MARK T. BOLAS

3323 Corinth Avenue
Los Angeles, CA 90066
(650) 868-5014
bolas@well.com

EDUCATION

M.S. Mechanical Engineering (Product Design) 1989
Stanford University
Thesis: *Design and Virtual Environments*

Graduate Coursework: Computer Music 1985-1987
University of California, San Diego
Music Department: Courses in *Computer Music and Composition*
Electrical Engineering Department: *Digital Signal Processing*

B.A. Physics; Minor in Music 1983
University of California, San Diego

EMPLOYMENT

Academic:

University of Southern California
Interactive Media Division, School of Cinema-Television:

Visiting Associate Professor 2004-present
Director, Interactive Narrative and Immersive Technologies Lab
Consulting Faculty, Institute for Creative Technologies
Affiliate Faculty, Center for Robotics and Embedded Systems

Visiting Scholar Summer 2003

Stanford University
Design Division, Mechanical Engineering:

Consulting Assistant Professor 2003-2004

Lecturer (four appointments) 1991-2002

Teaching Assistantships 1988-1989

Keio University, Japan
Graduate School of Media and Governance

Assistant Professor 2001-2002

Professional:

Fakespace Labs 1988-present
Founder, Chairman (former CEO and President)

One of the first virtual reality companies established. I was directly responsible for groundbreaking research and products in areas including: human/computer interaction, immersive displays (head-coupled and projector-based), and virtual environment software and content ranging from interactive music to scientific data visualization. My partners and I grew the company to over 50 people and spun off the systems integration product line as a new company, Fakespace Systems. It continues to be the largest provider of immersive visualization systems as part of Mechdyne, Inc.

Fakespace Labs now is a basic and applied research firm, often working in close collaboration with academic researchers, on projects including systems for computational illumination, human computer interface devices and displays, and advanced optical designs for display systems, including home entertainment. I resigned as CEO and president in 2001 to focus on design at Fakespace Labs and on academia.

Sonicbox, Inc. 1999-2001
Chairman, Co-Founder

Co-invented and patented key technologies for Internet radio and streaming audio. Lead designer of the Sonicbox Tuner and original product line. Played key role in developing the initial business plan, designing prototypes, and securing financing for the company, which licensed technology to Philips, Creative Labs, Acer, and Yahoo Japan.

Bentex 1984-1986
Electronic Group Leader

Responsible for final electronic system design and production of the Sprint 101, an innovative sub-sea remote inspection robot. Provided field support in the Antarctic and Norway. Developed robotic technology for Naval Ocean Systems Center.

Scripps Institute of Oceanography 1981-1984
Junior Developmental Engineer; Engineering Aide

Engineering and field support of electronic and mechanical equipment supporting a foremost geophysical observatory.

Other Employment 1978-1987

- Robotic speaker position system design, A&M Records
- Sound stage design & construction, UC San Diego
- Concert sound engineer, UC San Diego
- Cajun accordion MIDI design and development, RCA Records
- Design and debug of digital bus emulator, Meridian Design
- Custom installation of residential security systems
- Recording studio technician, Silverlake Studios

COURSES & TEACHING

University of Southern California

- CTIN 499 Inventing Extreme Dataspace
- CTIN 532 Interactive Experience Design
- CTIN 541 Design for Interactive Media, Mobile & Programming Module
- CTIN 542 Interactive Design and Production
- CTIN 555 Advanced Interactive Project (two terms)

Stanford University

- ME101 Visual Thinking (three terms)
- ME261 Designing and Building Virtual Environments
- ME218D Smart Project Design, Project Coach
- ME310 Design for Manufacture, Project Coach (two terms)
- ME101 Visual Thinking, Teaching Assistant
- ME103 Design for Manufacture, Teaching Assistant

Keio University

- Mobile and Augmented Media Project, Advanced Project Advisor

AWARDS & HONORS

Virtual Reality Technical Achievement Award, *for Seminal Technical Achievement in Virtual & Augmented Reality*. By IEEE Visualization and Graphics Technical Committee, 2005.

Innovations Award, *for Sonicbox*. By the Consumer Electronics Association, 2001.

CES Innovations Design & Engineering Honors Program - Audio, *for iRhythm*, 2001.

Best of What's New 2000 (100 Hottest Products), *for the Sonicbox Remote Tuner*. By Popular Science, December 2000.

Best of Tech, *for Sonicbox*. By InStyle, December 2000.

The Best of the Season, *for Sonicbox.* By Rolling Stone, December 2000.

Top Ten Products of the Year, *for the Immersive WorkWall*. By IEEE Computer Graphics, 1999.

Innovation Award, *for the Versabench*. By Computer Graphics World, 1998.

Product of the Year Award Nominee in Arts and Events, *for Fakespace Music*. By CyberEdge Journal, 1996.

Industry Excellence Award, *for the Immersive WorkBench*. Second place, by IEEE Computer Graphics and Applications, 1996.

Virtual Reality Product of the Year Award – Hardware, *for the PUSH*. By CyberEdge Journal, 1995.

Industry Excellence Award, *for the PUSH*. Second place, by IEEE Computer Graphics and Applications, 1995.

Virtual Reality Product of the Year Award – Hardware, *for the BOOM*, By CyberEdge Journal, 1993.

RESEARCH CONTRACTS & GRANTS

(PI or Project Director. Excludes standard product sales)

Low cost wide field of view head mounted display for aviation training, with Ian McDowall, for Latika Eifert, US Army RDECOM, Contract N61339-05-C-0032, 2005, $75,000

Context sensitive audio analysis for interactive multimedia indexing, with Larry Leifer and Julius Smith, Stanford MediaX Grant, 2004, $5,000 ($25,000 total grant)

Interactive networked toys: Using sensing technologies to create social awareness, with Glenda Revelle, Byron Reeves, Deanne Perez-Granados, Sesame Street Workshop, Stanford MediaX Grant, 2003, $35,000 ($74,768 total grant)

MULE, a multi-use light engine, with Ian McDowall, for Ralph Wachter, Office of Naval Research, Bridge extension to N00014-99-C-0122, 2003, $75,000

High-speed 3D shape digitization using projected light patterns, with Marc Levoy and Ian McDowall, Stanford MediaX Grant, 2002, $53,600 ($84,831 total grant)

FIDGET, a force input device for graphical environment tweaking, with Rolf Faste, Stanford MediaX Grant, 2002, $25,000

Fast action head mounted display, with Ian McDowall, for Jim Templeman and Linda Sibert, Office of Naval Research, Contract N00014-02-M-0230, 2002, $600,000 (Fakespace Labs/USC collaboration)

Boom Chameleon, a novel input/output device consisting of a tracked flatpanel touch sensitive display, with Ian McDowall, for Bill Buxton, Alias Research, 2000, $25,000

A multi-user deployable virtual workbench, with Ian McDowall, For Larry Rosenblum, Naval Research Lab, Ralph Wachter, Office of Naval Research, Richard Kaste, Army Research Laboratory, Contract N00014-99-C-0122, 1999, $500,000

Physical presence for virtual model displays, with Ian McDowall, for Steve Bryson, NASA Ames Research Center, Contract NAS2-98075, 1998, $40,000

Reconfigurable advanced visualization environment, for Los Alamos National Laboratories, 1998, $2,000,000 (transferred to Fakespace Systems, Inc.)

A versatile stereoscopic workbench for environment and model visualization, with Ian McDowall, for Dr. Richard Dunn, Naval Air Warfare Center, 1997, $200,000

A hybrid immersive/non-immersive virtual environment workstation, for Rudy Darken, Navy Research Laboratory, Contract N00014-96-C-2074, 1996, $65,498

FS2, A hands-free counter-balanced head-mounted stereoscopic display for ergonomic simulation, for Ken Socks, Chrysler Automotive, 1994, $164,000.

