

Marc Levoy

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Education

- 1971-1976 B. Architecture, Cornell University
Thesis: "A Computer-Assisted Keyframe Animation System"
Advisor: Donald P. Greenberg
- 1976-1978 M.S. in Architecture, Cornell University
Thesis: "Computer-Assisted Cartoon Animation"
Advisor: Donald P. Greenberg
- 1984-1989 Ph.D. in Computer Science, University of North Carolina at Chapel Hill
Dissertation: "Display of Surfaces from Volume Data"
Advisor: Henry Fuchs

Positions

- 1978-1983 Research Associate, Program of Computer Graphics,
Cornell University.
- 1980-1983 Senior Scientist and Director of Computer Animation Department,
Hanna-Barbera Productions.
- 1989-1990 Research Assistant Professor, Department of Computer Science,
University of North Carolina at Chapel Hill.
- 1990-1996 Assistant Professor, Departments of Computer Science and Electrical Engineering,
Stanford University.
- 1997-2005 *ibid*, Associate Professor.
- 2006-2011 *ibid*, Professor.
- 2011-2014 *ibid*, VMWare Founders Professor of Computer Science and Electrical Engineering.
- 2014- *ibid*, VMWare Founders Professor of Computer Science and Electrical Engineering,
Emeritus.
- 2011-2015 Software Engineering Manager,
GoogleX.
- 2015-2017 Principal Engineer,
Google.
- 2017- Distinguished Engineer,
Google.

Awards and honors

- 1976 Charles Goodwin Sands Memorial Medal for best undergraduate thesis, School of Architecture, Art, and Planning, Cornell University.
- 1991-1995 National Science Foundation Presidential Young Investigator.
- 1996 ACM SIGGRAPH 1996 Computer Graphics Achievement Award.
Citation: "Pioneering work in volume rendering"
- 2007 ACM Fellow.

Professional activities (in reverse chronological order by most recent year of involvement)

- Papers Chair, SIGGRAPH 2007.
- Member of Papers Advisory Board, SIGGRAPH 2002, 2003, 2006, 2009, 2010.
- Member of Program Committee, SIGGRAPH 1992, 1993, 1995, 1996, 1998, 2000, 2005, 2006, 2010, 2011.
- Member of Program Committee, CVPR 2006, 2009.
- Member of Program Committee, ICCP (Int'l Conf. on Computational Photography), 2009, 2010, 2011.
- Co-chair, Symposium on Computational Photography and Video, 2005.
- Member of Program Committee, 3D Digital Imaging and Modeling 2001, 2003, 2005.
- Member of Program Committee, Symposium on Interactive 3D Graphics 1997.
- Member of Program Committee, Visualization 1991, 1992, 1993, 1994, 1995, 1996.
- Member of Program Committee, Volume Visualization 1990, 1992, 1994, 1996.
- Member of Program Committee, Visualization in Biomedical Computing 1990, 1992, 1994.
- Co-chair of Program Committee, Symposium on Interactive 3D Graphics 1992.
- Chairman, Tutorial on Volume Visualization Algorithms and Architectures, SIGGRAPH 1990, 1991.
- Chairman, Tutorial on Two-Dimensional Computer Animation, SIGGRAPH 1981, 1982.
- Member, ACM, SIGGRAPH, IEEE, SPIE.

Keynote addresses, distinguished lectures (in reverse chronological order, with selected titles)

- Keynote address at Photography, Mobile, and Immersive Imaging (PMII) conference, Electronic Imaging Symposium, San Francisco, January 31, 2018.
- Invited talk at Extreme Imaging Workshop, ICCV 2015, Santiago, December 17, 2015, "Extreme Imaging Using Cell Phones".
- Capstone address at Code Neuro conference, San Francisco, November 20, 2015, "Scientific imaging in the age of cell phones and VR".
- Keynote address at University of North Carolina CS Department's 50th anniversary symposium, Chapel Hill, May 2015, "What 'mobile-first' means for the future of computer science".
- Keynote address at Cornell CS Department's 50th anniversary symposium, Ithaca, October 2014.
- Invited address at National Press Club, May 2014.
- Keynote address at Electrical and Computer Engineering Department Heads Association (ECEDHA) annual conference, Napa, March 2014.
- Invited address at Los Angeles County Museum of Art, January 2014.

