

WOJCIECH JAROSZ

Assistant Professor of Computer Science



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Current Position

Assistant Professor July 2015 – Present
Dartmouth College Hanover, NH, USA
 Director of the Visual Computing Lab
 Department of Computer Science

Research Interests

My research is concerned with deriving *theoretical models* and developing *computational algorithms* for efficiently capturing, simulating, manipulating, and physically realizing complex visual appearance. In effect, I strive to understand why things look the way they do, how we can simulate their interaction with light efficiently, how we can intuitively author or edit that appearance, and how we can create physical objects with control over their appearance. My publications explore practical applications in several overlapping areas in computer graphics including: participating media rendering, appearance editing & stylization, complex illumination and materials, global illumination, Monte Carlo methods and efficient sampling, high-dynamic range imaging; and computational materials and displays.

Education

Ph.D. in Computer Science Aug. 2003 – Sep. 2008
University of California, San Diego
 Advisors: Henrik Wann Jensen & Matthias Zwicker
 Thesis: *Efficient Monte Carlo Methods for Light Transport in Scattering Media*

M.S. in Computer Science March 2006
University of California, San Diego
 Advisor: Henrik Wann Jensen

B.S. in Computer Science May 2003
University of Illinois, Urbana–Champaign
 Highest Honors
 Advisors: John C. Hart & Michael Garland
 Senior Thesis: *Interactive Global Illumination for Improved Lighting Design Workflow*

Employment History

Sr. Research Scientist Jan. 2014 – Jun. 2015
Research Scientist Sep. 2010 – Dec. 2013
Post-Doc March 2009 – Sep. 2010
Disney Research Zürich, Switzerland
 Head of Rendering Group
 The Walt Disney Company (Switzerland) GmbH
 Supervisor: Markus Gross

Adjunct Lecturer August 2009 – June 2015
ETH Zürich Zürich, Switzerland
 Department of Computer Science

Post-Doc Oct. 2008 – Feb. 2009
University of California, San Diego
 Department of Computer Science & Engineering
 Supervisor: Henrik Wann Jensen

Research Intern Summer 2008
Adobe Software Systems San Jose, CA
 Advanced Technology Labs
 Supervisor: Nathan Carr

Research Intern Summers of 2003, 2005, 2006
Industrial Light & Magic San Francisco, CA
 R&D Group
 Supervisor: Florian Kainz

Student Researcher June 2001 – June 2003
University of Illinois, Urbana–Champaign
 Department of Computer Science
 Supervisor: John C. Hart

Honors & Awards



Eurographics Young Researcher Award 2013

The most prestigious early career award for European researchers in computer graphics: “given each year to two young researchers in the field who have already made a significant contribution. The intent of this award is to recognize people early on in their career who have already made a notable contribution and are likely to make more.” See dartgo.org/jarosz-eg-award.

Computer Graphics Forum Cover Image 2017

Image is used on cover of *Computer Graphics Forum* journal for the duration of the year. Co-authors of the image: Alessia Marra, Maurizio Nitti, Marios Papas, Thomas Müller, Markus Gross, Wojciech Jarosz and Jan Novák.

Computer Graphics Forum Cover Image 2015

Image is used on cover of *Computer Graphics Forum* journal for the duration of the year. Co-authors of the image: Jaroslav Křivánek, Martin Sik, Iliyan Georgiev, Toshiya Hachisuka, Petr Vevoda, Derek Nowrouzezahrai and Wojciech Jarosz.

Pacific Graphics Best Paper Award 2015

For the paper [J16]: R. Hostettler, R. Habel, M. Gross, and **W. Jarosz**. “Dispersion-based Color Projection using Masked Prisms”. In: *Computer Graphics Forum (Proceedings of Pacific Graphics)* 34.7 (Oct. 2015). DOI: 10.1111/cgf.12771.

UCSD Rendering Competition – 1st Place 2004

Won a trip to SIGGRAPH 2004 for rendering a realistic scene of a cluttered desk using a personally-written renderer for CSE 168. See graphics.ucsd.edu/courses/rendering/2004.

CRA Outstanding Undergraduate Award 2003

Honorable Mention





UIUC Dean’s List Fall 1999 – Spring 2003

Every semester during undergrad



Funding



Current funding

- \$ NVIDIA Corp. GPU Grant. (1 Quadro P5000), PI.  October 2017
- \$ Microsoft Corp. Azure Research Award. (\$20,000), PI.  September 2017–September 2018
- \$ Autodesk/Solid Angle Corp. Unrestricted Gift. (\$50,000), PI.  July 2017
- \$ Activision Corp. Unrestricted Gift. (\$15,000), PI.  January 2017
- \$ Burke Award. (\$12,500), PI.  2015–2018

Past funding

- \$ Dartmouth CS Department Equipment Grant. (\$14,000), Co-PI with Devin Balkcom.  2017
ABB Robotics - IRB 120 multipurpose industrial robot arm
- \$ Microsoft Corp. HoloLens Research Grant. (\$100,000), Co-PI with Emily Cooper and Xing-Dong Yang.  2016–2017
Augmenting Reality for the Visually Impaired

Research Impact



OpenEXR

openexr.org

I designed and implemented tiling and multi-resolution support as well as thread-safety and multi-threading in the OpenEXR high-dynamic range image format and library while working at Industrial Light & Magic. The work was paid for in part by a grant from The Academy of Motion Picture Arts and Sciences. Implemented features were first used in *Star Wars Episode III: Revenge of the Sith*, and have since been adopted by all major renderers (Pixar’s RenderMan, NVIDIA’s Mental Ray, Arnold, etc.) and commercial image editing packages (Adobe Photoshop, Creative Suite, etc.). OpenEXR is now the de-facto

standard image file format for professional film and special effects production, having been used in dozens of feature films.

