

Topical Issue Co-Editor, IEEE Journal of Selected Topics in Quantum Electronic (Feb. 2002)

Conference Co-Chair: First IEEE/LEOS International Conference on Optical MEMS. Kawai, Hawaii (Sept. 2000)

Program Committees, 2002-2004 OSA / IEEE Optical Fiber Communications Conference, 2003 SPIE Conference on Device and Process Technologies for Microelectronics, MEMS, and Photonics, SPIE Asian-Pacific Optical and Wireless Communications, Optical Switching and Integration II, 2003 OSA Topical Meeting on Optics in Computing, 2003 IEEE Design, Test and Integration of MEMS/MOEMS (DTIP), 2002 OSA / IEEE Integrated Photonics Research Conference, 2002 IEEE Symposium on Design, Test, Integration and Packaging of MEMS/MOEMS, SPIE Asia-Pacific Optical and Wireless Communications Conference, IEEE International Conference on Optical MEMS, SPIE 2001 International Symposium on Microelectronics and Micro-Electro-Mechanical Systems, 2001 IEEE Symposium on Design, Test, Integration and Packaging of MEMS / MOEMS, IEEE CPMT & LEOS Workshop on Fiber-Optics, 1999 Optoelectronics, Photonics Assembly, Packaging & Manufacturing Technology, 1998 IEEE/LEOS Summer Topical Meeting on Optical MEMS, 1997 OSA Topical Meeting on Spatial Light Modulators, 1997 IEEE/LEOS Workshop on Interconnections within High-Speed Digital Systems.

Member of the Optical Society of America and IEEE Lasers & Electro-Optics Society

PUBLIC PRESENTATIONS AND ARTICLES

Publications: Author or co-author of more than 100 refereed journal articles and conference presentations, invited talks and panel discussions.

Patents: Author or co-author of 45 issued U.S. Patents on computing, data storage and communications technology.

JOURNAL PUBLICATIONS

1. J. E. Ford, J. Meyer, and H. Houtman, "Measurement of electrical characteristics and electron density in a fast discharge pumped XeCl excimer laser," *Applied Physics Letters* **48**, 1639-1641, 1986.
2. J. E. Ford, Y. Fainman, and S. H. Lee, "Time integrating interferometry using photorefractive fanout," *Optics Letters* **13**, 856-858, 1988.
3. J. E. Ford, Y. Fainman, and S. H. Lee, "Enhanced photorefractive performance from 45°-cut BaTiO₃," *Applied Optics* **28**, 4808-4815, 1989.
4. J. E. Ford, Y. Fainman, and S. H. Lee, "Array interconnection by phase coded optical correlation," *Optics Letters* **15**, 1088-1090, 1990.
5. J. Ma, J. E. Ford, Y. Taketomi, and S. H. Lee, "Moving grating for enhanced holographic recording in SBN:60," *Optics Letters* **16**, 270-272, 1991.
6. R. Paturi, D. T. Lu, J. E. Ford, S. C. Esener, and S. H. Lee, "Parallel algorithms based on expander graphs for optical computing," *Applied Optics* **30**, 917-927, 1991.
7. J. Ma, Y. Taketomi, Y. Fainman, J. E. Ford, S. H. Lee, and Ken'ichi Chino, "Moving grating and dc external field in photorefractive GaP at 633 nm," *Optics Letters* **16**, 1080-1082, 1991.
8. Y. Taketomi, J. E. Ford, H. Sasaki, J. Ma, Y. Fainman, and S. H. Lee, "Incremental recording for photorefractive hologram multiplexing," *Optics Letters* **16**, 1774-1776, 1991.
9. H. Sasaki, Y. Fainman, J. E. Ford, Y. Taketomi, and S. H. Lee, "Dynamic photorefractive optical memory," *Optics Letters* **16**, 1874-1876, 1991.
10. H. Houtman, A. Cheuck, A. Y. Elezzabi, J. E. Ford, M. Laberge, W. Leise, J. Meyer, G. C. Stuart, and Y. Zhu, "High speed circuits for TE discharge lasers and high-voltage applications," *Review of Scientific Instruments* **64**(4), 839-853, 1993.
11. J. E. Ford, Y. Taketomi, D. Bize, R. R. Neurgaonkar, Y. Fainman, and S. H. Lee, "Multiplex holography in SBN:60 with applied field," *Journal of the Optical Society of America A* **9**, 1183-1192, 1992.
12. J. E. Ford, F. Xu, K. Urquhart, and Y. Fainman, "Polarization selective computer generated holograms," *Optics Letters* **18**, 456-458, 1992.
13. H. Takahashi, D. Zaleta, J. Ma, J. Ford, Y. Fainman and S. Lee, "Packaged optical interconnection system based on photorefractive correlation," *Applied Optics* **33**, 2991-2997, 1994.
14. J. E. Ford, Y. Fainman, and S. H. Lee, "Reconfigurable array interconnection by photorefractive correlation," *Applied Optics* **33**, 6363-6377, 1994.
15. J. Ma, B. Catanzaro, J. Ford, Y. Fainman, and S. Lee, "Photorefractive holographic lenses and applications for dynamic focusing and dynamic image shifting," *Applied Optics* **11**(8), 1994.
16. F. Xu, J. Ford, Y. Fainman, "Polarization selective computer generated holograms: Design, fabrication and applications," *Applied Optics* **34**, 256-266, 1995.
17. S. Hunter, C. Solomon, S. Esener, J. Ford, A. Dvornikov, P. Rentzepis, "3-dimensional optical image storage by 2-photon recording," *Optical Memory and Neural Networks* **3**, 261-290, 1994.