Keynote address at International Conference on Computational Photography (ICCP), Cambridge, April 2013, "What Google Glass means for the future of photography".
 Triangle Computer Science Distinguished Lecture Series, Chapel Hill, October 2013.
 Keynote address at Winter Computer Vision School, Lenk, January 2013.
 Commencement Address at Doctoral Hooding Ceremony, University of North Carolina Graduate School, Chapel Hill, May 2012.
 Distinguished lecture at University of Maryland College Park, March 2012.
 Keynote address at IS&T Conference on Human Vision and Electronic Imaging, San Francisco, January 2012.
 Keynote address at SMPTE 3D conference, New York, June 2011, "Computational photography and cinematography".
 Distinguished lecture at Howard Hugues Medical Institute, April 2011.
 Distinguished lecture at TTI/Vanguard conference, Charlotte, November 2010.
 Keynote address at 6sight conference on photography, San Jose, November 2010, "Computational photography and the Stanford Frankencamera".
 Keynote, PROCAMS workshop at CVPR 2009, Miami, June 2009.
 Triangle Distinguished Lecturer Series, Chapel Hill, NC, March 2009, "Light Field Photography and Microscopy".
 Keynote, Digital Photography V, at SPIE's Electronic Imaging Conference, San Jose, January 2009,
 Keynote, Indian Computer Vision and Computer Graphics (ICVCG) Conference, Bhubaneswar, December 2008.
 Keynote, ICIIP 2008, San Diego, October 2008, "New Techniques in Computational Photography".
 Keynote, OSA Computational Imaging workshop, Charlotte, June 2008. "Light Field Sensing".
 National Science Foundation, CISE Distinguished Lecture Series, October 2007, "Computational Photography".
 Keynote, OSA Fall Vision Meeting, Berkeley, September 2007.
 Adobe Distinguished Lecture Series, September 2006, "Computational Imaging in Photography and the Sciences".
 Keynote, IEEE/Eurographics Symposium on Point-Based Graphics, July 2006, "Where Does Point and Volume Data Come From?"
 Keynote, International Workshop on Volume Graphics, July 2006 (joint plenary session with Point-Based Graphics symposium)
 Keynote, Bay Area Vision Conference, March 2004, "Synthetic aperture illumination and photography using arrays of video projectors and cameras".
 Keynote speaker, DIMACS Workshop on Surface Reconstruction, April, 2003, "Why is 3D Scanning Hard?"
 Keynote speaker, 3D Data Processing, Visualization, and Transmission, June, 2002.
 Keynote speaker, SIAM, November, 2001, "The Digital Michelangelo Project".
 Featured speaker, Humanities West, October 2001.
 NASA Goddard, Information Science and Technology Colloquium, May 2001.
 Bell Laboratories, General Research Colloquium, May 2000.
 University of British Columbia, CICSRS's Distinguished Lecture Series, February 2000.
 Keynote speaker, 3D Digital Imaging and Modeling 1999.
 Keynote speaker, Eurographics 1999.
 Invited speaker, Graphics Interface 1992.
 Keynote speaker, Volume Visualization 1990.

Selected recent research grants (in reverse chronological order by final year of funding)

- 2012-2017 NIH, “CLARITY: Fully-assembled Biology” (with Karl Deisseroth, Ligu Lu, Krishna Shenoy, and Philippe Mourrain), \$22.5M.
- 2011-2014 Intel, “Programmable processors for photography and computer vision” (with Mark Horowitz and Pat Hanrahan).
- 2011-2013 Google, “New directions in burst-mode photography”.
- 2010-2012 National Science Foundation, “Frankencamera - an open-source camera for research and teaching in computational photography” (with Mark Horowitz, Fredo Durand, and William Freeman).
- 2010-2011 National Science Foundation, “A GPU-accelerated 3D-imaging and 3D-illumination system for feedback control of light fields in biological light microscopy” (with Stephen J. Smith and Jonathan Taylor).
- 2007-2011 Nokia, “Camera 2.0: Computational Photography on Mobile Platforms” (with Mark Horowitz).
- 2009-2010 Disney, “Frankencamera F3.”
- 2007-2010 Sanyo, “Computational Photography.”
- 2007-2010 Kodak, “New Techniques in Computational Photography.”
- 2006-2009 National Science Foundation, “Active computational imaging using a dense array of projectors and cameras” (with Mark Horowitz).
- 2005-2007 DARPA, “Dense Arrays of Inexpensive Video Cameras and Projectors” (with Mark Horowitz).
- 2003-2005 DARPA, “High-Performance Imaging Using Dense Camera Arrays” (with Mark Horowitz).
- 2003-2005 Google, “Multi-Perspective Panoramas of City Blocks.”
- 2002-2005 National Science Foundation, “High-Performance Imaging Using an Array of Low-Cost Cameras.”
- 2001-2004 National Science Foundation, “Solving the Puzzle of the Forma Urbis Romae.”
- 2000-2002 National Science Foundation, Digital Libraries Initiative 2, “Creating digital archives of 3D artworks.”
- 1998-2001 Intel, Sony, and Interval Research, “Stanford Immersive Television Project” (with Pat Hanrahan, Mark Horowitz, Bill Dally, and Carlo Tomasi).
- 1997-1999 Paul W. Allen Foundation, “The Digital Michelangelo Project.”