Technical Oscar

dartgo.org/openexr-oscar

My contributions to OpenEXR were recognized in an Academy Award of Technical Achievement in 2007, awarded to Florian Kainz: “Widely adopted, OpenEXR is engineered to meet the requirements of the visual effects industry by providing for lossless and lossy compression of tiered and tiled images.”

Pixar's RenderMan renderman.pixar.com

Several of my published methods have been incorporated directly into Pixar's RenderMan software, including: hierarchical sample warping [J52] for importance sampling environment maps, photon beams [J43], residual ratio tracking [J24] and unified points, beams & paths [J25] for participating media, and photon beam diffusion [J30] for subsurface scattering.

Disney's Hyperion dartgo.org/hyperion





My residual ratio tracking technique [J24] for participating media has also been incorporated into Disney's proprietary renderer *Hyperion*, which has been used to produce all of Disney's animated films since *Big Hero 6*.

PBRT version 3 pbrt.org

Several of the techniques I developed in my research (including photon beam diffusion [J30] and residual ratio tracking [J24]) have been incorporated into version 3 of the open-source PBRT rendering system, which is a standard rendering framework used in dozens of academic publications.

Movie Credits dartgo.org/jarosz-imdb

I have worked on, and been credited in a number of feature films for my contributions to computer graphics research.

-  **Big Hero 6** 2014
"Senior Research Scientist (Disney Research)"
For co-developing (with Dr. Jan Novák and Dr. Andrew Selle) the residual ratio tracking technique [J24] used to render the fog, clouds, and other volumetric effects throughout the film.
-  **Planes: Fire & Rescue** 2014
"Research Scientist (Disney Research)"
For contributing (with Dr. Ralf Habel) a method for artist-tunable but physically based, secondary motion of trees.
-  **Frozen** 2013
"Research Scientist (Disney Research)"
While researching the appearance of granular materials [J17], we took measurements (along with Dr. Marios Papas & Dr. Ralf Habel) of real snow using our custom capture device [J29], leading to the improved realism of all snow and ice in the film.
-  **Tangled** 2010
"Research Scientist (Research)"
For co-developing (with Dr. Andrew Selle and Dr. Jared Johnson) the artistic volumetric lighting system [J40] used for two shots in the film, including the climactic revival sequence.




Supervision



Current Ph.D. Students (👤) and Postdocs (👤)

-  Zack Misso, PhD  2017–Present
-  Benedikt Bitterli, PhD  2016–Present

Past Ph.D. Students (👤) and Postdocs (👤)

-  Srinath Ravichandran, PhD (now @ SideFx)  2015–2018
-  Nicolas Vibert, visiting PhD from McGill  Fall 2017
-  Yuan Tian, PhD  2015–2016
-  Gurprit Singh, Postdoc (now @ MPI)  2015–2017
-  Marios Papas, PhD (now @ Disney Research)  2011–2016
 *A computational appearance fabrication framework, and derived applications*
-  Romain Prévost, PhD  2013–2016
 *Physics-based optimization for assisted creation of tangible artifacts*
-  Fabrice Rousselle, Postdoc (now @ Disney Research)  2014–2015
-  Jan Novák, Postdoc (now @ Disney Research)  2014–2015
-  Ralf Habel, Postdoc (now @ Disney Animation)  2012–2014
-  Derek Nowrouzezahrai, Postdoc (now Prof. @ McGill)  2010–2011
-  Christian Regg, PhD  2010–2011































Masters Theses (👤+)

-  Xi Deng  2017–Present
 *Ongoing*
-  Shaojie Jiao  2017–Present
 *Ongoing*

Other Ph.D. Dissertation Committees

-  Iliyan Georgiev, PhD (Saarland University)  2015
 *Path Sampling Techniques for Efficient Light Transport Simulation*
-  Jan Novák, PhD (Karlsruhe Institute of Technology)  2014
 *Efficient Many-Light Rendering of Scenes with Participating Media*
-  Laurent Belcour, PhD (Université de Grenoble)  2012
 *A Frequency Analysis of Light Transport*
-  Adolfo Muñoz, PhD (Universidad de Zaragoza)  2010
 *Light Transport in Participating Media*

Interns (👤)

-  Adrian Blumer  Fall 2014
-  David Koerner  Fall 2014
-  Hugo Loi  Summer 2014
-  Oliver Klehm  Summer 2014
-  Rafael Hostettler  Summer 2014
-  Simon Kallweit  Summer 2014
-  Benedikt Bitterli  2014
-  Shuoran Yang  2014
-  Károly Zsolnai  Summer 2013
-  Johannes Meng (now @ Weta Digital)  Summers 2012, 2013
-  Iliyan Georgiev (now @ Solid Angle)  Summer 2012
-  Jan Novák (now @ Disney Research)  Summers 2011, 2012
-  Wenzel Jakob (now Prof. @ EPFL)  2010–2011
-  Robert Thomas  Summer 2010
-  Marios Papas (now @ Disney Research)  Summer 2010

- + Thomas Müller 📅 2015–2016
 📄 *Modeling and Rendering Heterogeneous Granular Materials*
- + Benedikt Bitterli 📅 2015
 📄 *Informed Choices in Primary Sample Space*
- + Adrian Blumer 📅 2013–2014
 📄 *Modular Radiance Transfer for Trees*
- + Romain Prévost 📅 2012–2013
 📄 *A Multi-Layering Framework for Raytraced Diffusion Curves*
- + Jorge Schwarzhaupt (now @ Weta Digital) 📅 2011–2012
 📄 *Occlusion-Aware Hessians for Error Control in Irradiance Caching*
- + Marina Späni 📅 2011–2012
 📄 *Rendering Dynamic Objects in Dynamic Environments*
- + Thomas Houit 📅 2011–2012
 📄 *The Magic Lens: Refractive Steganography*
- + Thomas Siegrist 📅 2011–2012
 📄 *Stereoscopic Perception of Material Reflectance*
- + Michael Morandi 📅 2011–2012
 📄 *Directional Occlusion Volumes*
- + Philipp Keller 📅 2011
 📄 *Manufacturing Layered Attenuators for Multiple Prescribed Shadow Images*
- + Silvan Tschopp 📅 2011
 📄 *Facial Performance Appearance Capture and Rendering*
- + Stefan Geiger 📅 2010–2011
 📄 *An Immersive 3D Augmented Reality Lens*
- + Benjamin Müller 📅 2010–2011
 📄 *Analytic Lighting in the Presence of Participating Media*
- + Pascal Goffin 📅 2009–2010
 📄 *Fast Ray Tracing of Line Primitives*

