

# Mark Lucente

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## Experience

**Zebra Imaging, Inc.** (Austin, TX USA) [www.zebraimaging.com](http://www.zebraimaging.com) **2005 - present**  
**Director, Display Products; Chief Scientist, Dynamic Holography:** Leading product line management and development of dynamic 3D holographic display technology and products. Responsible for ~\$6M each year, 12+ engineers and support staff, external customer/partner relationships. Technologies include modulation (e.g., LED, liquid crystal), custom optics, computer graphics and high-end computation hardware/software. Applications include geospatial visualization (e.g., battle-space management), scientific visualization (e.g., medical, geoseismic), financial analysis, multi-player online gaming. Corporate strategy.

**CLP Research Institute, Ltd.** (Hong Kong) [www.clpgroup.com](http://www.clpgroup.com) **2002 - 2005**  
**Technology Strategist:** Developed and managed research program focused on customer-side technologies for CLP Holdings, a group of energy services and investment companies. Created strategic partnerships with industry and academia to transfer technologies for renewable energy, energy efficiency, and intelligent infrastructure.

**RestaurantTrade, Inc.** (New York, NY USA) [www.averro.com](http://www.averro.com) **2001 - 2002**  
**Vice President of Technology Operations:** Led 20-person team to create software products that provide internetworked business intelligence and data-mining services for hospitality industry customers; led deployment to customers. 2002 revenue: US\$4mil.

**Soliloquy, Inc.** (New York, NY) [www.soliloquy.com](http://www.soliloquy.com) **1999 - 2001**  
**Chief Technology Officer:** Created start-up to automate online self-service. Built 45-person organization that generated rapid results: designed and created interactive software products; deployed products on clients' websites (Shop@AOL, buy.com, CNET, etc.); developed advanced technologies incorporating natural language understanding, artificial intelligence and statistical analytics. Managed team that included 12 Ph.D.'s. Corporate management included marketing, strategy, fund-raising. Member of the Board of Directors.

**IBM Corp. – T. J. Watson Research Center** (Yorktown Heights, NY) **1995 - 1999**  
**Research Staff Member:** 3D interactivity. Led team to create multimodal systems/devices that interact with user's speech, gestures and other sensory inputs, employing speech recognition, machine vision, eye tracking, and other sensing/biometric technologies. Transferred technology to IBM product divisions; applications included visualization, entertainment, education and home/mobile information. Co-authored IBM strategies for natural user interface, pervasive computing and 3D imaging. Interacted with customers (Chevron, Cable & Wireless, Nickelodeon, Disney, Edmark, P&G, Boeing), IBM Board of Directors, and global media (CNN, ABC, USA Today, WSJ, Comdex).

**MIT Media Laboratory** (Cambridge, MA) **1989 - 1995**  
**Postdoctoral Research Fellow; Research Assistant:** Created first-ever interactive electronic holographic 3D imaging system. Invented essential computation/encoding algorithms to achieve interactive speeds and bandwidth compression. Technologies: spatial light modulation based on acousto-optics, magneto-optics, liquid crystals, nonlinear optics and micro-mirror MEMS; iterative numerical simulation and optimization; digital video. Applications: biological/medical imaging, geoseismic visualization, computer-aided design.

**MIT Lincoln Laboratory – Optical Communication Group** (Lexington, MA) **1987 - 1989**  
**Research Assistant:** High-bandwidth photonic systems and semiconductor device physics. Analyzed excited carrier dynamics in semiconductor lasers used as optical transmitters. Applied nonlinear optical techniques.

**MIT Research Laboratory of Electronics** (Cambridge, MA) **1985 - 1987**  
**Research Assistant:** 3D imaging of biological tissue using ultrashort pulses of laser light. Applied ion lasers, solid state lasers, and colliding-pulse mode-locked dye lasers.

### **Education**

**Ph.D. Massachusetts Institute of Technology** (Cambridge, MA USA) **1994**  
Electrical Engineering and Computer Science  
Thesis: “Diffraction-specific fringe computation for electro-holography”  
Areas: photonics, optical modulation; numerical simulation algorithms; digital media; 3D.

**S.M. Massachusetts Institute of Technology** **1989**  
Electrical Engineering and Computer Science  
Thesis: “Four-wave mixing in a broad-area semiconductor laser”  
Areas: optical communication; physics of photonic devices, quantum physics.

**S.B. Massachusetts Institute of Technology** **1986**  
Electrical Engineering and Computer Science  
Thesis: “Femtosecond optical ranging of biological systems”  
Areas: electromagnetics, Fourier optics; lasers; economics; architecture.

### **Teaching**

**Columbia University – Department of Computer Science** (New York, NY) **1996**  
**Adjunct Assistant Professor:** Created and taught novel course in 3D imaging technology.

**MIT – Electrical Engineering and Computer Science** **1989 - 1994**  
**Research Assistant:** Taught holographic imaging; synthetic holography; and spatial imaging. Conducted laboratory sessions, tutorials and some lectures.