Low cost head-mounted display design, for Astounding Technologies, 1993, $25,000

A five degree of freedom mobile telepresence system, for Scott Fisher, Telepresence Research, 1993, $45,000

A telepresence system for the interactive virtual reality simulation system for robot control and operator training, for Sharon Stansfield, Sandia National Laboratories, 1992, $50,000

A binocular omni orientation monitor, for Creon Levitt, NASA Ames Research Center, 1991, $27,000

POINT, a proof of concept pan-only infrared tracker for a virtual reality game, for Rich Gold, Mattel Toys (new products division), 1990, $8,500

Molly, a three degree of freedom telepresence camera system, for Scott Fisher, NASA Ames Research Center, 1988, $25,000

MIDI-based Cajun accordion performance system, for Jo-El Sonnier and RCA Records, 1987, $12,000

PUBLICATIONS & PAPERS

Bolas, M., Gold, R., McDowall, I. *Second Harvest.* Forthcoming, Ambidextrous Magazine (publication of the Stanford Design School), 2006.

Bolas, M., Pair, J., Haynes, K., McDowall, I. *Environmental and Immersive Display Research at the University of Southern California.* Forthcoming, IEEE VR 2006 Workshop on Emerging Display Technologies, 2006.

MacDonald, K., Williams, J., Levoff, J., Morie, F., Bolas, M. *Application of Story Discovery to Intelligence Analysis.* Final Technical Report, February 2006.

Bolas, M., co-editor. *Stereoscopic Displays and Virtual Reality Systems I - XII*. Proceedings SPIE, 1994-2006.

Jones, A., Gardner, A., Bolas, M., McDowall, I., Debevec, P. *Performance Geometry Capture For Spatially Varying Relighting*. SIGGRAPH Technical Sketches, 2005.

Jones, A., Gardner, A., Bolas, M., McDowall I., Debevec P. *ICT Technical Report* ICT-TR-01.2005, July 2005.

Revelle, G., Zuckerman, O., Druin, A., Bolas, M. *Tangible User Interfaces For Children.* Conference on Human Factors in Computing Systems, Extended Abstracts, pp. 2051-2052, April 2005.

Fisher, S., Anderson S., Ruiz, S., Naimark M., Hoberman, P., Bolas M., Weinberg R.: *Experiments in Interactive Panoramic Cinema*. Proc. SPIE Vol. 5664, pp. 626-632, March 2005.

McDowall, I., Bolas, M. *Display, Sensing, and Control Applications for Digital Micromirror Displays*. Workshop On Emerging Display Technologies, pp. 35-36, IEEE VR, March 2005.

Levoy, M., Chen, B., Vanish, V., Horowitz, M., McDowall, I., Bolas, M. *Synthetic Aperture Confocal Imaging*. ACM Trans. Graph. 23(3), pp. 825-834, 2004.

Bolas, M., McDowall, I., Corr, D. *New Research and Explorations into Multiuser Immersive Display Systems.* IEEE Computer Graphics and Applications 24(1), pp. 18-21, 2004.

Ju, W., Madsen, S., Fiene, J., Bolas, M., McDowall I., Faste, R. *Interaction Devices for Hands-On Desktop Design*. Proc. SPIE 5006, pp. 585-595, May 2003.

Fisher, S., Saito, T., McDowall, I., Nakayama, Y., Bolas, M., Kohiyama, K. *Micro Archiving and Interactive Virtual Insect Exhibit*. Proc. SPIE 4660, pp. 375-381, May 2002.

McDowall, I., Bolas, M. *Reviewing Single and Multiple Viewer Stereo with DLP Projectors*. Invited paper, Immersive Projection Technology Symposium Program, Orlando, Florida, March 2002.

McDowall, I., Bolas, M., Corr, D., Schmidt, T. *Single and Multiple Viewer Stereo with DLP Projectors*. Proc. SPIE 4297, pp. 418-425, June 2001.

Bolas, M., McDowall, I., Bolas, N., Frerichs, D. *Internet Radio Strategy*. White paper for Sonicbox, Inc., 2000.

Bolas, M., McDowall, I., Williams, G., Corr, D., Berta, J. *Pixels are Good*. Proc. SPIE 3957, pp. 389-395, May 2000.

Williams, G., Faste, H., McDowall, I., Bolas, M. *Physical Presence – Palettes in Virtual Spaces*. Proc. SPIE 3639, pp. 374-384, May 1999.

Bolas, M., McDowall, I. *Physical Presence for Virtual Model Displays*. Final Report for NASA Ames Research Center, Contract NAS2-98075, 1999.

Williams, G., McDowall, I., Bolas, M. *Human Scale Interaction for Virtual Model Displays: A Clear Case for Real Tools*. Proc. SPIE 3295, pp. 350-353, April 1998.

Bolas, M. *Position Paper*. In: Modeling and Simulation: Linking Entertainment and Defense. Computer Science and Telecommunications Board, National Research Council. Washington, D.C.: National Academy Press, pp. 120-121, 1997.

McDowall, I., Bolas, M. *Immersive Display Technology Developments*, International Immersive Projection Technology Workshop. Stuttgart, Germany. Bullinger, H., Riedel, O. (eds.), Springer, pp. 87-95, 1997.

Bolas, M. *The Future of Virtual Reality: Head Mounted Displays versus Spatially Immersive Displays.* SIGGRAPH 97 Conference Proceedings, Annual Conference Series, ACM SIGGRAPH, Addison Wesley, pp. 485-86, August 1997.

Agrawala, M., Beers, A., McDowall, I., Frohlich, B., Bolas, M., Hanrahan, P., *The Two-User Responsive Workbench: Support for Collaboration Through Individual Views of a Shared Space*. SIGGRAPH Proceedings, pp. 327-332, August 1997.

McDowall, I., Bolas, M. *New Developments for Virtual Model Displays*. Computer Graphics, 31(2), pp. 50-52, May 1997.

Bolas, M., Bryson, S., McDowall, I. *Virtual Model Displays*. Proc. SPIE 3012, pp. 429-438, May 1997.

Fisher, S., Bolas, M., Merritt, J., Editors. *Stereoscopic Displays and Virtual Reality Systems IV*. Proc. SPIE 3012, May 1997.

Greuel, C., Bolas, M., Bolas, N., McDowall, I. *Sculpting 3D Worlds with Music: Advanced Texturing Techniques*. Proc. SPIE 2653, pp. 306-315, April 1996.

McDowall, I., Bolas, M. *Stereo Texture Facades*. Proc. SPIE 2653, pp. 316-319, April 1996.

Fisher, S., Bolas, M., Merritt, J., Editors. *Stereoscopic Displays and Virtual Reality Systems III*. Proc. SPIE 2653, April 1996.

Bolas, M., McDowall, I., Mead, R. *Applications Drive VR Interface Selection*. Computer 28(7), pp. 72-75, July 1995.

McDowall, I., Bolas, M. *High Resolution Stereo Solutions for Virtual Reality Applications.* Society for Information Display International Symposium, Digest of Applications Papers Volume XXVI, Orlando, Florida, SID95, pp. 41-44, May 1995.

Bolas, M., McDowall, I., Mead, R., Lorimer, E., Hackbush, J., Greuel, C. *Alternative Display and Interaction Devices*. Proc. SPIE 2409, pp. 211-219, February 1995.

Fisher, S., Bolas, M., Merritt, J., Editors. *Stereoscopic Displays and Virtual Reality Systems II.* Proc. SPIE 2409, February 1995.

Bolas, M., McDowall, I., Mead, R. *Immersive Desktop Display with Axial Muscle Navigation and Control.* White Paper. Symposium on Interactive 3D Graphics, ACM. Monterey, California. 1995.

Bolas, M., Lorimer, E., McDowall, I., Mead, R. *Proliferation of Counterbalanced, CRT-Based Stereoscopic Displays for Virtual Environment Viewing and Control*. Proc. SPIE 2177, pp. 325-334, April 1994.