18. R. Piyaket, S. Hunter, J. Ford, and S. Esener, "Programmable ultra-short optical pulse delay using an acousto-optic deflector," *Applied Optics* **34**, 1445-1453, 1995.
19. J. E. Ford, F. Xu and Y. Fainman, "Wavelength-selective planar holograms," *Optics Letters* **21**, 80-82 1996.
20. A. V. Krishnamoorthy, A. L. Lentine, K. W. Goossen, J. A. Walker, T. K. Woodward, J. E. Ford, G. F. Aplin, L. A. D'Asaro, S. P. Hui, B. Tseng, R. Leibenguth, D. Kossives, D. Dahringer, L. M. F. Chirovsky and D. A. B. Miller, "3-D Integration of MQW modulators over active submicron CMOS circuits: 375 Mb/s transimpedance receiver-transmitter circuit," *IEEE Photonics Technology Letters* **7**, 1288-1290, 1996.
21. F. Xu, R-C. Tyan, Y. Fainman and J. E. Ford, "Single-substrate birefringent computer generated holograms" *Optics Letters* **21**, 516-518, 1996.
22. A. V. Krishnamoorthy, J. E. Ford, K. W. Goossen, J. A. Walker, A. L. Lentine, S. P. Hui, B. Tseng, L. M. F. Chirovsky, R. Leibenguth, D. Kossives, D. Dahringer, L. A. D'Asaro, F. E. Kiamilev, G. F. Aplin, R. G. Rozier and D. A. B. Miller, "Photonic page buffer based on GaAs MQW modulators bonded directly over active silicon CMOS circuits," *Applied Optics* **35**, 2439-2456, 1996.
23. A. V. Krishnamoorthy, F. Xu, J. E. Ford and Y. Fainman, "Polarization-controlled multistage switch based on polarization-selective birefringent computer generated holograms" *Applied Optics* **36**(5), 997-1010, 1997.
24. F. Xu Y. Fainman, J. E. Ford and A. V. Krishnamoorthy, "Optoelectronic-VLSI packaging with polarization-selective computer generated holograms," *Optics Letters* **22**(14), 1095-1097, 1997.
25. A. V. Krishnamoorthy, R. G. Rozier, J. E. Ford and F. E. Kiamilev, "CMOS static RAM chip with high-speed optical read and write," *IEEE Photonics Technology Letters* **9**(11), pp. 1517-1519, November 1997.
26. J. E. Ford and D. J. DiGiovanni, "1xN fiber bundle scanning switch," *IEEE Photonics Technology Letters* **10**(7), 967-969, July 1998.
27. J. E. Ford, J. A. Walker, D. S. Greywall and K. W. Goossen, "Micromechanical fiber-optic attenuator with 3 microsecond response," *IEEE Journal of Lightwave Technology* **16**(9), 1663-1670, September 1998.
28. J. E. Ford and J. A. Walker, "Dynamic spectral power equalization using micro-optomechanics," *IEEE Photonics Technology Letters* **10**(10), 1440-1442, October 1998
29. J. E. Ford, V. A. Aksyuk, D. J. Bishop and J. A. Walker, "Wavelength add/drop switching using tilting micromirrors," *IEEE Journal of Lightwave Technology* **17**(5), 904-911, May 1999.
30. A. V. Krishnamoorthy, J. E. Ford, F. E. Kiamilev, R. Rozier, K. Goossen, B. Tseng, J. Walker, J. Cunningham, W. Y. Jan and M. C. Nuss, "The AMOEBA network: an optoelectronic switch for multiprocessor networking using dense-WDM," *IEEE Journal of Selected Topics in Quantum Electronics* **5**(2), 261-275, March 1999.
31. C. K. Madsen, J. A. Walker, J. E. Ford. K. W. Goossen, T. N. Nielson and G. Lenz, "A tunable dispersion compensating MEMS all-pass filter," *IEEE Photonics Technology Letters* **12**(6), pp. 651-653, June 2000.