Refereed conference papers (in reverse chronological order, including SIGGRAPH papers)

- (1) Hasinoff, S.W., Sharlet, D., Geiss, R., Adams, A., Barron, J.T., Kainz, F., Chen, J., Levoy, M., Burst photography for high dynamic range and low-light imaging on mobile cameras, *ACM Transactions on Graphics* (Proc. SIGGRAPH Asia), 2016.
- (2) Park, S.H., Levoy, M., Gyro-Based Multi-Image Deconvolution for Removing Handshake Blur, *Proc. CVPR 2014*.
- (3) Baek, J., Pajak, D., Kim, K., Pulli, K., Levoy, M., WYSIWYG Computational Photography via Viewfinder Editing, *ACM Transactions on Graphics* (Proc. SIGGRAPH Asia), 2013.
- (4) Ragan-Kelley, J., Adams, A., Paris, S., Levoy, M., Amarasinghe, S., Durand, F., “Decoupling algorithms from schedules for easy optimization of image processing pipelines,” *ACM Transactions on Graphics* (Proc. SIGGRAPH), Vol. 31., No. 4, 2012.
See also reprint in CACM 2018.
- (5) Davis, A., Durand, F., Levoy, M., Unstructured Light Fields, Proc. Eurographics 2012. Also published as *Computer Graphics Forum*, Vol. 31 (2012), Number 2.
- (6) Wan, G., Li, X., Agranov, G., Levoy, M., Horowitz, M., A Dual In-Pixel Memory CMOS Image Sensor for Computation Photography, *Proc. Symposium on VLSI Circuits* (Kyoto, Japan, June 2011).
- (7) Zhang, Z., Barbastathis, G., Levoy, M., “Limitations of Coherent Computer Generated Holograms,” *Proc. Digital Holography and Three-Dimensional Imaging (DH)* (Tokyo, Japan, May 9, 2011).
- (8) Adams, A., Talvala, E., Park, S.H., Jacobs, D.E., Ajdin, B., Gelfand, N., Dolson, J., Vaquero, D., Baek, J., Tico, M., Lensch, H.P., Matusik, W., Pulli, K., Horowitz, M., Levoy, M., “The Frankencamera: An Experimental Platform for Computational Photography,” *ACM Transactions on Graphics* (Proc. SIGGRAPH), Vol. 22, No. 4, 2010, Article 29, July 2010. Reprinted in *Communications of the ACM (CACM)*, Vol. 55, No. 11, November 2012.
- (9) Adams, A., Gelfand, N., Dolson, J., Levoy, M., “Gaussian KD-Trees for Fast High-Dimensional Filtering,” *ACM Transactions on Graphics* (Proc. SIGGRAPH), Vol. 28, No. 3, 2009.
- (10) Zhang, Z., Levoy, M., “Wigner Distributions and How They Relate to the Light Field,” *IEEE International Conference on Computational Photography (ICCP) 2009*. **Best paper** award.
- (11) Horstmeyer, R., Euliss, G., Athale, R., Levoy, M., “Flexible Multimodal Camera Using a Light Field Architecture,” *IEEE International Conference on Computational Photography (ICCP) 2009*.

- (12) Fuchs, C., Heinz, M., Levoy, M., Lensch, H.P., “Combining Confocal Imaging and Descattering,” *Eurographics Symposium on Rendering (EGSR) 2008*.
- (13) Talvala, E., Adams, A., Horowitz, M., Levoy, M., “Veiling Glare in High Dynamic Range Imaging,” *ACM Transactions on Graphics (Proc. SIGGRAPH)*, Vol. 26, No. 3, 2007.
- (14) Adams, A., Levoy, M., “General Linear Cameras with Finite Aperture,” *Proc. Eurographics Symposium on Rendering (EGSR) 2007*.
- (15) Levoy, M., Ng, R., Adams, A., Footer, M., Horowitz, M., “Light field microscopy,” *ACM Transactions on Graphics (Proc. SIGGRAPH)*, Vol. 25, No. 3, 2006.
- (16) Garg, G., Talvala, E., Levoy, M., Lensch, H., “Symmetric Photography : Exploiting Data-sparseness in Reflectance Fields,” *Proc. 2006 Eurographics Symposium on Rendering*.
- (17) Vaish, V., Szeliski, R., Zitnick, C.L., Kang, S.B., Levoy, M., “Reconstructing Occluded Surfaces using Synthetic Apertures: Stereo, Focus and Robust Measures,” *Proc. CVPR 2006*.
- (18) Wilburn, B., Joshi, N., Vaish, V., Talvala, E., Antunez, E., Barth, A., Adams, A., Levoy, M., Horowitz, M., “High Performance Imaging Using Large Camera Arrays,” *ACM Transactions on Graphics (Proc. SIGGRAPH)*, Vol. 24, No. 3, 2005.
- (19) Sen, P., Chen, B., Garg, G., Marschner, S., Horowitz, M., Levoy, M., Lensch, H., “Dual Photography,” *ACM Transactions on Graphics (Proc. SIGGRAPH)*, Vol. 24, No. 3, 2005.
- (20) Vaish, V., Garg, G., Talvala, E., Antunez, E., Wilburn, B., Horowitz, M., Levoy, M., “Synthetic Aperture Focusing using a Shear-Warp Factorization of the Viewing Transform,” *Proc. Workshop on Advanced 3D Imaging for Safety and Security*, in conjunction with CVPR 2005.
- (21) Chen, B., Ofek, E., Shum, H., Levoy, M., “Interactive Deformation of Light Fields,” *Proc. Symposium on Interactive 3D Graphics and Games (I3D) 2005*.
- (22) Roman, A., Garg, G., Levoy, M., “Interactive Design of Multi-Perspective Images for Visualizing Urban Landscapes,” *Proc. Visualization 2004*.
- (23) Levoy, M., Chen, B., Vaish, V., Horowitz, M., McDowall, I., Bolas, M., “Synthetic aperture confocal imaging,” *ACM Transactions on Graphics (Proc. SIGGRAPH)*, Vol. 23, No. 3, 2004.
- (24) Koller, D., Turitzin, M., Levoy, M., Tarini, M., Croccia, G., Cignoni, P., Scopigno, R., “Protected Interactive 3D Graphics Via Remote Rendering,” *ACM Transactions on Graphics (Proc. SIGGRAPH)*, Vol. 23, No. 3, 2004.
- (25) Wilburn, B., Joshi, N., Vaish, V., Levoy, M., Horowitz, M., “High Speed Video Using a Dense Camera Array,” *Proc. CVPR 2004*.