- + Jared M. Johnson (now @ Google) 📅 Summer 2010
 + Derek Nowourzezahrai (now Prof. @ McGill) 📅 Summer 2009

Bachelor Theses/Projects (👤)

- + Bailey Miller 📅 2017–Present
 📄 *Ongoing*
- + George J. Hito 📅 2017–Present
 📄 *Overlaying Virtual Scale Models on Real Environments Without the Use of Peripherals*
- + Jonathan Huang 📅 2016–2017
 📄 *A HoloLens Application to Aid People who are Visually Impaired in Navigation Tasks*
- + Simon Kallweit 📅 2013
 📄 *Photon Beam Methods in Rendering*
- + Benedikt Bitterli 📅 2012–2013
 📄 *BSSRDF Explorer: A Rendering Framework for the BSSRDF*
- + Jakob Progsch 📅 2012–2013
 📄 *BRDF Fitting using Nonlinear Optimization Methods*
- + Sebastien Millius 📅 2011
 📄 *Fabrication Method Analysis for Goal-Based Caustics Surfaces*
- + Adrian Blumer 📅 2011
 📄 *Visibility Silhouette Level-of-Detail*

Ph.D. Habilitation Committees

- + Cyril Soler (Université de Grenoble) 📅 June 2014
 📄 *Models and Analyses for Image Synthesis*

Teaching



- Assistant Professor, Department of Computer Science, Dartmouth College** 📅 Fall 2015–Present
- COSC 77/177: Computer Graphics 📅 Fall 2018, 2017, 2016
 - COSC 89/189: Computational Aspects of Digital Photography 📅 Winter 2018, Fall 2015
 - COSC 87/187: Rendering Algorithms 📅 Spring 2018, 2017, 2016

- Lecturer, Department of Computer Science, ETH Zürich, Switzerland** 📅 Fall 2009–Spring 2015
- 252-5705-00G: Image Synthesis (2015: with Wenzel Jakob) 📅 Spring 2012, 2013, 2014, 2015
 - 252-0543-01L: Computer Graphics (2009: with Alex Hornung, 2010: with Alex Hornung & Ilya Baran) 📅 Fall 2009, 2010

- Teaching Assistant, Dept. of Computer Science & Engineering, UC San Diego** 📅 Fall 2005–Spring 2008
- CSE 168: Rendering Algorithms (teaching assistant, guest lecturer) 📅 Spring 2005, 2006, 2007, 2008
 - CSE 169: Computer Animation (teaching assistant) 📅 Winter 2006
 - CSE 167: Introduction to Computer Graphics (teaching assistant) 📅 Fall 2005

Publications



Below you can find a list of my academic publications and patents (separated by type and sorted by year), along with links to accompanying [🔗](#) project pages, direct [📄](#) PDF downloads, and approximate [📄](#) citation counts scraped from my Google Scholar [profile](#).

My name and those of my advisees are in **bold**.

📖 Edited Issues & Volumes





- [E1] **W. Jarosz** and P. Peers, eds. *Proceedings of the Eurographics Symposium on Rendering 2014*. Vol. 33. Computer Graphics Forum 4. June 2014.
- [E2] D. Gutierrez and **W. Jarosz**, eds. *Scattering: Acquisition, Modeling, and Rendering*. Vol. 33. IEEE Computer Graphics and Applications 3. Los Alamitos, CA, USA: IEEE Computer Society, May 2013. DOI: 10.1109/MCG.2013.46.

📖 Peer-Reviewed Journal Articles







- [J1] M. Kinateder, J. Gualtieri, M. J. Dunn, **W. Jarosz**, X.-D. Yang, and E. A. Cooper. "Using an Augmented Reality Device as a Distance-based Vision Aid—Promise and Limitations". In: *Optometry and Vision Science* (June 2018). DOI: 10.1097/OPX.0000000000001232.
[🔗](#) webpage [📄](#) pdf
- [J2] J. Novák, I. Georgiev, J. Hanika, and **W. Jarosz**. "Monte Carlo Methods for Volumetric Light Transport Simulation". In: *Computer Graphics Forum (Proceedings of Eurographics - State of the Art Reports)* 37.2 (May 2018).
[🔗](#) webpage [📄](#) pdf [📄](#) citations: 1
- [J3] J. Marco, A. Jarabo, **W. Jarosz**, and D. Gutierrez. "Second-Order Occlusion-Aware Volumetric Radiance Caching". In: *ACM Transactions on Graphics (Presented at SIGGRAPH)* 37.2 (Apr. 2018). DOI: 10.1145/3185225. To appear.
[🔗](#) webpage [📄](#) pdf
- [J4] L. Belcour, G. Xie, C. Hery, M. Meyer, **W. Jarosz**, and D. Nowrouzezahrai. "Integrating Clipped Spherical Harmonics Expansions". In: *ACM Transactions on Graphics (Presented at SIGGRAPH)* 37.2 (Mar. 2018). DOI: 10.1145/3015459. To appear.
[🔗](#) webpage [📄](#) pdf [📄](#) citations: 1
- [J5] **B. Bitterli**, W. Jakob, J. Novák, and **W. Jarosz**. "Reversible Jump Metropolis Light Transport Using Inverse Mappings". In: *ACM Transactions on Graphics (Presented at SIGGRAPH)* 37.1 (Jan. 2018). DOI: 10.1145/3132704.
[🔗](#) webpage [📄](#) pdf
- [J6] **B. Bitterli** and **W. Jarosz**. "Beyond Points and Beams: Higher-Dimensional Photon Samples for Volumetric Light Transport". In: *ACM Transactions on Graphics (Proceedings of SIGGRAPH)* 36.4 (July 2017). DOI: 10.1145/3072959.3073698.
[🔗](#) webpage [📄](#) pdf [📄](#) citations: 5
- [J7] G. Singh and **W. Jarosz**. "Convergence Analysis for Anisotropic Monte Carlo Sampling Spectra". In: *ACM Transactions on Graphics (Proceedings of SIGGRAPH)* 36.4 (July 2017). DOI: 10.1145/3072959.3073656.
[🔗](#) webpage [📄](#) pdf [📄](#) citations: 1