Fisher, S., Bolas, M., Merritt, J., Editors. *Stereoscopic Displays and Virtual Reality Systems*, Proc. SPIE 2177, April 1994.

Bolas, M. *Human Factors in the Design of an Immersive Display*. IEEE Computer Graphics and Applications, 14(10), pp. 55-57, January 1994.

Bolas M: *Designing Virtual Environments.* In: The Virtual Reality Casebook, Loeffler, C and Anderson, T., Eds., pp. 49-54. New York: Van Nostrand Reinhold, 1994. Also in Japanese: In: Anthology of Industry and Culture. *Virtual Realities.* ISBN4-87408-576-8.

Bolas, M. *Practical VR – Five Years of Lessons Learned*. Industrial Virtual Reality Show and Conference. Proceedings, pp. 90-99. Tokyo, Japan: Reed Exhibitions Japan, Ltd., 1993.

Bolas, M. *Virtual Environments for Public Exhibitions.* SIGGRAPH Visual Proceedings, p. 225, 1993.

Bolas, M. *Design Background for the Boom2C: A Headcoupled Stereoscopic VR Display*. Journal of Three Dimensional Images 7(2), March 1993.

Bolas, M. *Design and Virtual Environments.* Second International Conference on Artificial Reality and Tele-Existence, Japan Technology Transfer Association., pp. 135-141, Tokyo, Japan, 1992.

Bolas, M., Stone, P. *Virtual Mutant Theremin*. Proceedings International Computer Music Association Conference, San Jose, California, pp. 360-361, 1992.

McDowall, I., Bolas, M., Pieper, S., Fisher, S., Humphries, J. *Implementation and Integration of a Counterbalanced CRT-based Stereoscopic Display for Interactive Viewpoint Control in Virtual Environment Applications*. Stereoscopic Displays and Applications, Merritt, J., Fisher, S., Eds., Proc. SPIE 1256, pp. 136-146, September 1990.

Bolas, M., Fisher, S. *Head-Coupled Remote Stereoscopic Camera System for Telepresence Applications*. Virtual Environment Applications, Stereoscopic Displays and Applications, Merritt, J., Fisher, S., Eds., Proc. SPIE 1256, pp. 113-123, September 1990.

Fisher, S., Jacoby, R., Bryson, S., Stone, P., McDowall, I., Bolas, M., Dasaro, D., Wenzel,E., Coler, C., Kerr, D. *The Ames Virtual Environment Workstation: Implementation Issues and Requirements*. Human machine interfaces for teleoperators and virtual environments, NASA Conference Publication 10071, pp. 70-73, 1990.

ARTWORK (*in juried exhibit)

*Horsie** (with Ian McDowall), 2004.

*Still Life** (with Christian Greuel et al), 1996.

*Phlor-X** (with Niko Bolas et al), 1995.

*New York Dance** (with Niko Bolas et al), 1995.

*Vacuii** (with Christian Greuel et al), 1995.

*Tango Texture** (with Ian McDowall), 1993.

*Enter**, 1989.

*Composition with Line 1918 (*also *Flatlands*)*, 1989.

Touch Face, 1989.

Mutant Theremin (with Phil Stone), 1989.

A sea-sic walrus. (on CARL computer music synthesizer), 1986.

Why am I arguing with a lizard? (on Buchla synthesizer), 1981.

PATENTS (*licensed or implemented in products or exhibits)

Patents Granted:

*Multi-person stereo display system**. McDowall, I., Bolas, M.
2005: U.S. Patent 6,924,833
2003: U.S. Patent 6,535,241

*Internet radio receiver with linear tuning interface**. McDowall, I., Bolas, M., Smith, S.
2005: U.S. Patent 6,920,479

*Gimbal mounted virtual reality display system**. Mead, R., Bolas, M., McDowall, I
2004: U.S. Patent 6,774,870
2002: U.S. Patent 6,396,462
2000: U.S. Patent 6,094,180

*Method and apparatus for sharing streaming media links**. Sass, J., Bolas, M.
2004: U.S. Patent 6,769,028.

Method and system for adding advertisements over streaming audio based upon a user profile over a world wide area network of computers. Frerichs, D., McDowall, I., Bolas, M.
2004: U.S. Patent 6,684,249.

Method and system for high performance computer-generated virtual environments.* McDowall, I., Bolas, M.
2002: U.S. Patent 6,441,815
2001: U.S. Patent 6,285,370
1999: U.S. Patent 5,905,499

Internet radio receiver having a rotary knob for selecting audio content provider designations and negotiating internet access to URLS associated with the designations.* Bolas, M., McDowall, I.
2002: U.S. Patent 6,389,463

Remote tuner for internet-based radio.* Bolas, M., Fisher, S., Jones, W., Kim, S.
2001: U.S. Design Patents D439,576; D439,888; D439,889; D440,551; D440,553; D440,554

Virtual reality glove system with fabric conductors.* McDowall, I., Bolas, M., Mead, R., Greuel, C.
2000: U.S. Patent 6,128,004

Adjustable immersive projection table.* McDowall, I., Bolas, M.
2000: U.S. Patent. 6,075,502

Method for line field-sequential color video display. McDowall, I., Bolas, M.
1996: U.S. Patent 5,528,262

Method and system for controlling computer-generated virtual environment in response to audio signals.* Bolas, M., McDowall, I.
1996 U.S. Patent 5,513,129

Image display method and apparatus with means for yoking viewpoint orienting muscles of a user.* Bolas, M., McDowall, I., Mead, R.
1995: U.S. Patent 5,436,638

Spring counterbalanced boom suspension system.* Bolas, M., Mead, R.
1993: U.S. Patent 5,253,832

Patents Pending:

U.S. Patent Application 11/269,900, pending publication. Filed: August 2005.

U.S. Patent Application 11/166,897, pending publication. Filed: June 2005.

U.S. Patent Application 11/165,812, pending publication. Filed: June 2005.

U.S. Patent Application 10/971,376, pending publication. Filed: October 2004.

U.S. Patent Application 60/621,268, pending publication. Filed: October 2004.

System and method for limiting dead air time in internet streaming media delivery. U.S. Patent Application 20050165942. McDowall, I., Bolas, M. 2005.

Playlist radio. U.S. Patent Application 20040254659. Bolas, M., McDowall, I. 2004.

Method and system for high performance computer-generated virtual environments. U.S. Patent Application 20020030679. McDowall, I., Bolas, M. 2002.

Gimbal-mounted virtual reality display system. U.S. Patent Application 20020140634. Mead, R., McDowall, I., Bolas, M. 2002.

Internet radio receiver with linear tuning interface. U.S. Patent Application 20020073171. McDowall, I., Bolas, M., Smith, S. 2002.

Internet radio receiver and interface. U.S. Patent Application 20010042109. Bolas, M., McDowall, I. 2001.

EXHIBITS (*lead role in juried exhibit)

Snared Illumination. Emerging Technologies Gallery, SIGGRAPH, Los Angeles, 2004.*

MicroArchiving. By Keio University. Emerging Technologies Gallery, SIGGRAPH, Los Angeles, 2001.

In Search of the Holy Grail. By Infobyte and ENEL. In *Mediascape* at the Guggenheim SOHO, New York, 1996, and in *TILE Conference*, award winner, Brussells, 1997.

The Tomb of Neferatari. By Infobyte and ENEL. At the Museum of Civilization in Ottawa, 1996, and the Museum of Cairo, 1997.

Soundscapes II. Digital Bayou, SIGGRAPH, New Orleans, 1996.*

Vacuii. VR Garden, IntermediaWORLD. San Francisco, March 1996.

Soundscapes. Interactive Entertainment, SIGGRAPH, Los Angeles, 1995.*

Boom Room at the VROOM, SIGGRAPH, Orlando, 1994.

Virtual Basilica of St. Francis of Assisi. By Infobyte. Walt Disney EPCOT Center, 1994.