- (26) Vaish, V., Wilburn, B., Joshi, N., Levoy, M., "Using Plane + Parallax for Calibrating Dense Camera Arrays," *Proc. CVPR 2004*.
- (27) Gelfand, N., Ikemoto, L., Rusinkiewicz, S., Levoy, M., "Geometrically Stable Sampling for the ICP Algorithm," *Proc. 3D Digital Imaging and Modeling 2003*, IEEE Computer Society Press, 2003.
- (28) Ikemoto, L., Gelfand, N., Levoy, M., "A Hierarchical Method for Aligning Warped Meshes," *Proc. 3D Digital Imaging and Modeling 2003*, IEEE Computer Society Press, 2003.
- (29) Rusinkiewicz, S., Hall-Holt, O., Levoy, M., "Real-Time 3D Model Acquisition," *ACM Transactions on Graphics* (Proc. SIGGRAPH), Vol. 21, No. 3, July, 2002, pp. 438-446.
- (30) Davis, J., Marschner, S.R., Garr, M., Levoy, M., "Filling holes in complex surfaces using volumetric diffusion," *Proc. First International Symposium on 3D Data Processing, Visualization, and Transmission (3DPVT '02)* (Padua, Italy, June 19-21, 2002).
- (31) Godin, G., Beraldin, J.-A., Rioux, M., Levoy, M., Cournoyer, L., Blais, F., "An Assessment of Laser Range Measurement of Marble Surfaces," *Proc. Fifth Conference on optical 3-D measurement techniques*, Vienna University of Technology, Vienna, Austria, 2001.
- (32) Jensen, H.W., Marschner, S., Levoy, M., Hanrahan, P. "A Practical Model for Subsurface Light Transport," *Proc. SIGGRAPH 2001* (Los Angeles, August 12-17, 2001). In *Computer Graphics Proceedings*, Annual Conference Series, 2001, ACM SIGGRAPH, pp. 511-518.
- (33) Wei, L.-Y., Levoy, M., "Texture Synthesis over Arbitrary Manifold Surfaces," *Proc. SIGGRAPH 2001* (Los Angeles, August 12-17, 2001). In *Computer Graphics Proceedings*, Annual Conference Series, 2001, ACM SIGGRAPH, pp. 355-360
- (34) Rusinkiewicz, S., Levoy, M., "Efficient Variants of the ICP Algorithm," *Proc. 3D Digital Imaging and Modeling 2001*, IEEE Computer Society Press, 2001, pp. 145-152.
- (35) Rusinkiewicz, S., Levoy, M., "Streaming QSplat: a viewer for networked visualization of large, dense models," *Proc. 2001 Symposium on Interactive 3D Graphics*, ACM, 2001, pp. 63-76.
- (36) Levoy, M., Pulli, K., Curless, B., Rusinkiewicz, S., Koller, D., Pereira, L., Ginzton, M., Anderson, S., Davis, J., Ginsberg, J., Shade, J., Fulk, D., "The Digital Michelangelo Project: 3D scanning of large statues," *Proc. SIGGRAPH 2000* (New Orleans, Louisiana, July 23-28, 2000). In *Computer Graphics Proceedings*, Annual Conference Series, 2000, ACM SIGGRAPH, pp. 131-144.
- (37) Rusinkiewicz, S., Levoy, M., "Qsplat: a multiresolution point rendering system for large meshes," *Proc. SIGGRAPH 2000* (New Orleans, Louisiana, July 23-28, 2000). In *Computer Graphics Proceedings*, Annual Conference Series, 2000, ACM SIGGRAPH, pp. 343-352.