📖 Peer-Reviewed Conference Papers

- [P1] L. Maguire, **M. Papas**, **W. Jarosz**, P. Fox, G. Dicosniski, and M. Olivares. "The Modelling of Caustics to Produce a Projection Image". In: *Optical Security Documents Conference*. Jan. 2018.
[🔗](#) webpage [📄](#) pdf
- [P2] M. Mara, M. McGuire, **B. Bitterli**, and **W. Jarosz**. "An Efficient Denoising Algorithm for Global Illumination". In: *Proceedings of High Performance Graphics*. Los Angeles, California, USA: ACM, July 2017. ISBN: 978-1-4503-5101-0. DOI: 10.1145/3105762.3105774.
[🔗](#) webpage [📄](#) pdf [📄](#) citations: 3
- [P3] T. Hachisuka, I. Georgiev, **W. Jarosz**, J. Křivánek, and D. Nowrouzezahrai. "Extended Path Integral Formulation for Volumetric Transport". In: *Proceedings of EGSR (Experimental Ideas & Implementations)*. The Eurographics Association, June 2017. DOI: 10.2312/sre.20171195.
[🔗](#) webpage [📄](#) pdf
- [P4] J. Marco, **W. Jarosz**, D. Gutierrez, and A. Jarabo. "Transient Photon Beams". In: *Spanish Computer Graphics Conference (CEIG)*. The Eurographics Association, June 2017. ISBN: 978-3-03868-046-8. DOI: 10.2312/ceig.20171216.
[🔗](#) webpage [📄](#) pdf
- [P5] **R. Prévost**, M. Bächer, **W. Jarosz**, and O. Sorkine-Hornung. "Balancing 3D Models with Movable Masses". In: *Proceedings of the Vision, Modeling and Visualization Workshop (VMV)*. Eurographics Association, Oct. 2016. DOI: 10.2312/vmv.20161337.
[🔗](#) webpage [📄](#) pdf [📄](#) citations: 3
- [P6] D. Koerner, J. Novák, P. Kutz, R. Habel, and **W. Jarosz**. "Subdivision Next-Event Estimation for Path-Traced Subsurface Scattering". In: *Proceedings of EGSR (Experimental Ideas & Implementations)*. The Eurographics Association, June 2016. DOI: 10.2312/sre.20161214.
[🔗](#) webpage [📄](#) pdf [📄](#) citations: 2
- [P7] A. Chapiro, C. O'Sullivan, **W. Jarosz**, M. Gross, and A. Smolic. "Stereo from Shading". In: *Proceedings of EGSR (Experimental Ideas & Implementations)*. June 2015. DOI: 10.2312/sre.20151173.
[🔗](#) webpage [📄](#) pdf [📄](#) citations: 1
- [P8] T.-W. Schmidt, F. Pellacini, D. Nowrouzezahrai, **W. Jarosz**, and C. Dachsbacher. "State of the Art in Artistic Editing of Appearance, Lighting, and Material". In: *Eurographics 2014 - State of the Art Reports*. Strasbourg, France: Eurographics Association, Apr. 2014. DOI: 10.2312/egst.20141041.
[🔗](#) webpage [📄](#) pdf [📄](#) citations: 18
- [P9] B. J. Loos, D. Nowrouzezahrai, **W. Jarosz**, and P.-P. Sloan. "Delta Radiance Transfer". In: *Proceedings of ACM SIGGRAPH Symposium on Interactive 3D Graphics and Games*. Costa Mesa, CA: ACM, Mar. 2012. DOI: 10.1145/2159616.2159648.
[🔗](#) webpage [📄](#) pdf [📄](#) citations: 7