Virtual Environments for Public Exhibitions. Tomorrow's Realities Gallery, SIGGRAPH, Anaheim, 1993.*

Boom and Molly. Cyberarts. Pasadena, November 1991.

Be Here Now. Tomorrow's Realities Gallery, SIGGRAPH, Las Vegas, 1991.*

Molly. Cyberthon, Whole Earth Institute, San Francisco, October 1990

Molly. TED2 Conference, Monterey, California, February 1990.

SITE INSTALLATIONS

Imaging, The Tools of Science. By the Chicago Museum of Science and Industry, 1993-present.

Virtual Chemist. By Sense8. Petronas Twin Towers, Kuala Lumpur, Malaysia, 1998-2004.

Virtual Brewery Adventure. By Telepresence Research. Sapporo Beer Museum, Tokyo, 1995-2000.

Project Mercury. By Greystone Entertainment, SegaCity Irvine, California, 1998.

GameArc. By GameWorks, Inc. At GameWorks, Seattle and Las Vegas, 1997.

Strats, Studios and the Seattle Sound. By Fakespace. Experience Music Project. December 1996-February 1997.

CLIENTS & APPLICATIONS (selected)

Academic & scientific research clients: *Stanford Medical School* – pre-reconstructive surgical visualization; *NASA Goddard Flight Center* – ocean temperature and magnetic field modeling; *Stanford Research Institute* – protein binding site modeling; *Mississippi State University* – oceanography model of Sea of Japan; *NASA Ames* – computational fluid dynamic visualization, space shuttle aerodynamics; *Army Corps of Engineers* – visualizing complex waterway designs; *National Center for Supercomputer Applications* – study of galaxy formation.

National research laboratories: *Oak Ridge* – material science visualizations to study the interaction between atoms; *Los Alamos* – visualization for stockpile stewardship; *Pacific Northwest* – data mining tool using metaphors of virtual galaxies; *Sandia* – telepresence for managing nuclear waste.

Industry: *Petronas* (Kuala Lumpur) – off-shore oil platform design; *Ford, Chrysler, BMW, Boeing, Lockheed Martin, Hughes, Fiat* (Italy), *Northrop, Electric Boat, Daimler* (Germany) – computer-aided design of aircraft, ships, boats, and automobiles; *Deneb Robotics* – factory floor simulation; *Fraunhofer* (Stuttgart) – industrial applications; *Matsushita* (Japan) – virtual showroom, equipment design.

Public entertainment & education: *Chicago Museum of Science and Industry* – one of the first permanent VR displays, still in operation after 13 years and over a million patrons; *Infobyte at the Guggenhein SoHo* – virtual reality game set in Italian churches and piazzas; *Walt Disney Epcot Center* – virtual Basilica of St. Francis of Assisi; *Experience Music Project* museum – immersive music environment.

National security: *Naval Research Lab* – virtual sandbox for strategic planning; *US Army Tank Command* – collaborative environments to improve vehicle performance; *Naval Postgraduate School* – student research and education in simulation and modeling; *US Naval Air Warfare Center* – visualization system qualification for deployment.

INVITED PRESENTATIONS & PANELS

Invited speaker for the upcoming IEEE International Workshop on Projector-Camera Systems, New York, June 2006.

Invited presentation. *Displays for Immersive Education and Training. USC Institute for Creative* Technologies. Marina del Rey, California, October 2005.

Panelist. *VR in Entertainment.* 11th International Conference on Human-Computer Interaction. Las Vegas, July 2005.

Panelist. *Bridging the Gap: Divergence Between Procams Research in Industry and Academics.* IEEE International Workshop on Projector-Camera Systems. San Diego, June 2005.

Invited short presentation. *The Sociable Elmo Project: Using Sensing Technologies to Create Social Awareness in Toys.* Third Annual Media X Conference. November 2004.

Panelist. *Research, Development and Investment in Entertainment Technologies and Media Studies Innovation: From the University to Industry Application.* Digital Hollywood. Santa Monica, September 2004.

Invited presention. Stanford MediaX, *Fisher Price Focus Meeting*, September, 2004.

Invited short presentation. *FIDGET – Further Developments.* Media X Conference, November 2003.

Invited presentation. *A Rapid Structured Light Scanner - The Zebra.* Graphics Lunch Series. Stanford University, April 2003.

Panelist. *The Future of Stereoscopic Imaging*, Stereoscopic Displays and Virtual Reality Systems X, San Jose, January 2003.

Invited short presentation. *Force Input Device for Graphical Environment Tweaking – FIDGET*. First Annual Media X Conference. Nov 16, 2002.

Panelist. *VR Goes Bezerkely!* Virtual Systems and Multi-Media, 7th Annual Conference. University of California, Berkeley, 2001.

Invited presentation. *Pixels are Good, Now Put Them to Work.* Terascale Post-Processing Seminar, Center for Applied Scientific Computing. Livermore, California, July 2001.

Invited presentation. *Be There Here: Art & Virtual Reality.* San Francisco Museum of Modern Art, Media Arts Council, March 2001.

Panelist. *The Next Generation: Novel Techniques for Display and Interaction.* IEEE VR '99. Houston, March 1999.

Invited presentation. SRI Seminar. Menlo Park, California, May 1998.

Panelist. *Usability is from Venus, Virtual Environments are from Mars: User-Centered Evaluation Methodology in a New Medium.* Virtual Reality Annual International Symposium, Atlanta, Georgia, March 1998.

Invited lecture. *The Entrepreneurial Engineer.* Stanford University Electrical Engineering 203. January 1998.

Invited private presentation. *Potential of VR Instrumentation for the Multimedia Super Corridor.* For the Prime Minister of Malaysia, Dato' Seri Dr. Mahathir Bin Mohamad, New York, 1997.

Panelist. *The Future of Virtual Reality: Head Mounted Displays Versus Spatially Immersive Displays.* SIGGRAPH 97, August 1997.

Keynote speaker. *Immersion.* Virtual Reality WorldWide Conference. Santa Clara, April 1997.

Invited speaker. *Interface Between Human and Technology = Immersion.* VERGE Conference at the Exploratorium, Virtual Reality Education Foundation, Inc. San Francisco, February 1997.

Invited participant. *Experiential Computing and Virtual Reality.* Committee on Modeling and Simulation: Linking Entertainment and Defense Conference, Computer Science and Telecommunications Board, National Research Council, October 1996.

Featured panelist. *Virtual Reality in the Real World.* Architectural, Engineering, and Construction Systems Conference, June 1996.

Panelist. *The Design Process and New Horizons in Virtual Reality.* IEEE VRAIS, April 1996

Invited presentation. *Virtual Reality Issues Related to Visualization and Drug Development.* Computer-Aided Drug Development, Cambridge Healthtech Institute. San Francisco, April 1995.

Invited Speaker. *Head-Coupled Displays.* Virtual Reality 94. San Jose, May 1994.

Invited presentation. *Virtual Reality – It's Not Just for Demos Any More.* Dartmouth College, October 1993.

Invited presentation. *BOOM2C.* Industrial Virtual Reality Conference. Tokyo, Japan, June 1993.

Invited participant. First Small Business Retreat on the Future Directions of Human-Computer Interaction. Santa Fe, New Mexico, May 1993.

Invited demonstration. *Boom 3C.* President Bill Clinton and Vice President Al Gore at Silicon Graphics, Inc. Mountain View, California, February 1993.

Invited presentation. *Design and Virtual Environments.* Second International Conference on Artificial Reality & Tele-existence. Tokyo, Japan, July 1992.

Panelist. *TechnoStress*. Human Factors Society 35th Annual Meeting, San Francisco, September 1991.

Invited presentation. *Design and Virtual Environments.* Stanford Design Conference. Palo Alto, July 1991.

Invited presentation. *Virtual Worlds: Real Challenges.* SRI International, David Sarnoff Research Center. Palo Alto, June 1991.