- (38) Wei, L.-Y., Levoy, M., “Fast texture synthesis using tree-structured vector quantization,” Proc. SIGGRAPH 2000 (New Orleans, Louisiana, July 23-28, 2000). In *Computer Graphics Proceedings*, Annual Conference Series, 2000, ACM SIGGRAPH, pp. 479-488.
- (39) Curless, B., Levoy, M., “A Volumetric Method for Building Complex Models from Range Images,” Proc. SIGGRAPH '96 (New Orleans, LA, August 5-9, 1996). In *Computer Graphics Proceedings*, Annual Conference Series, 1996, ACM SIGGRAPH, pp. 303-312.
- (40) Krishnamurthy, V., Levoy, M., “Fitting Smooth Surfaces to Dense Polygon Meshes,” Proc. SIGGRAPH '96 (New Orleans, LA, August 5-9, 1996). In *Computer Graphics Proceedings*, Annual Conference Series, 1996, ACM SIGGRAPH, pp. 313-324.
- (41) Levoy, M., Hanrahan, P., “Light Field Rendering,” Proc. SIGGRAPH '96 (New Orleans, LA, August 5-9, 1996). In *Computer Graphics Proceedings*, Annual Conference Series, 1996, ACM SIGGRAPH, pp. 31-42.
- (42) Leros, A., Garfinkle, C., Levoy, M., “Feature-Based Volume Metamorphosis,” Proc. SIGGRAPH '95 (Los Angeles, CA, August 6-11, 1995). In *Computer Graphics Proceedings*, Annual Conference Series, 1995, ACM SIGGRAPH, pp. 449-456.
- (43) Levoy, M., “Polygon-Assisted JPEG and MPEG Compression of Synthetic Images,” Proc. SIGGRAPH '95 (Los Angeles, CA, August 6-11, 1995). In *Computer Graphics Proceedings*, Annual Conference Series, 1995, ACM SIGGRAPH, pp. 21-28.
- (44) Curless, B., Levoy, M., “Better optical triangulation through spacetime analysis,” *Proc. ICCV '95*, Cambridge, Mass., June, 1995, IEEE, pp. 987-994.
- (45) Agrawala, M., Beers, A.C., and Levoy, M., “3D Painting on Scanned Surfaces,” *Proc. 1995 Symposium on Interactive 3D Graphics*, Monterey, April, 1995, ACM, pp. 145-150.
- (46) Turk, G., and Levoy, M., “Zippered Polygon Meshes from Range Images,” Proc. SIGGRAPH '94 (Orlando, Florida, July 24-29, 1994). In *Computer Graphics Proceedings*, Annual Conference Series, 1994, ACM SIGGRAPH, pp. 311-318.
- (47) Lacroute, P. and Levoy, M., “Fast Volume Rendering Using a Shear-Warp Factorization of the Viewing Transformation,” Proc. SIGGRAPH '94 (Orlando, Florida, July 24-29, 1994). In *Computer Graphics Proceedings*, Annual Conference Series, 1994, ACM SIGGRAPH, pp. 451-458.
- (48) Levoy, M., “Spreadsheets for Images,” Proc. SIGGRAPH '94 (Orlando, Florida, July 24-29, 1994). In *Computer Graphics Proceedings*, Annual Conference Series, 1994, ACM SIGGRAPH, pp. 139-146.
- (49) Totsuka, T. and Levoy, M., “Frequency Domain Volume Rendering,” Proc. SIGGRAPH '93 (Anaheim, California, August 1-6, 1993). In *Computer Graphics Proceedings*, Annual Conference Series, 1993, ACM SIGGRAPH, pp. 271-278.

- (50) Nieh, J. and Levoy, M., "Volume Rendering on Scalable Shared-Memory MIMD Architectures." *Proc. 1992 Workshop on Volume Visualization*, ed. A. Kaufman and W. Lorensen, ACM, Boston, Massachusetts, October, 1992, pp. 17-24.
- (51) Levoy, M., "Methods for Improving the Efficiency and Versatility of Volume Rendering," *Proc. XI IPMI International Conference (Berkeley, California, June, 1989)*, ed. D.A. Ortendahl and J. Llacer, Wiley-Liss, 1991, pp. 473-488.
- (52) Levoy, M., Fuchs, H., Pizer, S.M., Rosenman, J., Chaney, E.L., Sherouse, G.W., Interrante, V., Kiel, J., "Volume Rendering in Radiation Treatment Planning," *Proc. First Conference on Visualization in Biomedical Computing*, IEEE Computer Society Press, Atlanta, Georgia, May, 1990, pp. 4-10.
- (53) Levoy, M. and Whitaker, R., "Gaze-Directed Volume Rendering," *Computer Graphics (Proc. 1990 Symposium on Interactive 3D Graphics)*, Vol. 24, No. 2, Snowbird, Utah, March, 1990, pp. 217-223.
- (54) Pizer, S.M., Fuchs, H., Levoy, M., Rosenman, J.G., Davis, R.E., and Renner, J.B., "3D Display with Minimal Predefinition," *Proc. CAR '89*, ed. H. Lemke et al., Springer, Berlin, June, 1989, pp. 723-736.
- (55) Levoy, M., "Design for a Real-Time High-Quality Volume Rendering Workstation," *Proc. Chapel Hill Workshop on Volume Visualization*, ed. C. Upson, University of North Carolina, May, 1989, pp. 85-92.
- (56) Fuchs, H., Levoy, M., Pizer, S., and Rosenman, J., "Interactive Visualization and Manipulation of 3D Medical Image Data," *Proc. NCGA '89*, Philadelphia, April, 1989, Vol. I, pp. 118-131.
- (57) Pizer, S.M., Levoy, M., Fuchs, H., and Rosenman, J.G., "Volume Rendering for Display of Multiple Organs, Treatment Objects, and Image Intensities," *Proc. SPIE*, Vol. 1137, Paris, April, 1989, pp. 92-97.
- (58) Levoy, M., "Direct Visualization of Surfaces from Computed Tomography Data," *Medical Imaging II, Proc. SPIE*, Vol. 914, Santa Clara, California, February, 1988, pp. 828-841.
- (59) Feibush, E., Levoy, M. and Cook, R., "Synthetic Texturing using Digital Filters," *Computer Graphics (Proc. SIGGRAPH)*, Vol. 14, No. 3, Seattle, Washington, July, 1980, pp. 294-301.
- (60) Levoy, M., "A Computer Animation System Based on the Multiplane Technique," *Computer Graphics (Proc. SIGGRAPH)*, Vol. 11, No. 2, San Jose, California, July, 1977, pp. 65-71.