- [J8] G. Singh, B. Miller, and **W. Jarosz**. “Variance and Convergence Analysis of Monte Carlo Line and Segment Sampling”. In: *Computer Graphics Forum (Proceedings of EGSR)* 36.4 (June 2017). DOI: 10.1111/cgf.13226.
 webpage  pdf
- [J9] T. Müller, **M. Papas**, M. Gross, **W. Jarosz**, and J. Novák. “Efficient Rendering of Heterogeneous Polydisperse Granular Media”. In: *ACM Transactions on Graphics (Proceedings of SIGGRAPH Asia)* 35.6 (Dec. 2016), 168:1–168:14. DOI: 10.1145/2980179.2982429.
 webpage  pdf  citations: 10
- [J10] F. Rousselle, **W. Jarosz**, and J. Novák. “Image-space Control Variates for Rendering”. In: *ACM Transactions on Graphics (Proceedings of SIGGRAPH Asia)* 35.6 (Dec. 2016), 169:1–169:12. DOI: 10.1145/2980179.2982443.
 webpage  pdf  citations: 2
- [J11] **A. Blumer**, J. Novák, R. Habel, D. Nowrouzezahrai, and **W. Jarosz**. “Reduced Aggregate Scattering Operators for Path Tracing”. In: *Computer Graphics Forum (Proceedings of Pacific Graphics)* 35.7 (Oct. 2016), pp. 461–473. DOI: 10.1111/cgf.13043.
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- [J12] P. H. Christensen and **W. Jarosz**. “The Path to Path-Traced Movies”. In: *Foundations and Trends in Computer Graphics and Vision* 10.2 (Oct. 2016), pp. 103–175. ISSN: 1572-2740. DOI: 10.1561/06000000073.
 webpage  pdf  citations: 8
- [J13] **B. Bitterli**, F. Rousselle, B. Moon, J. A. Iglesias-Gutián, D. Adler, K. Mitchell, **W. Jarosz**, and J. Novák. “Nonlinearly Weighted First-order Regression for Denoising Monte Carlo Renderings”. In: *Computer Graphics Forum (Proceedings of EGSR)* 35.4 (June 2016), pp. 107–117. DOI: 10.1111/cgf.12954.
 webpage  pdf  citations: 18
- [J14] **R. Prévost**, A. Jacobson, **W. Jarosz**, and O. Sorkine-Hornung. “Large-Scale Painting of Photographs by Interactive Optimization”. In: *Computers & Graphics* 55 (Apr. 2016), pp. 108–117. DOI: 10.1016/j.cag.2015.11.001.
 webpage  pdf  citations: 9
- [J15] T.-W. Schmidt, F. Pellacini, D. Nowrouzezahrai, **W. Jarosz**, and C. Dachsbacher. “State of the Art in Artistic Editing of Appearance, Lighting, and Material”. In: *Computer Graphics Forum* 35.1 (Feb. 2016), pp. 216–233. DOI: 10.1111/cgf.12721.
 webpage  pdf  citations: 18
- [J16] R. Hostettler, R. Habel, M. Gross, and **W. Jarosz**. “Dispersion-based Color Projection using Masked Prisms”. In: *Computer Graphics Forum (Proceedings of Pacific Graphics)* 34.7 (Oct. 2015). DOI: 10.1111/cgf.12771.
 webpage  pdf  citations: 3
- [J17] J. Meng, **M. Papas**, R. Habel, C. Dachsbacher, S. Marschner, M. Gross, and **W. Jarosz**. “Multi-Scale Modeling and Rendering of Granular Materials”. In: *ACM Transactions on Graphics (Proceedings of SIGGRAPH)* 34.4 (July 2015). DOI: 10.1145/2766949.
 webpage  pdf  citations: 16
- [J18] **B. Bitterli**, J. Novák, and **W. Jarosz**. “Portal-Masked Environment Map Sampling”. In: *Computer Graphics Forum (Proceedings of EGSR)* 34.4 (June 2015). DOI: 10.1111/cgf.12674.
 webpage  pdf  citations: 4
- [P10] D. Nowrouzezahrai, S. Geiger, K. Mitchell, R. Sumner, **W. Jarosz**, and M. Gross. “Light Factorization for Mixed-Frequency Shadows in Augmented Reality”. In: *10th IEEE International Symposium on Mixed and Augmented Reality (Proceedings of ISMAR 2011)*. Oct. 2011. DOI: 10.1109/ISMAR.2011.6092384.
 webpage  pdf  citations: 36
- [P11] J. van Baar, S. Poulakos, **W. Jarosz**, D. Nowrouzezahrai, R. Tamstorf, and M. Gross. “Perceptually-Based Compensation of Light Pollution in Display Systems”. In: *Proceedings of the 2011 ACM Symposium on Applied Perception in Graphics and Visualization*. New York, NY, USA: ACM, Aug. 2011. DOI: 10.1145/2077451.2077460.
 webpage  pdf  citations: 6
- [P12] J. Chen, I. Baran, F. Durand, and **W. Jarosz**. “Real-Time Volumetric Shadows using 1D Min-Max Mipmaps”. In: *Proceedings of ACM SIGGRAPH Symposium on Interactive 3D Graphics and Games*. I3D 2011. New York, NY, USA: ACM, Feb. 2011. DOI: 10.1145/1944745.1944752.
 webpage  pdf  citations: 40
- [P13] J. C. Hart, E. Bachtá, **W. Jarosz**, and T. Fleury. “Using Particles to Sample and Control More Complex Implicit Surfaces”. In: *SMI '02: Proceedings of the Shape Modeling International 2002 (SMI'02)*. Washington, DC, USA: IEEE Computer Society, Aug. 2002, p. 129. DOI: 10.1109/SMI.2002.1003537.
 webpage  pdf  citations: 46

📄 Refereed Sketches, Abstracts, & Talks







- [S1] **W. Jarosz** and **B. Bitterli**. “Beyond Points and Beams: Higher-Dimensional Photon Samples for Volumetric Light Transport”. In: *International Conference on Transport Theory*. Monterey, CA, Oct. 2017.
 citations: 5
- [S2] J. M. Johnson, D. Lacewell, A. Selle, and **W. Jarosz**. “Gaussian Quadrature for Photon Beams in Tangled”. In: *ACM SIGGRAPH 2011 Talks*. SIGGRAPH 2011. Vancouver, Canada: ACM, Aug. 2011. DOI: 10.1145/2037826.2037898.
 citations: 3
- [S3] B. J. Loos, L. Antani, K. Mitchell, D. Nowrouzezahrai, **W. Jarosz**, and P.-P. Sloan. “Runtime Implementation of Modular Radiance Transfer”. In: *ACM SIGGRAPH 2011 Talks*. SIGGRAPH 2011. Vancouver, Canada: ACM, Aug. 2011. DOI: 10.1145/2037826.2037905.
 webpage  pdf
- [S4] T. Hachisuka, **W. Jarosz**, and H. W. Jensen. “An Error Estimation Framework for Photon Density Estimation”. In: *ACM SIGGRAPH 2010 Talks*. SIGGRAPH 2010. Los Angeles, California: ACM, Aug. 2010, 3:1–3:1. DOI: 10.1145/1837026.1837030.
 citations: 2
- [S5] **W. Jarosz**, C. Donner, M. Zwicker, and H. W. Jensen. “Radiance caching for Participating Media”. In: *ACM SIGGRAPH 2007 Sketches*. SIGGRAPH 2007. San Diego, California: ACM, Aug. 2007. DOI: 10.1145/1278780.1278848.
 citations: 58


