Invited participant. *International Workshop on Virtual Reality.* Esalen Institute. Big Sur, June 1991.

Invited speaker. *In Cyberspace.* Culture Board of the City of Munich, German Museum. Munich, Germany, April 1991.

Invited presentation. *The Medium of Virtual Reality.* Computer Game Developers' Conference. San Jose, March 1991

Invited lecture. *VR is a Metaphor*. Center for Design Research seminar, Stanford University. October 1990.

PROFESSIONAL ACTIVITIES

E-Learning Committee, Interactive Media Division, 2006.

Chair, Thesis Policy Committee, Interactive Media Division, 2005-present.

Workshop Organizer. Emerging Display Technologies New System Applications: From Images to Sensing, Interaction, and Enhancement. IEEE VR, 2005 & 2006.

Paper Reviewer. Computer Human Interface Conference, 2006.

Program Committee. IEEE International Workshop on Projector-Camera Systems. New York, 2006.

Chair. The Engineering Reality of Virtual Reality Conference, SPIE. 1994-present.

National Science Foundation Review Panel, Graphics and Visualization, 2005

Stanford Product Realization Lab Strategy Planning Committee, 2005

Paper Reviewer. IEEE Transactions on Visualization and Computer Graphics, 2005.

Paper Reviewer. SIGGRAPH 2005.

Reviewer. Emerging Technologies Jury, SIGGRAPH 2005.

Panel Moderator. Emerging Technologies, SIGGRAPH 2005.

Scientific Committee. Virtual Concept 2005 Conference, 2005.

Reviewer. Eurographics Workshop in Virtual Environments and Immersive Projection Technology Workshop, 2005.

Reviewer, IEEE and ACM International Symposium on Mixed and Augmented Reality, 2005.

Proposal Review Committee. Stanford Media X Grants, 2004

Program Committee, Immersive Projection Technology Workshop, 2000.

Review Committee. International Conference on Virtual Systems and MultiMedia, 1999.

Program Committee. IEEE VR, 1999 & 2000.

Paper Reviewer and Program Committee. Virtual Reality Annual International Symposium, 1996, 1997 & 1998.

Panel Chair. Virtual Environment Research and Applications at NASA Ames. Virtual Universe Conference, 1997.

Panels Committee and Jury. SIGGRAPH 1995.

Co-Chair. Symposium on Research Frontiers in Virtual Reality Program Committee, IEEE Visualization 1993.

Current & Recent Advisory Roles:
Advisor. *Ambidextrous Magazine*, the journal of the Stanford University d.school for the larger design community.

Advisory Committee. University of North Carolina, Chapel Hill's Science and Technology Center proposal to National Science Foundation, 2004.

Advisor, *Ausim Inc*.

Advisor, *Limcom, Inc*.

Advisor, *LibSyn, Inc*.

Consultant, *Intuitive Surgical, Inc.*

Advisor, *Visual Acuity, Ltd.*

Memberships:

- Institute of Electrical and Electronic Engineering (IEEE)
- International Society for Optical Engineering (SPIE)
- Association for Computing Machinery (ACM): Special Interest Group: Graphics (SIGGRAPH)
- Society for Information Displays (SID)
- Microscopical Society of Southern California

MEDIA REFERENCES & PRESS COVERAGE

Books:

Communication in the Age of Virtual Reality. Biocca, F., Levy, M., eds. Hillsdale, New Jersey: Lawrence Erlbaum Associates, Inc., pp. 68-9, 79, 138. 1995.

Virtual Reality: Scientific and Technological Challenges. Durlach, N., Mavor, A., eds. National Academy Press, pp. 48, 128, 130, 132, 192. 1995.

Silicon Mirage: The Art and Science of Virtual Reality. Aukstakalnis, S., and Blatner, D. Berkeley: Peachpit Press, pp.95-96, 230-231, pp. 233-235, 289-291. 1995.

Virtual Reality. Rheingold, H. New York: Summit Books, pp. 340-341. 1991. Also in Japanese: Softbank Books, ISBN4-89052-378-2.

Documentaries:

Design Vintage Realities. Thesis work included in compilation curated by Rachel Strickland for International Conference on Virtual Systems and Multi-Media, 7th Annual Conference. University of California, Berkeley, October 2001.

The Story of Computer Graphics. Interviews with critical and influential contributors to the field of computer graphics Directed by F. Foster, 1999.

Media:

Survey of State-of-the-Art on Synthetic Environments. Laurendeau, D., Final report. Laval University, Quebec, August 2003.

Digital Gifts $100 or Less. *Time Digital*, pp. 61, January/February 2001.

Online Radio the Focus of Increased Business Activity. Traiman, B., *Billboard*, February 17, 2001.

New Camcorders Join the Digital Revolution. Evangelista, B., *San Francisco Chronicle*, January 8, 2001.

Best of What's New. *Popular Science*, pp. 49, December 2000.

World Wide Radio. Hamilton, A., *Time Magazine*, pp. 119, October 9, 2000.

IM Remote Tuner, Sonicbox. *Washington Post*, August 18, 2000.

Music from the Net away from the Net. *Newsweek*, pp. 14, August 14, 2000.

Cisco: Internet Home, with Wired Appliances and All, Opens Its Doors. Langberg, M. *San Jose Mercury News*, pp. C1-2, July 26, 2000.

Sonicbox: Tune In the Web, Wirelessly. Jacobi, J., *Streamingmedia*, July 14, 2000.

Sonicbox iM Remote Tuner. *CNET Computers.com*, June 2, 2000.

Cover story. Why the Web Won't Kill Radio Stars. *Click*, pp. 54-60, June 2000.

Microsoft Goes Clicking and Streaming into Digital Media. Harvey, P., *Red Herring*, February 2, 2000.

The Emperor Strikes Back: On the Eve of a New Millennium, Bill Gates Talks About the Future of Microsoft, the Convergence of Technology and Entertainment--and His Favorite 'Star Trek' Captain. *Entertainment Weekly*, pp. 28+, January 7, 2000.

People & Organizations. *Real Time Graphics*, January 2000.

Fakespace Announces ImmersaDesk H3. *Real Time Graphics*, January 2000.

Fakespace Intros New Look for Big Displays. *Computer Graphics World*, January 2000.

Techno-Baubles. *Entertainment*. January 2000.

Virtual Architecture - Concepts and Methods of Information Transfer in the Digital Environment.

Reconfigurable RAVE Display System Generates Multiple Large-Scale Visualization Environments. *Virtual Medical Worlds*, December 1999.

Sonicbox from *Microsoft*, December 10, 1999.

Microsoft's New Battleground: Music Players. Blank, D., *Wall Street Journal*, pp. B6, December 7, 1999.

Microsoft Unveils Music, Video Products with Broad-band Appeal. Haring, B., *USA Today*, pp. 3D, December 7, 1999.

Sonicbox Links Digital Music to a Home Stereo. *IDG.net*, December 7, 1999.

Real, Sonicbox Turn Up Net Radio. *Wired.com*, December 6, 1999.

Fakespace Systems Announces RAVE Display System. *Real Time Graphics*, December 1999.

Canadian Center Opens Up Virtual Design Industry. *Computer-Aided Engineering*, December 1999.

Virtual Reality – DC/Detroit Area Offices. *Individual.com* Personal Newspage, November 10, 1999.

Putting People Power into Virtual Reality. Stewart, P. and Buttolo, P., *Mechanical Engineering Design*, pp. 18-24, November 1999.

Navigational & Gestural Devices. *VR News*, November 1999.

Interactive Devices. Brum, J., *Silicon Graphics World*, November 1999.

Virtual Reality Reaches New Heights in Digital Workroom. *National Defense*, November 1999.

Navigation and Gesture Technologies, Isdale, J., *VR News*, November 1999.

Immersive Display System. *IEEE Computer Graphics and Applications*, November 1999.