**MIT – Electrical Engineering and Computer Science** **1986 - 1987**  
**Teaching Assistant** for modern optics laboratory. Conducted laboratory sessions, tutorials.

### **Invited talks, panels, etc.:**

OSA Frontiers in Optics, Optics in Information Science: 2007-2008 “Optics for Virtual/Mixed Environments and Interactivity” Theme Chair; 2006 “Optics for Multimedia & Immersive Environments” Co-Chair.

DARPA Tech 2007: Highly acclaimed demonstration of interactive 3D holographic display technology; part of STO exhibit.

CLP Science & Technology Colloquium: “New materials for photovoltaics & illumination”, CLP Holdings, Ltd., Hong Kong, 2004.

- MIDM HKU lecture: “Electricity distribution and renewables in a dense urban setting infrastructure”, Master of Interdisciplinary Design & Management Programme, University of Hong Kong Department of Architecture, 2003.
- Imperial College IIS Colloquium: “Interactivity and intelligence: natural, visual, commercial”, Imperial College of Science, Technology and Medicine, London, U.K., Department of Electrical & Electronic Engineering, Intelligent and Interactive Systems Group.
- GIS Forum: “e-Learning: MIT OpenCourseWare Project”, The Open Group Japan, (Tokyo, Japan), 2003.
- ACM SIGCHI ‘01 panel: “Panel: Is ignorance bliss?: informed consent online”, (Seattle, WA, March 2001) Special Interest Group on Computer-Human Interaction; with Batya Friedman, John C. Thomas, Mark Ackerman, Nancy Willard, Ulrike Lechner.
- New York Academy of Sciences lecture: “e-Commerce, conversations and customers”, 2000.
- TED8 panel: “People and Information”, (Monterey, CA 1998) Technology, Entertainment, Design; with Walt Mossberg, Ann Winblad, Kim Polese, Janet Baker.
- SIGGRAPH ‘98 panel: “Interfaces for Humans: Natural Interaction, Tangible Data, and Beyond”, (Orlando, FL, 1998 July); with Michael Harris, Bill Buxton, William Freeman, Hiroshi Ishii, Michael Sinclair
- GIS Forum: “Internet2: the next generation of internetworking”, The Open Group Japan, (New York), 1998.
- MIT EECS Colloquium: “Computational bandwidth reduction for interactive 3D holography”, Department of Electrical Engineering and Computer Science, 1995.
- Gordon Research Conference: “Interactive 3D holographic imaging using bandwidth compression algorithms”, Optical Signal Processing and Holography, 1995.
- TI CRL Colloquium: “3D holographic imaging with DMDs”, Texas Instruments Central Research Laboratory, 1993.
- Lasers and Electro-optics Society of the IEEE invited lecture: “Electro-holographic displays”, 1992.

### **Publications on holography:**

- M. Lucente et al., “Computational Display Holography”, chapter in *Holographic Imaging*, Stephen A. Benton et al., Wiley-Interscience (April 14, 2008); hardcover book ISBN-10: 047006806X and ISBN-13: 978-0470068069.
- M. Lucente, “Interactive holographic displays: the first 10 years”, book chapter in *Holography. The first 50 years*, (Springer Series in Optical Sciences Vol. 78), Springer-Verlag (Berlin), editor J.-M. Fournier, ISBN #3540670750, 2004.
- M. Lucente, “Interactive three-dimensional holographic displays: seeing the future in depth”, *ACM SIGGRAPH Computer Graphics*, vol. 31, #2, p. 63, May 1997. Invited paper.
- E. A. Sholler, F. M. Meyer, M. Lucente and D. G. Hopper, “True 3-D displays for avionics and mission crewstations”, *Cockpit Displays IV, Proc. of the SPIE*, vol. 3057, #40, Apr. 1997.