Refereed journal papers (SIGGRAPH papers are listed as conference papers)

- (61) Ragan-Kelley, J., Adams, A., Barnes, C., Sharlet, D., Paris, S., Levoy, M., Amarasinghe, S., Durand, F., “Halide: decoupling algorithms from schedules for high performance image processing,” *Communications of the ACM (CACM)*, Vol. 61, No. 1, January, 2018.
See also original paper in SIGGRAPH 2012.
- (62) Jacobs, D.E., Gallo, O., Cooper, E.A., Pulli, K., Levoy, M., Simulating the Visual Experience of Very Bright and Very Dark Scenes, *ACM Transactions on Graphics*, Vol. 34, No. 3, April 2015.
- (63) Cohen, N., Yang, S., Andalman, A., Broxton, M., Grosenick, L., Deisseroth, K., Horowitz, M., Levoy, M., Enhancing the performance of the light field microscope using wavefront coding, *Optics Express*, Vol. 22, Issue 20 (2014).
- (64) Broxton, M., Grosenick, L., Yang, S., Cohen, N., Andalman, A., Deisseroth, K., Levoy, M., Wave Optics Theory and 3-D Deconvolution for the Light Field Microscope, *Optics Express*, Vol. 21, Issue 21, pp. 25418-25439 (2013).
- (65) Kaye, E.A., Hertzberg, Y., Marx, M., Werner, B., Navon, G., Levoy, M., Pauly, K.B., Application of Zernike polynomials towards accelerated adaptive focusing of transcranial high intensity focused ultrasound, *Journal of Medical Physics*, Vol. 39, No. 6254 (2012).
- (66) Wan, G., Li, X., Agranov, G., Levoy, M., Horowitz, M., CMOS Image Sensors With Multi-Bucket Pixels for Computational Photography, *IEEE Journal of Solid-State Circuits*, Vol. 47, No. 4, April, 2012, pp. 1031-1042.
- (67) Levoy, M., “Experimental Platforms for Computational Photography,” *IEEE Computer Graphics and Applications*, Vol. 30, No. 5, September/October, 2010, pp. 81-87.
- (68) Levoy, M., Zhang, Z., McDowall, I., “Recording and controlling the 4D light field in a microscope,” *Journal of Microscopy*, Vol. 235, Pt. 2, 2009, pp. 144-162. **Cover article.**
- (69) Levoy, M., “Light fields and computational imaging,” *IEEE Computer*, August 2006.
- (70) Koller, D., Levoy, M., “Protecting 3D Graphics Content,” *Communications of the ACM (CACM)*, Vol. 48, No. 6, June 2005.
- (71) Koller, D., Trimble, J., Najbjerg, T., Gelfand, N., Levoy, M., “Fragments of the City: Stanford’s Digital Forma Urbis Romae Project,” *Proc. Third Williams Symposium on Classical Architecture, Journal of Roman Archaeology suppl.*, 2006.
- (72) Koller, D., Levoy, M., “Computer-aided Reconstruction and New Matches in the Forma Urbis Romae,” To appear in *Proc. Formae Urbis Romae - Nuove Scoperte, Bullettino Della Commissione Archeologica Comunale di Roma*, 2006.

- (73) Anderson, S.E., Levoy, M., “Unwrapping and Visualizing Cuneiform Tablets,” *IEEE Computer Graphics and Applications*, Vol. 22, No. 6, November/December, 2002, pp. 82-88.
- (74) Singh, J.P., Gupta, A., and Levoy, M., “Parallel Visualization Algorithms and their Implications for Multiprocessor Architecture,” *IEEE Computer*, Vol. 27, No. 7, July, 1994, pp. 45-55.
- (75) Davis, R.E., Levoy, M., Rosenman, J.G., Fuchs, H., Pizer, S.M., Skinner, A., Pillsbury, H.C., “Three-Dimensional High-Resolution Volume Rendering (HRVR) of CT and MRI Data: Applications to Otolaryngology - Head and Neck Surgery,” *Laryngoscope*, Vol. 101, June, 1991, pp. 573-582.
- (76) Levoy, M., “Efficient Ray Tracing of Volume Data,” *ACM Transactions on Graphics*, Vol. 9, No. 3, July, 1990, pp. 245-261.
- (77) Levoy, M., “A Hybrid Ray Tracer for Rendering Polygon and Volume Data,” *IEEE Computer Graphics and Applications*, Vol. 10, No. 2, March, 1990, pp. 33-40.
- (78) Levoy, M., “Volume Rendering by Adaptive Refinement,” *The Visual Computer*, Vol. 6, No. 1, February, 1990, pp. 2-7.
- (79) Fuchs, H., Levoy, M., and Pizer, S., “Interactive Visualization of 3D Medical Data,” *IEEE Computer*, Vol. 22, No. 8, August, 1989, pp. 46-51.
- (80) Levoy, M., “Display of Surfaces from Volume Data,” *IEEE Computer Graphics and Applications*, Vol. 8, No. 3, May, 1988, pp. 29-37.