An Impressive Spread. *Computer Graphics World*, November 1999.

Sonicbox Deal. Bessman, J. *Billboard*, October 30, 1999.

Fakespace Systems Announces Industry First: A Fully Reconfigurable Display System for Immersive Visualization. *Vis-Sim.org*, October 25, 1999.

Play Net Radio Anywhere. *PC World*, October 12, 1999.

Sonicbox Brings Net Radio into Your Living Room. *CNN broadcast*, October 12, 1999.

Cover story. Radio's Doomsday Device: The Internet Sonicbox. *Radio Ink* 24(21), pp. 20-24, October 11, 1999.

CAVE: Surrounded by Science at ODU. *Virginian Pilot*, October 11, 1999.

TIME Special Report. *Time International*, October 11, 1999.

X Division Goes to the Movies. *Reflections*, October 1999.

Mergers and Acquisitions. *Computer-Aided Engineering*, October 1999.

In Brief. *Computer Graphics World*, October 1999.

London Centre: Proof Future is Here. *The London Free Press*, September 16, 1999.

Section cover story. Sonicbox Brings Net Radio to Actual Radios. Kornblum, J., *USA Today*. September 10, 1999.

Virtual Reality Displays: Periscopes to Cyberspace. *TV Technology*, September 8, 1999.

Screen Aids Collaborative Design. *Industry Week*, September 6, 1999.

Hot Products. *Design News*, September 6, 1999.

Computer Conference is a Window on a World of Wonder. *San Diego Union-Tribune*, September 5, 1999.

Fakespace Acquires Pyramid & Immersive Projection Displays. *VR News*, September 1999.

VETC Becomes Canada's First VR Center. *Silicon Graphics World*, September 1999.

SGI Reality Center. *Real Time Graphics*, September 1999.

OK, How About Some Good News. *Real Time Graphics*, September 1999.

News & Analysis. *MicroDisplay Report*, September 1999.

Integrating VR and CAD. *IEEE Computer Graphics & Applications*, September 1999.

Fakespace Installation at IMTI Speeds Virtual Worlds to Reality. *Design Product News*, September 1999.

Image of the Month. *Computer-Aided Engineering*, September 1999.

Getting the Big Picture. *Computer Graphics World*, September 1999.

Virtual Reality Centre Opened in London, Ontario. *CAD Systems*, September 1999.

Car Manufacturers Go Virtual. *Computing Canada*, August 13, 1999.

Fakespace to Unveil Interactive Devices for 3D Data Manipulation and Immersive Visualization. *Virtual Medical Worlds*, August 9, 1999.

Merging of Fakespace and Pyramid Systems Creates Clear Market Leader in Immersive Visualization Technology. *Virtual Medical Worlds*, August 9, 1999.

DJ Electrohome Ltd.'s Fakespace Unit Merges with Pyramid Systems. *Dow Jones*, August 9, 1999.

Canadian VR. *Offshore*, August 1999.

WorkWall for Collaboration. *IEEE Computer Graphics & Applications*, August 1999.

On the Job: Virtual Nuclear Testing. *Cadalyst*, August 1999.

Immersed in Immersive Imaging. *Advanced Imaging*, August 1999.

Fakespace and Canada's National Research Council Unveil Immersive Workroom Facility at the Virtual Environment Technologies Centre. *WAVE Newsletter*, July 8, 1999.

Workwall Display Handles Stereo, High-Res Accuracy. *Silicon Graphics World*, July 1999.

Fakespace Unveils Immersive WorkRoom. *Real Time Graphics*, July 1999.

Das Plastische Panoptikum. *CT Magazin fur Computer Technik*, July 1999.

Virtual Reality Centers. *A/E/C Systems*, July 1999.

Other Tools. *A/E/C Systems*, July 1999.

Ontario VR Centre Opening Soon. *Design Engineering*, June 1999.

Computer Graphics World's 1998 Innovation Awards. *Computer Graphics World*, pp. 27-28, January 1999.

Fakespace 'Pushes' the Immersive Desktop. *Computer Graphics World* 21(12), pp. 14, December 1998.

Affordable Stereo Optic Display. *Desktop Engineering*, December 1998.

Dessault's Catia V5: NT Based, Works on UNIX, Interoperates with V4. *Engineering Automation Report*, December 1998.

Naval Air Center Designs Draw on Immersive Device to Tune Systems. Angelillo, J., *Silicon Graphics World* 8(12), December 1998.

VR Initiative, Video Help Position SGI to Champion Market. *Silicon Graphics World*, December 1998.

Spectacle for the Eyes. Pescovitz, D., *New Scientist (UK)*, p40, November 7, 1998.

Head-mounted Displays. *MicroDisplay Report*, November 1998.

New Push 640 Display to Deliver Affordable 3D Immersion at Your Desktop. *Virtual Medical Worlds* (web-based), November 1998.

Dessault Systemes. *VR News*, November 1998.

Cover story. Det Magiska Ögat: Prototypens Centrala Roll. *Verkstads Forum (Sweden)* 5(7), pp. 12-14, October/November 1998.

Silicon Graphics/Fakespace/Dessault. *VREfresh*, October 14, 1998.

Visualization Tool is Viewed on Working Planes. *Product Design & Development*, October 1998.

Fakespace Introduces Push 640 Desktop Display. *Real Time Graphics*, October 1998.

Good Stuff. *Real Time Graphics*, October 1998.

Sun Microsystems. *VR News*, October 1998.

Buyers Guide: Push Desktop Display & Immersive Workbench. *A/E/C Systems Computer Solutions*, Autumn 1998.

Science at SIGGRAPH: The Magic is Not Just at the Movies. *Animation World Magazine*, September 4, 1998.

Build a Better Simulation. *Computer Graphics World* (Special Graphics Issue), September 1998.

Siggraph Rewound. *Computer-Aided Engineering*, September 1998.

Desktop VR Tool. *Desktop Engineering*, September 1998.

Fakespace Introduces VersaBench VMD. *Real Time Graphics*, September 1998.

Fakespace Holds Great Promise for Medical Visualization. Versweyveld, L., *Virtual Medical Worlds Monthly*, August 1998.

Review of Bolas Virtual Environments/Art Pieces (web discussion). Jacobson, B., www.useit.com/alertbox/981115_comments.html, 1998.

Industry News. *VR News*, August 1998.

VR and Interior Design. *Desktop Engineering*, August 1998.

Fakespace's Virtual Model Display Systems Demonstrated at Siggraph '98. *Virtual Medical Worlds*, July 20, 1998.

Cover story. Scientists Look to a Virtual World. Shedding, V., *Scientific Computing World (UK)*, pp. 19-20, July 1998.

Electrohome Investment. *Real Time Graphics*, July 1998.

Large-Scale 3D Visualization Display. *Military Training Technology* 3(3), pp. 29, July 1998.

Fakespace Holds Great Promise for Medical Visualization. *Virtual Medical Worlds*, June 9, 1998.

Cover story. Electrohome Buys into Fakespace. *VR News*, June 1998.

Een Schone Schijnwereld. Hommes, I., *Elsevier (The Netherlands)*, pp. 144-153, May 16, 1998.

Virtual Workbench. *Mechanical Engineering*, May 1998.

Cover story. Technology Trends: US Navy Chooses Virtual Reality for Visualizing Battlefields. Wilson, A., *Vision Systems Design*, pp. 7, May 1998.

Fakespace, Inc. *VR News*, May 1998.

Virtual Journeys. *Computer Graphics World*, May 1998.

Fakespace's 3D Display Supports Different Orientations. *Display Monitor (UK)*, April 17, 1998.

Fakespace Delivers 3-D Display For Navy Aircraft Designers. *Military & Aerospace Electronics*, April 1998.

Playing Around with War Games and IQ Tests. *Tech Week*, March 23, 1998.