- M. Lucente, "Computational holographic bandwidth compression", *IBM Systems Journal*, vol. 35, #3&4, p. 349, Oct. 1996.
- M. Lucente, "Holographic bandwidth compression using spatial subsampling", *Optical Engineering*, vol. 35, #6, p. 1529, June 1996.
- M. Lucente and T. A. Galyean, "Rendering interactive holographic images", *Proceedings of SIGGRAPH 95* (Los Angeles, CA, Aug. 1995). In *Computer Graphics Proceedings, Annual Conference Series, 1995, ACM SIGGRAPH*, p. 387.
- M. Lucente, R. Pappu, C. J. Sparrell, and S. A. Benton, "Progress in holographic video with the acousto-optical modulator display", *International Conference on Applications of Optical Holography, Proc. SPIE Int. Soc. Opt. Eng.*, vol. 2577, #2, 1995.
- J. A. Watlington, M. Lucente, C. J. Sparrell, V. M. Bove, Jr., and I. Tamitani, "A hardware architecture for rapid generation of electro-holographic fringe patterns", *Practical Holography IX, Proc. SPIE Int. Soc. Opt. Eng.* vol. 2406, #23, p. 172, 1995.
- M. Lucente, S. A. Benton and P. St.Hilaire, "Electronic holography: the newest". *International Symposium on Three Dimensional Imaging and Holography*, Osaka, Japan, p. 107, 1994. Invited.
- M. Lucente, "Diffraction-Specific Fringe Computation for Electro-Holography", *Ph. D. Thesis*, Dept. of Electrical Engineering and Computer Science, Massachusetts Institute of Technology, 1994 Sept.
- M. Lucente, "Interactive computation of holograms using a look-up table", *Journal of Electronic Imaging*, vol. 2, #1, p. 28, Jan 1993.
- P. St.Hilaire, S. A. Benton, M. Lucente, J. D. Sutter and W. J. Plesniak, "Advances in holographic video", *Practical Holography VII, Proc. SPIE Int. Soc. Opt. Eng.*, vol. 1914, #27, 1993.
- P. St.Hilaire, S. A. Benton and M. Lucente, "Synthetic aperture holography: a novel approach to three-dimensional displays", *Journal of the Optical Society of America A*, vol. 9, #11, p. 1969, 1992.
- S. A. Benton and M. Lucente, "Interactive computation of display holograms", *Proc. of the 10th International Conference of the Computer Graphics Society on Visual Computing*, p. 247, 1992.
- M. Lucente, "Optimization of hologram computation for real-time display", *Practical Holography VI, Proc. SPIE Int. Soc. Opt. Eng.*, vol. 1667, #04, p. 32, 1992.
- P. St.Hilaire, S. A. Benton, M. Lucente and P. M. Hubel, "Color images with the MIT holographic video display", *Practical Holography VI, Proc. SPIE Int. Soc. Opt. Eng.*, vol. 1667, #33, p. 73, 1992.
- M. Lucente, P. St.Hilaire, S. A. Benton, et al., "New approaches to holographic video", *Holographics International '92, Proc. SPIE Int. Soc. Opt. Eng.* vol. 1732 #48, p. 377, 1992.
- P. St.Hilaire, S. A. Benton, M. Lucente, J. Underkoffler and H. Yoshikawa, "Real-time holographic display: improvements using a multichannel acousto-optic modulator and holographic optical elements", *Practical Holography V, Proc. SPIE Int. Soc. Opt. Eng.*, vol. 1461, p. 254, 1991.

P. St.Hilaire, S. A. Benton, M. Lucente, M. L. Jepsen, J. Kollin, et al., “Electronic display system for computational holography”, *Practical Holography IV, Proc. SPIE Int. Soc. Opt. Eng.* vol. 1212, p. 174, 1990.

**Publications on nonlinear/semiconductor photonics:**

M. Lucente, E.S. Kintzer, S.B. Alexander, J.G. Fujimoto and V.W.S. Chan, “Coherent optical communication with injection-locked high-power semiconductor laser array”, *Electronics Letters*, vol. 25, #17, p. 1112, 17 Aug. 1989.

M. Lucente, G.M. Carter and J.G. Fujimoto, “Nonlinear mixing and phase conjugation in broad-area diode lasers”, *Applied Physics Letters*, vol. 53, #6, p. 467, 8 Aug. 1988.

M. Lucente, J.G. Fujimoto and G.M. Carter, “Spatial and Frequency Dependence of Four-Wave Mixing in a Broad-Area Diode Laser”, *Applied Physics Letters*, vol. 53, #20, p. 1897, 14 Nov. 1988.

**Publications on intelligent interaction:**

M. Lucente, “Conversational interfaces for e-commerce applications”, *Communications of the ACM (CACM)*, vol. 43, #9, p. 59, Sept. 2000. Invited paper: natural language conversations via websites.

M. Lucente, “Visualization Space: a testbed for deviceless multimodal user interface”, *Intelligent Environments Symposium, AAAI Spring Symposium Series* (Stanford University), 1998. Chaired session.

M. Lucente, “A response to ‘Some thoughts on the state of the technical science in 2012’”, *Proceedings of the IEEE*, vol. 86, #10, p. 2108, Oct.1998. Invited predictive paper: a glimpse of the world 50 years in the future.

U.T. Mello, M. Lucente and T. Jackman, “Using visualization and parallel computing for interactive reservoir characterization”, *Proc. of 1997 Offshore Technology* (Houston, TX), May 1997.

G. Kendall, M. Lucente and C.C. Ngan, “Electrical engineering for 21st century power systems”, *ICEE (International Conference on Electrical Engineering) 2003*, (Hong Kong), 2003.

**Publications on energy:**

G. Kendall, M. Lucente and C.C. Ngan, “Electrical engineering for 21st century power systems”, *ICEE (International Conference on Electrical Engineering) 2003*, (Hong Kong), 2003.

**Patents:** 1 (natural language understanding); 5 pending (dynamic holographic imaging).

**Honors:** Sigma Xi, Tau Beta Pi, Eta Kappa Nu.

**Memberships**

Optical Society of America (OSA);

Institute of Electrical and Electronics Engineers (IEEE);

American Association for the Advancement of Science (AAAS);  
SPIE – The International Society for Optical Engineering, Life Member;  
Association for Computing Machinery (ACM).

Citizen of U.S.A.