Other conference papers

- (81) Levoy, M, Zhang, Z., “The Light Field Microscope” (extended abstract), *Focus on Microscopy*, Valencia, Spain, April, 2007.
- (82) Levoy, M., “The Digital Michelangelo Project,” *SIGGRAPH 2000 3D Photography course notes*, New Orleans, Louisiana, July, 2000.
- (83) Levoy, M., “The Digital Michelangelo Project,” *SIGGRAPH '99 3D Photography course notes*, Los Angeles, California, August, 1999.
- (84) Levoy, M., “The Digital Michelangelo Project,” *CVPR '99 3D Photography course notes*, Fort Collins, Colorado, June, 1999.
- (85) Levoy, M., “A Taxonomy of Volume Visualization Algorithms,” *SIGGRAPH '91 Introduction to Volume Visualization course notes*, Las Vegas, Nevada, July, 1991, pp. 6-12.

- (86) Levoy, M., "Ray Tracing of Volume Data," *SIGGRAPH '91 Introduction to Volume Visualization course notes*, Las Vegas, Nevada, July, 1991, pp. 85-112.
- (87) Levoy, M., "Photorealistic Volume Rendering in Scientific Visualization," *SIGGRAPH '91 Photorealistic Volume Modeling and Rendering Techniques course notes*, Las Vegas, Nevada, July, 1991, pp. 2-1 - 2-13.
- (88) Levoy, M., "Frame Buffer Configurations for Paint Programs," *SIGGRAPH '82 Two-Dimensional Computer Animation course notes*, Boston, Massachusetts, August, 1981, pp. 19-30.
- (89) Levoy, M., "Area Flooding Algorithms," *SIGGRAPH '81 Two-Dimensional Computer Animation course notes*, Dallas, Texas, August, 1981, pp. 6-12.
- (90) Levoy, M., "Introduction to Two-Dimensional Computer Animation," *SIGGRAPH '82 Two-Dimensional Computer Animation course notes*, Boston, Massachusetts, August, 1981, pp. 6-18.

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- (91) Levoy, M., "The Digital Michelangelo Project," *Proc. Second International Conference on 3D Digital Imaging and Modeling*, IEEE Computer Society Press, 1999, pp. 2-11.
- (92) Levoy, M., "The Digital Michelangelo Project," In *Proc. Eurographics '99, Computer Graphics Forum*, Vol 18, No. 3, 1999.
- (93) Levoy, M., "The Digital Michelangelo Project," *Proc. Electronic Imaging and the Visual Arts (EVA) '99*, Florence, Italy, March 26, 1999.
- (94) Levoy, M., "Digitizing the Shape and Appearance of Three-Dimensional Objects," In *Frontiers of Engineering*, National Academy of Engineering, 1997, pp. 37-46. Also appeared in *The Bridge*, Vol. 27, No. 2, National Academy of Engineering, 1997, pp. 12-15.
- (95) Levoy, M., "Volume Rendering Using the Fourier Projection-Slice Theorem," *Proc. Graphics Interface '92*, Canadian Information Processing Society, Vancouver, British Columbia, May, 1992, pp. 61-69.
- (96) Levoy, M., "The Design And Implementation of a Large-Scale Computer-Assisted Cartoon Animation System," *Proc. Datorgrafikdaggar conference*, Linkoping, Sweden, June, 1983.

Book chapters

- (97) Levoy, M., "The early history of point-based graphics," chapter in *Point-Based Graphics*, edited by M. Gross and H. Pfister, published by Morgan-Kaufman, 2007.

- (98) Levoy, M., “The Digital Michelangelo Project,” chapter in *Exploring David: Diagnostic Tests and State of Conservation*, edited by S. Bracci, F. Falletti, M. Matteini, and R. Scopigno, published by Giunti, Italy, 2004.
- (99) Levoy, M., “Viewing Algorithms,” chapter introduction in *Volume Visualization*, ed. A. Kaufman, IEEE Computer Society Press, 1991, pp. 89-92.