- [19] H. Zimmer, F. Rousselle, W. Jakob, O. Wang, D. Adler, **W. Jarosz**, O. Sorkine-Hornung, and A. Sorkine-Hornung. "Path-space Motion Estimation and Decomposition for Robust Animation Filtering". In: *Computer Graphics Forum (Proceedings of EGSR)* 34.4 (June 2015). DOI: 10.1111/cgf.12685.
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- [C3] T. Hachisuka, **W. Jarosz**, G. Bouchard, P. H. Christensen, J. R. Frisvad, W. Jakob, H. W. Jensen, M. Kaschalk, C. Knaus, A. Selle, and B. Spencer. "State of the Art in Photon Density Estimation". In: *ACM SIGGRAPH Courses*. Los Angeles, California: ACM, July 2012. DOI: 10.1145/2343483.2343489.
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- [J37] I. Sadeghi, A. Munoz, P. Laven, **W. Jarosz**, F. Seron, D. Gutierrez, and H. W. Jensen. “Physically-based Simulation of Rainbows”. In: *ACM Transactions on Graphics (Presented at SIGGRAPH)* 31.1 (Feb. 2012), 3:1–3:12. DOI: 10.1145/2077341.2077344.
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- [P2] J. Novak, **W. Jarosz**, and A. Selle. “Residual ratio tracking for estimating attenuation in heterogeneous volumes”. Patent 9767601 B2 (US). Sept. 2017.
- [P3] K. Subr, K. Mitchell, **W. Jarosz**, and D. Nowrouzezahrai. “Combining sampling arrangements and distributions for stochastic integration in rendering”. Patent 9741153 B2 (US). Aug. 2017.
- [P4] **W. Jarosz** and N. A. Carr. “Method and apparatus for converting spherical harmonics representations of functions into multi-resolution representations”. Patent 9703756 B2 (US). July 2017.
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- [P7] **W. Jarosz**, J. Meng, **M. Papas**, R. Habel, C. Dachsbacher, and S. Marschner. “Bidirectional point distribution functions for rendering granular media”. Patent 9472016 B2 (US). Oct. 2016.
- [P8] R. Habel and **W. Jarosz**. “Photon beam diffusion”. Patent 9401043 B1 (US). July 2016.
- [P9] D. Nowrouzezahrai, **W. Jarosz**, J. Johnson, J. D. Lacewell, A. Selle, and M. Kaschalk. “Programmable system for artistic volumetric lighting”. Patent 9396580 B1 (US). July 2016.
- [P10] J. Chen, I. Baran, F. Durand, and **W. Jarosz**. “Rendering images with volumetric shadows using rectified height maps for independence in processing camera rays”. Patent 9280848 B1 (US). Mar. 2016.
- [P11] **M. Papas**, **W. Jarosz**, W. A. Jakob, S. M. Rusinkiewicz, W. Matusik, and T. A. Weyrich. “Reflective and refractive surfaces configured to project desired caustic pattern”. Patent 9188783 B1 (US). Nov. 2015.
- [P12] W. Jakob, C. Regg, and **W. Jarosz**. “Progressive expectation-maximization for hierarchical rendering of participating media”. Patent 9013484 B1 (US). Apr. 2015.
- [P13] **W. Jarosz**, **M. Papas**, D. Nowrouzezahrai, and T. Houit. “Refractive steganography lens and method for determining milling plan for same”. Patent 8964295 B2 (US). Apr. 2015.




- [J40] D. Nowrouzezahrai, J. Johnson, A. Selle, D. Lacewell, M. Kaschalk, and **W. Jarosz**. “A Programmable System for Artistic Volumetric Lighting”. In: *ACM Transactions on Graphics (Proceedings of SIGGRAPH)* 30.4 (Aug. 2011), 29:1–29:8. ISSN: 0730-0301. DOI: 10.1145/2010324.1964924.
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- [J41] W. Jakob, C. Regg, and **W. Jarosz**. “Progressive Expectation–Maximization for Hierarchical Volumetric Photon Mapping”. In: *Computer Graphics Forum (Proceedings of EGSR)* 30.4 (June 2011). DOI: 10.1111/j.1467-8659.2011.01988.x.
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- [J42] **M. Papas, W. Jarosz, W. Jakob, S. Rusinkiewicz, W. Matusik, and T. Weyrich**. “Goal-based Caustics”. In: *Computer Graphics Forum (Proceedings of Eurographics)* 30.2 (June 2011), pp. 503–511. DOI: 10.1111/j.1467-8659.2011.01876.x.
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- [J43] **W. Jarosz, D. Nowrouzezahrai, I. Sadeghi, and H. W. Jensen**. “A Comprehensive Theory of Volumetric Radiance Estimation Using Photon Points and Beams”. In: *ACM Transactions on Graphics (Presented at SIGGRAPH)* 30.1 (Jan. 2011), 5:1–5:19. DOI: 10.1145/1899404.1899409.
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- [J44] T. Hachisuka, **W. Jarosz, and H. W. Jensen**. “A Progressive Error Estimation Framework for Photon Density Estimation”. In: *ACM Transactions on Graphics (Proceedings of SIGGRAPH Asia)* 29.6 (Dec. 2010), 144:1–144:12. ISSN: 0730-0301. DOI: 10.1145/1882261.1866170.
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- [J45] **W. Jarosz, N. A. Carr, and H. W. Jensen**. “Importance Sampling Spherical Harmonics”. In: *Computer Graphics Forum (Proceedings of Eurographics)* 28.2 (Apr. 2009), pp. 577–586. DOI: 10.1111/j.1467-8659.2009.01398.x.
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- [J46] T. Hachisuka, **W. Jarosz, R. P. Weistroffer, K. Dale, G. Humphreys, M. Zwicker, and H. W. Jensen**. “Multidimensional Adaptive Sampling and Reconstruction for Ray Tracing”. In: *ACM Transactions on Graphics (Proceedings of SIGGRAPH)* 27.3 (Aug. 2008), 33:1–33:10. DOI: 10.1145/1360612.1360632.
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- [J47] S. Paris, W. Chang, O. I. Kozhushnyan, **W. Jarosz, W. Matusik, M. Zwicker, and F. Durand**. “Hair Photobooth: Geometric and Photometric Acquisition of Real Hairstyles”. In: *ACM Transactions on Graphics (Proceedings of SIGGRAPH)* 27.3 (Aug. 2008), 30:1–30:9. DOI: 10.1145/1360612.1360629.
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- [J48] **W. Jarosz, M. Zwicker, and J. Schulze**. “EvalWare: Virtual Reality and Visualization Resources [Best of the Web]”. In: *Signal Processing Magazine, IEEE* 25.4 (July 2008), pp. 123–127. ISSN: 1053-5888. DOI: 10.1109/MSP.2008.923512.
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- [J49] **W. Jarosz, M. Zwicker, and H. W. Jensen**. “Irradiance Gradients in the Presence of Participating Media and Occlusions”. In: *Computer Graphics Forum (Proceedings of EGSR)* 27.4 (June 2008), pp. 1087–1096. DOI: 10.1111/j.1467-8659.2008.01246.x.
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- [P14] H. Bowles, K. Mitchell, R. Sumner, **W. Jarosz, and M. Gross**. “Iterative reprojection of images”. Patent 8624891 B2 (US). Jan. 2014.
- [P15] **W. Jarosz, D. Nowrouzezahrai, R. Thomas, P.-P. Sloan, and M. Zwicker**. “Image processing using iterative generation of intermediate images using photon beams of varying parameters”. Patent 8638331 B1 (US). Jan. 2014.
- [P16] **W. Jarosz, D. Nowrouzezahrai, and S. Watson**. “Compensation for self-scattering on concave screens”. Patent 8611005 B2 (US). Dec. 2013.
- [P17] S. C. Geiger, **W. Jarosz, M. J. Lang, K. J. Mitchell, D. Nowrouzezahrai, R. W. Sumner, and T. Williams**. “Virtual lens - rendering for augmented reality”. Patent 9164723 B1 (US). Jan. 2013.