32. K. W. Goossen, J. A. Walker, D. T. Neilson, J. E. Ford and W. H. Knox, "Micromechanical gain slope compensator for spectrally linear optical power equalization," *IEEE Photonics Technology Letters* **12**(7), pp. 831-833, July 2000.
33. J. E. Ford, K. W. Goossen, J. A. Walker, D. T. Neilson, D. M. Tennant, S. Y. Park and J. W. Sulhoff, "Interference Based Micromechanical Spectral Equalizers" *IEEE Journal of Selected Topics in Quantum Electronics*, **10**(3), pp. 579-587, May-June 2004.
34. J. A. Dobrowolski, J. E. Ford, B. T. Sullivan, L. Lu, and N. R. Osborne, "Conducting antireflection coatings with low polarization dependent loss for telecommunication applications," *Optics Express* **12**(25), pp. 6258-6269, 2004.
35. Q. Lin, R. Jiang, C. F. Marki, C. J. McKinstrie, R. Jopson, J. Ford, G. P. Agraway and S. Radic, "40 Gb/s Optical Switching and Wavelength Multicasting in a Two-Pump Parametric Device," *IEEE Photonics Technology Letters* **17**, pp. 2376-2378, Nov. 2005 (NEW)
36. T. K. Chan and J. E. Ford, "Retro-reflecting optical modulator using a MEMS deformable micro-mirror array," *IEEE Journal of Lightwave Technology* **24**(1), pp. 516 – 525, Jan. 2006
37. G. Wilson, C-J Chen, P. Gooding and J. E. Ford, "Spectral passband filter with independently variable center wavelength and bandwidth," *IEEE Photonics Technology Letters* **18**, pp. 1660-1662, Aug. 2006
38. R. Jiang, R. Saperstein, N. Alic, M. Nezhad, C. McKinstrie, J. Ford, Y. Fainman and S. Radic, "Parametric Wavelength Conversion from Conventional Near-Infrared to Visible Band" *IEEE Photonics Technology Letters* **18**(23), 2006 pp. 2445 – 2447, Dec. 2006
39. M. C. Wu, O. Solgaard, and J. E. Ford, "Optical MEMS for Lightwave Communication," *Journal of Selected Topics in Quantum Electronics* **12**(24), pp. 4433-4454, Dec. 2006
40. R. Jiang; R. E. Saperstein, N. Alic, M. Nezhad, C. J. McKinstrie, J. E. Ford, Y. Fainman, and S. Radic, "Continuous-Wave Band Translation Between the Near-Infrared and Visible Spectral Ranges," *IEEE Journal of Lightwave Technology* **25**(1), pp.58-66, Jan. 2007
41. E. J. Tremblay, R. A. Stack, R. L. Morrison and J. E. Ford, "Ultra-Thin Cameras Using Annular Folded Optics," *Applied Optics* **46**, pp.463-471, Feb. 2007
42. T. K. Chan, R. Jiang, S. Radic, and J. E. Ford, "1092 Channel Two-Dimensional Array Demultiplexer for Ultra-High Bandwidth Systems," *IEEE Journal of Lightwave Technology* **25**(3), pp.719-725, Mar. 2007
43. E. J. Tremblay, J. Rutkowski, I. Tamayo, R. A. Stack, R. L. Morrison, M. A. Neifeld, Y. Fainman, and J. E. Ford, "Extended Depth of Field in Annular Folded Imagers By Wavefront Coding," to be published in *Applied Optics* 2008