Technical reports and other publications

- (100) Levoy, M., Pritch, Y., Portrait mode on the Pixel 2 and Pixel 2 XL smartphones, *Google Research blog*, October 17, 2017. URL: <https://research.googleblog.com/2017/10/portrait-mode-on-pixel-2-and-pixel-2-xl.html>
- (101) Levoy, M., HDR+: Low Light and High Dynamic Range photography in the Google Camera App, *Google Research blog*, October 27, 2014. URL: <https://research.googleblog.com/2014/10/hdr-low-light-and-high-dynamic-range.html>
- (102) Wan, G., Horowitz, M., Levoy, M., Applications of Multi-Bucket Sensors to Computational Photography, Stanford Computer Graphics Laboratory Technical Report 2012-2, November, 2012.
- (103) Jacobs, D., Baek, J., Levoy, M., Focal stack compositing for depth of field control, Stanford Computer Graphics Laboratory Technical Report 2012-1, October, 2012.
- (104) Karpenko, A., Jacobs, D., Baek, J., Levoy, M., Digital Video Stabilization and Rolling Shutter Correction using Gyroscopes, Stanford University Computer Science Tech Report CSTR 2011-03, September, 2011.
- (105) Levoy, M., Singh, H., Improving underwater vision using confocal imaging, Stanford Computer Graphics Laboratory Technical Memo 2009-001, June, 2009.
- (106) Adelsberger, R., Ziegler, R., Levoy, M., Gross, M., Spatially Adaptive Photographic Flash, Technical Report 612, ETH Zürich, Institute of Visual Computing, December 2008.
- (107) Levoy, M., “Optical recipes for light field microscopes,” Stanford Computer Graphics Laboratory Technical Memo 2006-001, June, 2006.
- (108) Ng, R., Levoy, M., Brédif, M., Duval, G., Horowitz, M., Hanrahan, P., Light Field Photography with a Hand-Held Plenoptic Camera Stanford Tech Report CTSR 2005-02, April, 2005.
- (109) Levoy, M., “Rendering Mixtures of Geometric and Volumetric Data,” Technical Report 88-052, Computer Science Department, University of North Carolina at Chapel Hill, December, 1988.

- (110) Levoy, M. and Whitted, T., “The Use of Points as a Display Primitive,” Technical Report 85-022, Computer Science Department, University of North Carolina at Chapel Hill, January, 1985.

Past Ph.D. students (in reverse chronological order)

Michael Broxton (Computer Science)

Dissertation: Volume reconstruction and resolution limits for three dimensional snapshot microscopy

Completed: August, 2017.

Noy Cohen (Electrical Engineering)

Dissertation: A wavefront-coded light field microscope

Completed: August, 2015.

David Jacobs (Computer Science)

Dissertation: Simulating the visual experience of very bright and very dark scenes using afterimages and mesopic effects

Completed: December, 2014.

Sung Hee Park (Electrical Engineering)

Dissertation: Gyro-based multi-image deconvolution for removing handshake blur

Completed: August, 2014.

Jongmin Baek (Computer Science)

Dissertation: WYSIWYG computational photography via viewfinder editing

Completed: December, 2013.

Zhengyun Zhang (Electrical Engineering)

Dissertation: Analysis and synthesis of three-dimensional illumination using partial coherence

Completed: August, 2011.

Andrew Adams (Computer Science)

Dissertation: High-dimensional Gaussian filtering for computational photography

Completed: July, 2011.

Eddy Talvala (Electrical Engineering, co-advised with Mark Horowitz)

Dissertation: The Frankencamera: building a programmable camera for computational photography

Completed: February, 2011.

Vaibhav Vaish (Computer Science)

Dissertation: Synthetic aperture imaging using dense camera arrays

Completed: March, 2007

David Koller (Computer Science)

Dissertation: Protected dissemination and computer-aided reconstruction of digitized cultural artifacts

Completed: December, 2006

Billy Chen (Computer Science)

Dissertation: Novel methods for manipulating and combining light fields

Completed: August, 2006

Gaurav Garg (Electrical Engineering)

Dissertation: Efficiently acquiring reflectance fields using patterned illumination

Completed: August, 2006

Natasha Gelfand (Computer Science, co-advised with Leo Guibas)
 Dissertation: Feature analysis and registration of scanned surfaces
 Completed: August, 2006

Augusto Roman (Electrical Engineering)
 Dissertation: Multiperspective imaging for automated urban visualization
 Completed: August, 2006

Li-Yi Wei (Electrical Engineering)
 Dissertation: Texture synthesis by fixed neighborhood searching
 Completed: December, 2001

Szymon Rusinkiewicz (Computer Science)
 Dissertation: Real-time acquisition and rendering of large 3D Models
 Completed: August, 2001

Venkat Krishnamurthy (Computer Science)
 Dissertation: Fitting smooth surfaces to dense polygon meshes
 Completed: January, 1998

Brian Curless (Electrical Engineering)
 Dissertation: New methods for surface reconstruction from Range Images
 Completed: July, 1997

Philippe Lacroute (Electrical Engineering)
 Dissertation: Fast volume rendering using a shear-warp factorization
 of the viewing transformation
 Completed: August, 1995

Past postdoctoral students

2004-2006 Hendrik Lensch
 2000-2002 Steve Marschner
 1997-1999 Kari Pulli
 1992-1994 Greg Turk