Cover story. VR Speeds Up Car Designs. Studt, T., *R&D Magazine*, pp. 74, March 1998.

Tech Update. *Popular Mechanics*, February 1998.

Product Premiers. *Military Training Technology*, February 1998.

Fakespace Introduces IWB-50 Immersive WorkBench. *Real Time Graphics*, February 1998.

Center to Further Virtual Reality in Medicine. *Computer Graphics World*, January 1998.

Industry Wrap-up. *Engineering Automation Report*, January 1998.

Buyer's Guide. *Scientific Computing & Automation*, December 1997.

Fakepace Inc. *VR News*, December 1997.

Videogame Nirvana: GameWorks Joint Venture Provides Mecca for Video Game Fanatics. Oldham, S., *Popular Mechanics* 174(12), pp. 146, December 1, 1997.

Navy Research Lab Explores Use of VR for Command and Control in Marines' Sea Dragon. *Silicon Graphics World*, November 1997.

Vitual Reality Catches On. *Computer-Aided Engineering*, November 1997.

Interactive Imaging. *Advance Radiology* (Canada), July 1997.

VR Drives Chrysler's New Cars. *Computer Graphics World*, July 1997.

VR at Chrysler. *Computer-Aided Engineering*, July 1997.

Joint Simulation Facilitates Training Realism Concepts. *Signal*, July 1997.

VR Drives Chrysler's New Cars. Mahoney, D., *Computer Graphics World*, July 1997.

The Virtual Windtunnel on the Virtual Workbench. *IEEE Computer Graphics & Applications*, July 1997.

In the News-1996 Industry Excellence Awards. Lear, A., *IEEE Computer Graphics*, June 1997.

Medical Volume Visualization-The Doorway to the Future. *Innovation3* (Summer), June 1997.

High-Res VR Displays. Helsel, S., *Computer Graphics World*, May 1997.

Mega-Dose. *MTV Music Television*, April 19, 1997.

A Cut Above Routine Surgery, Computers & Technology. Richter, J., *San Francisco Examiner*, April 6, 1997.

Tools for a Collaborative World. *Computer-Aided Engineering*, April 1997.

Fakespace Music at Seattle. *Feedback Magazine*, Issue 3.1, pp. 7, 11, Spring 1997.

Solving Real-World Problems Virtually. Quellette, J., *The Industrial Physicist*, March 1997.

The Design Benefits of Group VR. Rowell, A., *Computer Graphics World* 20(2), pp. 21-27, February 1997.

VR's New Perspective. *Computer-Aided Engineering*, February 1997.

New Tool. *Military Training Technology*, February 1997.

The Design Benefits of Group VR. *Computer Graphics World*, February 1997.

The Virtual Representation of Data Has Impact Everywhere. *Scientific Computing & Automation*, February 1997.

Fakespace at I/ITSEC. *CyberEdge Journal*, January-February 1997.

Military Eyes New Fakespace Virtual Environment. Wilson, J., *Military & Aerospace Electronics*, January 1997.

On Location: Experience Music Project. Dube, R., *Webnoize*, January 1997.

Working in Virtual Worlds. Products I/O Section, *Computer Graphics World*, January 1997.

NASA Uses First Immersive Workbench for Surgery Training. Eggleston, D., *Silicon Graphics World*, January 1997.

Computing. *Mechanical Engineering*, January 1997.

Fakespace Debuts DUO-Dynamic Display System. *Real Time Graphics*, January 1997.

NASA Uses First Immersive Workbench for Surgery Training. *Silicon Graphics World*, January 1997.

Pinch Glove. *VR News*, January 1997.

Working in Virtual Worlds. *Computer Graphics World*, January 1997.

In-Your-Face ROCK! Linn, A., *The Olympian*, January 3, 1997.

Let's Work Together Let's Play Together. Jacobson, L., *IRIS Universe*, Winter 1997.

The Art of Virtual Reality. Barsook, P., *IRIS Universe*, No. 36, pp. 39-40, 1996.

The Seattle Sound. Wooton, S., *The Herald*, December 28, 1996.

Strats, Studios and the Seattle Sound. Flowers, C., *South County Journal*, December 27, 1996.

They Were Legends; Now They're History. Phalen, T., *Seattle Times*, December 13, 1996.

Fakespace DUO. *VR News*, December 1996.

Guanti da Chirurgo. Riva, G., *Virtual (Italy)*, pp. 30-32, December 1996.

Cover story. La Science de L'illusion: La Réalité Virtuelle. Langois, G., *Interface (Montreal)* 17(6), pp. 40-43, 46-49, November-December 1996.

A Rock Experience Coming to Seattle; Strats, Studios and the Seattle Sound Exhibition. Palmer, M., *San Francisco Chronicle*, November 12, 1996.

Cover story. NASA Spinoff Makes Virtual Design a Reality. *NASA Tech Briefs* 20(11), November 1996.

Immersive & 3D Display Systems. *Techology Review*, October 1996.

Not Exactly Rocket Science. Goodkind, M., *Standard Today*, September-October 1996.

SIGGRAPH on the Bayou; Knee-Deep in 3D. Brill, L., *IRIS Universe*, Fall 1996.

Music of the Spheres. Greuel, C., *IRIS Universe*, Summer 1996.

Wired for Art: The Reopened Guggenheim SoHo. Rosenbaum, L. *The Wall Street Journal*, July 2, 1996.

A Museum's Metamorphosis: The Virtual Arcade. Smith, R. *The New York Times*, June 18, 1996.

Cover story. *Playgraph Magazine (Japan)* 32(6), June 1996.

New Media News. Gonzaga, M. *Broadcast on KRON-TV (Bay TV)*, April 12, 1996.

Conference Trail. Delaney, B., *CyberEdge Journal*, pp. 24, March/April 1996.

Best VR of 1995 *CyberEdge Journal*, pp. 6-7, March/April 1996.

Sound Drives Graphics, Soundscapes Experiences Take New Approach. Jones, C., *Silicon Graphics World*, pp. 25, March 1996.

VR Brewing. *Multimedia Producer*, p. 16, March 1996.

Virtual Reality Resource Guide. *Virtual Reality Special Report*, pp. 34-35, March 1996.

1995 Industry Excellence Awards Favor 3D Products. *IEEE Computer Graphics and Applications*, p.89. 1996

VR Worlds that Boogie to the Beat. King, D., *Computer Graphics World*, pp. 17, December 1995.

Hidden Reality: Fakespace. Ostman, C., *Midnight Engineering*, pp. 12-15, November/December 1995.

Interactive Art? It's Virtually a Reality. *Los Angeles Times*, November 26, 1995.

Modeling for Virtual Reality. Mahoney, D., *Computer Graphics World*, pp. 45-50, October 1995.

Entertainment News. Delaney, B., *CyberEdge Journal*, pp. 29, September/October 1995.

Virtual Brewery Adventure. *Media Report (Japan)*, September 1995.

Fur den Industriellen Einsatz sind Datenhelme Ungeeignet. *Computerwoche (Germany)*, September 1995.

Industry Buzz. *Virtual Reality Monthly*, September 1995.

Virtual Reality: Zwei Wege Führen in die kunstliche Welt. Post, H., *VDI Nachrichten (Germany)*, September 1995.

Virtual Reality Gets Real: VR Here and Now. Wolff, E., *Daily Variety*, pp. 26, August 7, 1995.

Human Integrated Design, Deitz, D., *Mechanical Engineering*, August 1995.

Division Ltd. Named International Distributor of Fakespace Immersive Displays. *VR World*, July/August 1995.

Virtually Unstoppable VR Invades Health Care Field. Alfenito, C., *San Jose and Silicon Valley Business Journal: Health Care Quarterly*, pp. 28, 36, July 17-23, 1995.

Fakespace Debuts Desktop Immersive Display. *Real Time Graphics* 4(1) July 1995.

Virtual Reality as a Design Tool. *Engineering Automation Report*, July 1995.