“ Invited Talks & Lectures

- [L1] “Mastering the Interaction of Light & Matter: From Real to Virtual, and Back Again”. MIT CSAIL, Graphics Lunch. Feb. 2016.
- [L2] “Mastering the Interaction of Light & Matter: From Real to Virtual, and Back Again”. Invited Talk at BBN/Raytheon Technologies. Feb. 2016.
- [L3] “Visual Computing Lab Research Overview”. Invited talk, Dartmouth Thayer School of Engineering Colloquium. Feb. 2016.
- [L4] “Mastering the Interaction of Light & Matter: From Real to Virtual, and Back Again”. Computer Science Colloquium, Williams College. Oct. 2015.
- [L5] “High Dynamic Range Photography”. Invited Talk, Universidad de Zaragoza. Mar. 2015.
- [L6] “Mastering the Interaction of Light & Matter: From Real to Virtual, and Back Again”. Invited Talk, Visual Computing Lab, UC Berkeley. Aug. 2014.
- [L7] “Mastering the Interaction of Light & Matter: From Real to Virtual, and Back Again”. Stanford University. Computer Science Seminar, Invited Talk. Mar. 2014.
- [L8] “Mastering the Interaction of Light & Matter: From Real to Virtual, and Back Again”. Dartmouth College, Computer Science Colloquium. Feb. 2014.
- [L9] “The Perils of Evolutionary Rendering Research: Beyond the Point Sample”. Invited Talk, EGSR 2013. June 2013.
- [L10] “The Perils of Evolutionary Rendering Research: Beyond the Point Sample”. Keynote Talk. Journées du groupe de travail rendu. Mar. 2013.
- [L11] “The Perils of Evolutionary Rendering Research: Beyond the Point Sample”. Invited Talk, TU Wien Graphics Konversationsatorium. Feb. 2013.
- [L12] “*Tangled: Behind the Magic*”. Scientifica¹¹: Zürcher Wissenschaftstage, Disney-Night. Aug. 2011.
- [L13] “The Research Behind the Magic”. Computer Science - Distinguished Lecture Series, UIUC. Nov. 2010.
- [L14] “Non-Photorealistic Rendering”. Invited lecture for CSE 168, UCSD. June 2008.

[J50] **W. Jarosz**, M. Zwicker, and H. W. Jensen. “The Beam Radiance Estimate for Volumetric Photon Mapping”. In: *Computer Graphics Forum (Proceedings of Eurographics)* 27.2 (Apr. 2008), pp. 557–566. DOI: 10.1111/j.1467-8659.2008.01153.x.
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[J51] **W. Jarosz**, C. Donner, M. Zwicker, and H. W. Jensen. “Radiance Caching for Participating Media”. In: *ACM Transactions on Graphics (Presented at SIGGRAPH)* 27.1 (Mar. 2008), 7:1–7:11. ISSN: 0730-0301. DOI: 10.1145/1330511.1330518.
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[J52] P. Clarberg, **W. Jarosz**, T. Akenine-Möller, and H. W. Jensen. “Wavelet Importance Sampling: Efficiently Evaluating Products of Complex Functions”. In: *ACM Transactions on Graphics (Proceedings of SIGGRAPH)* 24.3 (Aug. 2005), pp. 1166–1175. DOI: 10.1145/1073204.1073328.
 webpage  pdf  citations: 150

[L15] “Textures, Environment mapping, and Procedurals”. Invited lecture for CSE 168, UCSD. May 2008.

[L16] “Efficient Light Transport in Scattering Media”. Invited Talk, Walt Disney Animation Studios, Los Angeles. Feb. 2008.