UNITED STATES PATENTS

1. "Dual-Scale Topology Optoelectronic Matrix Algebraic Processing System"
S. Esener, J. Ford, A. Krishnamoorthy and G. Marsden (#5,321,639)
2. "Fiber Optic Switching Device and Method Using Free Space Scanning"
J. Ford (#5,621,829)
3. "Attenuation Device for Wavelength Multiplexed Optical Fiber Communications"
J. Ford, D. Miller, M. Nuss and J. Walker (#5,745,271)
4. "Wafer Level Integration of an Optical Modulator and III-V Photodetector"
J. Cunningham, J. Ford, K. Goossen and J. Walker (#5,784,187)
5. "Techniques for Modulating Signals in Optical Communications"
J. Ford and J. Walker (#5,796,880)
6. "Optical Packaging Assembly for Reflective Devices"
D. Bishop, J. Ford, M. MacDonald, R. Ruel and J. Walker (#5,815,616)
7. "Fourier-Plane Photonics Package"
M. Feuer and J. Ford (#5,857,048)
8. "Multi-Fiber Optical Cable"
D. DiGiovanni and J. Ford (#5,898,811)
9. "Level Setting Attenuator"
J. Ford and K. Goossen (#5,900,983)
10. "Fiber Optic Network Using Space and Wavelength Multiplexed Data Channel Arrays"
(covers parallel switch hardware)
J. Ford, W. Knox, A. Krishnamoorthy, D. Miller and M. Nuss (#5,912,751)
11. "WDM Source for Access Applications"
D. Bishop, J. Ford and J. Walker (#5,936,752)
12. "Optical Packaging Assembly for Transmissive Devices"
D. Bishop, J. Ford, M. MacDonald, R. Ruel and J. Walker (#5,940,558)
13. "Micro-Mechanical, Anti-Reflection, Switched Optical Modulator Array & Fab. Method"
J. Ford, K. Goossen and J. Walker (#5,943,158)
14. "Free Space Optical Bypass-Exchange Switch"
V. Aksyuk, D. Bishop, J. Ford and J. Walker (#5,943,454)
15. "Multiple Wavelength Optical Transceiver"
J. Ford, J. Walker and T. Wood (#5,963,684)
16. "Retro-Reflecting Electroabsorption Optical Modulators"
J. Ford, A. Lentine and T. Woodward (#5,966,234)
17. "Article Comprising a Wavelength-Selective Add-Drop Multiplexer"
V. Aksyuk, D. Bishop, J. Ford and R. Slusher (#5,974,207)
18. "Methods and Arrangements for Duplex Fiber Handling"
J. Ford and M. Feuer (#5,980,117)
19. Method And Apparatus for a Network Comprising a Fourier Plane Photonics Package"