VR Dives into Ocean Research. *Silicon Graphics World*, July 1995.

Real Engineering in a Virtual World. Deitz, D., *Mechanical Engineering* 117(7), pp. 78-85, July 1995.

Visione ad Ampio Raggio. *Virtual (Italy)*, p. 78, May 1995.

Driving VR. Mahoney, D., *Computer Graphics World*, pp. 22-24, 26, 31, 33, May 1995.

Virtuality Steers New-Car Design. *Popular Mechanics*, May 1995.

VR Turns Brewery into a Great Date. Graves, G. *New Media*, p. 38, March 1995.

Somewhere Over the Rainbow. Brill, L., *Digital Video Magazine*, pp. 32-43, March 1995.

Room with a Brew, *Trendlines, CIO*, March 1995.

A Simulating Experience. Stavnicky, L., *Designfax Magazine*, February 1995.

Simuation: Art and Science. Owen, J., *Manufacturing Engineering*, pp. 61-63, February 1995.

Fakespace Sharpens View of Sapporo's Virtual Brewery Tour. *Silicon Graphics World*, February 1995.

Ford Motor Company. User Profile, *VR News* 4(1), pp. 23-25, January/February 1995.

Virtual Brewery Goes on Tap in Tokyo. *Computer Graphics World*, January 1995.

I/ITSEC '94 – The Top Show for Simulation. Latham, R., *Real Time Graphics* 3(6), pp. 3, 6-7, January 1995.

Virtual Brewery Adventure. Community Forum, *IRIS Universe*, Number 31, 1995.

Fakespace Has Real Demo of Simulated Brew. Hostetler, M. and C. Matsumoto, *The Business Journal*, pp. 25, December 12, 1994.

Fakespace Launches High-Resolution Immersive Stereo Displays for 'Hands-Free' and 'Kiosk' Applications. *VR News* 3(10), pp.18, December 1994.

Museum-VR: Opening the Gateway to Cyberspace: Part I. Brill, L., *Virtual Reality World*, pp. 33-40, November/December 1994.

Industry Outlook. *CyberEdge Journal*, pp. 22-23, November/December 1994.

Autofact '94 Stroll Is A High-Tech Ball. Keebler, J., *Automotive News*, November 21, 1994.

Hard-Wired-Bodies Plugging into Virtual Reality. Alfenito, C., *Ability*, pp. 26-30, November 1994.

Cover story. Carmakers Log On to the Future: Computers, Electronics Become Indispensable to Builders and Drivers. Thomas C., *Automotive News*, pp. 1-2, October 17, 1994.

Warning: Today's Museum Tour May Result in a Virtual Hangover. Hamilton, D., *The Wall Street Journal*, pp. B1, October 1994.

VR Interfaces Hold Key for Future Systems. *Military & Aerospace Technology*, June 1994.

Metaphors for the Traveling Cybernaut Part II. Brill, L., *Virtual Reality World*, May/June 1994.

Fakespace's Immersive Display Targets Health Market. *Silicon Graphics World*, May 1994

Fakespace Introduces MedView™ Immersive Display. *Real Time Graphics* 2(9), pp. 10, April/May 1994.

Engineering Visualization: Not Just Pretty Pictures. Schmitz, B., *Computer-Aided Engineering*, April 1994.

Immersive Images. *Computer Graphics World*, pp. 72, April 1994.

Industry Roundup: Fakespace Inc. *VR News* 3(3), pp. 8, April 1994.

Fakespace Ships BOOM3C to NASA Ames, Naval Research Centers. *Silicon Graphics World* 4(3), pp. 10, March 1994.

New Boom™ Display has Field-Sequential Color. *Real Time Graphics* 2(7), pp. 1-2, February 1994

Plan to Set Up National IT Council. *New Straits Times (Malaysia)*, p. 14. November 16, 1993

Siggraph '93. Hamit, F., Meyer, K., Delaney, B. *CyberEdge Journal* 3(5) pp. 1, 8, September/October 1993

Go with the Flow: Visualizing Complex Waterway Designs with Virtual Reality. Aukstakalnis, S. *CADalyst* 10(8), pp. 56-58, August 1993.

Cover story. Visual Display. *Virtual Reality News* 2(3), July/August 1993.

Galactic Graphics: Cosmologists Turn to Computer Graphics to Visualize the Formation of Galaxies. Barnes-Svarney, P., *Computer Graphics World*, pp. 36-38, 40, December 1992.

Facing Interface Issues. Special Report: Virtual Reality. Brill, L., *Computer Graphics World*, April 1992.

Virtual Environments Enhance Visualization Techniques at NCSA. Iverson, W., *Supercomputing Review*, pp. 28-29, January 1992.

Interview. Virtual Reality Still Unrealistic. Alexander, M., *Computer World* 25(25), p. 20, July 1991.

Cyberthon 1.0: VR Fair in San Francisco. Kadrey, R., *Whole Earth Review*, p. 54, Spring 1991.

Jo-El Sonnier: Cajun Accordionist Joins the Midi Revolution. Trubitt, D. *Keyboard*, p. 28, August 1990.

Virtual Reality and the Electronic Musician. Trubitt, D. *Electronic Musician*, pp. 31-32, 35-40, July 1990.

Biography

Mark Bolas is a research scientist, artist, and designer of perceptually focused computer systems used to augment perception, agency, and intelligence. He is a Visiting Associate Professor in the Interactive Media Division, School of Cinema and Television at the University of Southern California, and Chairman of Fakespace Labs in Mountain View, California.

Mark's 1988-89 thesis work *Design and Virtual Environments* was done under the direction of Rolf Faste in Stanford's design program and Scott Fisher at NASA Ames. It was among the first efforts to map the breadth of virtual reality as a new medium. This effort provided the foundation for a number of seminal observations that led Mark toward a basic model for immersive experience design, concluding that the medium's power to deeply transport a user is closely tied to finding an appropriate balance between realism and abstraction.

Mark co-founded Fakespace Inc. to build instrumentation for research labs to explore virtual reality and grow the emerging field. His work with Ian McDowall resulted in the invention of display and interaction tools used by most VR research and development centers around the world. The Boom, the Pinch, the Rave, and VLIB software are just a few examples of the tools they created that changed design and research in many areas: automotive and aerospace design, oil and gas exploration, molecular modeling and data visualization, to name a few. Fakespace products have been used to design cars at Chrysler, bring immersion to software environments like Catia, allow our national laboratories and research centers around the world to dig a bit deeper in visualizing their data, and educate patrons at the Chicago Museum of Science and Industry.

Mark continues to explore the nature of virtual reality through the design of immersive experiences. His work focuses on creating virtual environments and transducers that fully engage one's perception and cognition, and create a visceral memory of the experience. His work has been exhibited in many venues including six Emerging Technology exhibits at Siggraph starting in 1991 with *Flatlands*, which used the illusion of perspective to transform a sculpture into *Mondrian's Composition with Line, 1918*; the music-driven worlds of *Vacuii* and *StillLife* created with Christian Greuel and Niko Bolas; and the invisibly structured *Snared Illumination* created with Perry Hoberman and Ian McDowall.

Mark has been a professor at Stanford University and Keio University, exploring tangible interfaces, augmented reality, and computational illumination. These projects have explored context sensitive audio interfaces, socially interactive toys, augmented reality, confocal illumination, and mobile phone web logging. Mark has co-chaired *The Engineering Reality of Virtual Reality* conference at SPIE for over 10 years. He holds twenty patents with his co-inventors at Fakespace and has won many significant awards for his products and designs.

Mark's cross-disciplinary work and teaching have led him to understand that design is a conceptual discipline that can be taught independently of the field to which it's being applied. It is a discipline or process that transcends the specific implementation details of the science or art through which it is being learned or practiced. Developing the implications of this theoretical model of design is now part of his ongoing research and teaching at USC.