[L17] “Efficient Light Transport in Scattering Media”. Invited lecture for CSE 272, UCSD. Dec. 2007.

[L18] “Texturing”. Invited lecture for CSE 168, UCSD. May 2007.

[L19] “Global Illumination”. Invited lecture for CSE 168, UCSD. May 2006.




[L20] “OpenEXR: Towards Realtime Playback”. SIGGRAPH 2005 OpenEXR Birds of a Feather. Aug. 2005.

[L21] “Non-Photorealistic Rendering”. Invited lecture for CSE 168, UCSD. June 2005.





Service & Professional Activities



Chairing & Editorial duties

- **Associate editor**, Journal of Computer Graphics Techniques (JCGT)  2015–Present
- **Associate editor**, Computer Graphics Forum (Wiley)  2014–2017
- **Papers co-chair**, Eurographics Symposium on Rendering (EGSR)  2014

Conference Committees

- **Steering Committee**, Eurographics Symposium on Rendering (EGSR)  2017–Present
- **Technical Papers Committee**, ACM SIGGRAPH Asia  2017
- **Papers Committee**, Eurographics Symposium on Rendering (EGSR)  2010–2012, 2016, 2017
- **Full Papers International Program Committee**, Eurographics (EG)  2013, 2014, 2016
- **Technical Papers Committee**, ACM SIGGRAPH  2012, 2013, 2015
- **International Program Committee**, GRAPP  2015
- **Technical Program Committee**, SIBGRAPI  2014
- **Papers Committee**, ACM SIGGRAPH Symposium on Interactive 3D Graphics and Games (i3D)  2012–2014
- **Sketches Committee**, SIGGRAPH Asia  2008, 2009

Reviewer

- ACM SIGGRAPH  2004–2018
- ACM SIGGRAPH Asia  2008–2010, 2012–2014, 2017–2018
- ACM Transactions on Graphics (TOG)  2009–2013
- Eurographics (EG)  2008–2016
- Eurographics Symposium on Rendering (EGSR)  2005, 2009–2012, 2015–2017
- Computer Graphics Forum  2009–2011, 2013–2017
- The Visual Computer  2007, 2010
- Interactive Ray Tracing  2007

College Committees

- Faculty recruiting 📅 2017–Present
- Department Webmaster 📅 2015–Present
- M.S. D.A. admissions 📅 2016–2017
- Ph.D. admissions 📅 2014–2016

Press & Media Coverage



- 📄 “Every grain of sand: Method efficiently renders massive assemblies of granular materials.” *PhysOrg*. December 8, 2016.
<https://phys.org/news/2016-12-grain-sand-method-efficiently-massive.html>
- 📄 “You Can Stop Worrying, Disney Figured Out How to Make Perfect CG Sugar.” *Gizmodo*. December 8, 2016.
<http://gizmodo.com/you-can-stop-worrying-disney-figured-out-how-to-make-p-1789824492>
- 📄 “This simulation is so good it’s hard to believe it’s not real.” *Popular Mechanics*. December 8, 2016.
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- 📄 “Disney Research Devises a Method of 3D Printing Models That Balance or Breakdance.” *3DPrint.com*. October 7, 2016.
<https://3dprint.com/151798/disney-research-balancing/>
- 📄 “Scientists Develop Spray Cans That Know What to Paint.” *Wall Street Journal Video*. May 2, 2016.
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- 📄 “Spray Cans That Know What to Paint.” *The Wall Street Journal*. April 29, 2016.
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- 📄 “Move over Banksy! Robotic spray can helps novices reproduce photos as giant ‘paint by numbers’ murals.” *Daily Mail*. April 8, 2016.
<http://www.dailymail.co.uk/sciencetech/article-3529871/Move-Banksy-Robotic-spray-helps-novices-reproduce-photos-giant-paint-numbers-murals.html>
- 📄 “Smart spray paint copies color photos onto walls.” *gizmag*. April 8, 2016.
<http://newatlas.com/smart-spray-paint-computer-aided-mural-dartmouth/42715/>
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<http://www.techradar.com/news/world-of-tech/this-smart-spray-can-will-instantly-turn-you-into-a-pro-graffiti-artist-1318575>
- 📄 “Scientists Invent Robotic ‘Artist’ That Spray Paints Giant Murals.” *NeuroScienceNews*. April 7, 2016.
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<https://phys.org/news/2016-04-scientists-robotic-artist-giant-murals.html>
- 📄 “Think You Know Rainbows? Look Again.” *Scientific American*. February 26, 2016.
<http://www.scientificamerican.com/article/think-you-know-rainbows-look-again-slide-show1/>

Other

- Symposium on Computer Animation 📅 2007
Student Volunteer
- SIGGRAPH UIUC Student Chapter 📅 Jul. 2001–Jun. 2002
President

- 📄 “New device improves full-color image projection.” *PhysOrg*. October 21, 2015.
<http://phys.org/news/2015-10-device-full-color-image.html>
- 📄 “5 Crazy New Ideas Out Of Disney Research.” *FastCompany*. August 7, 2015.
<http://www.fastcodesign.com/3049566/5-crazy-new-ideas-out-of-disney-research>
- 📄 “New method efficiently renders granular materials at multiple scales.” *PhysOrg*. August 5, 2015.
<http://phys.org/news/2015-08-method-efficiently-granular-materials-multiple.html>
- 📄 “Disney’s new rendering technique could usher in a new era of animation.” *i09*. November 19, 2013.
<http://i09.com/disneys-new-rendering-technique-could-usher-in-a-new-e-1467435361>
- 📄 “New algorithms improve animations featuring fog, smoke and underwater scenes.” *PhysOrg*. November 18, 2013.
<http://phys.org/news/2013-11-algorithms-animations-featuring-fog-underwater.html>
- 📄 “The State of Rendering - Part 2.” *fxguide*. July 17, 2013.
<http://www.fxguide.com/featured/the-state-of-rendering-part-2/>
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