- J. Ford and M. Feuer (#5,991,058)
20. "Free-Space Optical Signal Switch Arrangement"
M. Fatehi and J. Ford (#6,002,818)
 21. "Fiber Optic Network Using Space and Wavelength Multiplexed Data Channel Arrays"
(covers parallel transceiver hardware)
J. Ford, W. Knox, A. Krishnamoorthy, D. Miller and M. Nuss (#6,023,361)
 22. "Optical Receiver with Integrated Variable Attenuator"
J. Ford and J. Walker (#6,066,844)
 23. "Fiber Optic Network Using Space and Wavelength Multiplexed Data Channel Arrays"
(covers network design & operation)
J. Ford, W. Knox, A. Krishnamoorthy, D. Miller and M. Nuss (#6,097,519)
 24. "Methods & Apparatus for Monitoring & Controlling Optical Modulator Signal Quality"
K. Devenport, J. Ford, A. Krishnamoorthy and T. Woodward (#6,108,119)
 25. "Micromechanical Membrane Tilt-Mirror Switch"
J. Ford and J. Walker (#6,178,033)
 26. "Variable Single-Mode Attenuators By Spatial Interference"
E. Bergmann, J. Ford and J. Walker (#6,178,284)
 27. "Reconfigurable Wavelength Division Multiplex Add/Drop Device Using Micromirrors"
V. Aksyuk, D. Bishop, J. Ford and J. Walker (#6,204,946)
 28. "Integrated Opto-Mechanical Apparatus"
J. Ford (#6,212,314)
 29. "Free-Space Arrayed Waveguide Router"
C. Dragone, J. Ford (#6,263,127)
 30. "Multiple collimated-beam photonics package"
J. Ford (#6,272,272)
 31. "Method and device for aligning optical fibers in an optical fiber array"
J. Ford (#6,304,694)
 32. "*Optomechanical platform*"
J. Ford (#6,307,657)
 33. "*Micro-opto mechanical multistage interconnection switch*"
J. Ford (#6,317,530)
 34. "*Dispersed image inverting wavelength multiplexer*"
J. Ford, D. Neilson (#6,337,935)
 35. "*Automatic level control circuit for optical system*"
J. Ford, W. Knox (#6,392,769)
 36. "*Optical network using remote optical powering of optoelectronic switch*"
J. Ford, W. Knox, A. Krishnamoorthy, M. Nuss (#6,567,195, May 2003)
 37. "*Reduction of modal noise in step-index fiber bundles*"
J. Ford, A. Krishnamoorthy (#6,577,420, June 10, 2003)

38. *“Wavelength division multiplexed optical communication system having tunable multi-channel dispersion compensating filters”*
J. Ford, K. Goossen, C. Madsen, J. Walker (#6,631,246, October 2003)
39. *“Free-space multi-port wavelength router with broad wavelength passbands”*
J. Ford, D. Neilson (#6,634,810, October 2003)
40. *“Optoelectronic network interface device”*
J. Ford, A. Krishnamoorthy (#6,647,010, November 2003)
41. *“Electromechanical optical modulator providing stray light control”*
J. Ford, J. V. Gates, G. E. Henein, D. A. Ramsey, J. A. Walker (#6,704,130, March 2004)
42. *“Optical MEMS switch with imaging system”*
J. Ford, R. C. Giles, D. T. Neilson, R. Ryf (#6,704,476, March 2004)
43. *“Article comprising a tunable filter”*
J. Ford, K. Goossen, J. A. Walker (#6,718,086, April 2004)
44. *“Method & apparatus for spatial-shift wavelength multiplexing in communication systems”*
J. E. Ford, D. T. Neilson (#6,763,163, July 2004)
45. *“Tunable spectral filter”*
J. E. Ford, G. Wilson (#6,891,676, May 10, 2005)