

Curriculum Vitae
Henrik Wann Jensen

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Education

1996 **Ph.D. in Computer Science** at the Technical University of Denmark
1993 **M.Sc. in Electrical Engineering** at the Technical University of Denmark

Summary of Interests

Computer graphics, realistic image synthesis, appearance models, global illumination, caustics, participating media, subsurface scattering, ray tracing, Monte Carlo techniques, parallel rendering algorithms, software architecture, numerical techniques, data compression and image analysis.

Professional Experience

2002- **Assistant Professor at University of California, San Diego**
1999-2002 **Research Associate at Stanford University**
Derived new BSSRDF model for rendering translucent materials, and developed techniques for rendering the night sky as well as scenes with smoke and fire.
2001 **Consultant at Pixar Animation Studios**
1998-1999 **Postdoctoral Associate at Massachusetts Institute of Technology**
Developed subsurface scattering algorithm based on photon mapping, worked on weathering simulations, night city rendering, and material models.
1996-1998 **Research Scientist at M.I.**
Principal developer of: Shadow maps, photon map prototype, shader tree evaluation plus caching, and image caching for interactive tuning of shaders.

Research

My PhD research addressed the simulation of global illumination by introducing the concept of **photon mapping**. The key features of the photon mapping algorithm are the use of photon tracing and the photon map. The photon map is decoupled from the scene geometry, and it can be used in models with millions of objects and complex materials. Photon mapping is the first practical method capable of rendering caustics on complex non-Lambertian materials, volume caustics, true subsurface scattering, and motion blurred global illumination effects.

I have developed several techniques for simulating subsurface scattering in translucent materials. This includes the first **BSSRDF** model, which is also the first first practical model capable of accurately rendering highly scattering translucent materials such as marble, milk and skin.

I have written seven radiosity and ray tracing based renderers. My current renderer, *Dali*, features an efficient thread- and host-parallel kernel and it can simulate all aspects of global illumination including caustics, participating media, and subsurface scattering.

Book

- Henrik Wann Jensen. *“Realistic Image Synthesis using Photon Mapping”*. ISBN: 1-56881-140-7. AK Peters, July 2001
- Henrik Wann Jensen. *“Realistic Image Synthesis using Photon Mapping”*. Japanese translation by Takeshi Naemura. ISBN 4-27407-950-3. Ohmsha Ltd., July 2002

Dissertations

- Henrik Wann Jensen. “*The Photon Map in Global Illumination*”. Ph.D. dissertation, The Technical University of Denmark, 1996
- Henrik Wann Jensen. “*Global Illumination - Simulated using Bidirectional Monte Carlo Ray Tracing*”. M.Sc. thesis, The Technical University of Denmark, 1993

SIGGRAPH Publications

- Henrik Wann Jensen and Juan Buhler. “A Rapid Hierarchical Rendering Technique for Translucent Materials”. *Proceedings of SIGGRAPH’2002*, pages 576–581, San Antonio, July 2002
- Duc Quang Nguyen, Ronald Fedkiw, and Henrik Wann Jensen. “Physically Based Modeling and Animation of Fire”. *Proceedings of SIGGRAPH’2002*, pages 721–728, San Antonio, July 2002
- Henrik Wann Jensen, Steve Marschner, Marc Levoy, and Pat Hanrahan. “A Practical Model for Subsurface Light Transport”. *Proceedings of SIGGRAPH’2001*, pages 511–518, Los Angeles, August 2001
- Henrik Wann Jensen, Fredo Durand, Mike Stark, Simon Premoze, Julie Dorsey, and Peter Shirley. “A Physically-Based Night Sky Model”. *Proceedings of SIGGRAPH’2001*, pages 399–408, Los Angeles, August 2001
- Ronald Fedkiw, Jos Stam, and Henrik Wann Jensen. “Visual Simulation of Smoke”. *Proceedings of SIGGRAPH’2001*, pages 15–22, Los Angeles, August 2001
- Julie Dorsey, Alan Edelman, Henrik Wann Jensen, Justin Legakis, and Hans Pedersen. “Modeling and Rendering of Weathered Stone”. *Proceedings of SIGGRAPH’99*, pages 225–234, Los Angeles, August 1999
- Henrik Wann Jensen and Per H. Christensen. “Efficient Simulation of Light Transport in Scenes with Participating Media using Photon Maps”. *Proceedings of SIGGRAPH’98*, pages 311–320, Orlando, July 1998

Refereed Conference and Journal Publications

- Mike Cammarano and Henrik Wann Jensen. “Time Dependent Photon Mapping”. *Proceedings of the 13th Eurographics Rendering Workshop*, pages 141–150, Pisa, 2002
- Gernot Schaufler and Henrik Wann Jensen. “Ray Tracing Point Sampled Geometry”. *Rendering Techniques 2000*. Eds. B. Péroche and H. Rushmeier. Springer-Verlag, pages 319–328, Brno, June 2000
- Henrik Wann Jensen, Justin Legakis, and Julie Dorsey. “Rendering of Wet Materials”. In *Rendering Techniques ’99*. Eds. D. Lischinski and G. W. Larson. Springer-Verlag, pages 273–282, 1999
- Rasmus Tamstorf and Henrik Wann Jensen. “Adaptive Sampling and Bias Estimation in Path Tracing”. In *Rendering Techniques ’97*. Eds. J. Dorsey and Ph. Slusallek. Springer-Verlag, pages 285–295, 1997
- Henrik Wann Jensen. “Rendering Caustics on Non-Lambertian Surfaces” (Extended version of Graphics Interface’96 paper). *Computer Graphics Forum*, vol. 16 (1), pages 57–64, March 1997
- Henrik Wann Jensen. “Global Illumination using Photon Maps”. In *Rendering Techniques ’96*. Eds. X. Pueyo and P. Schröder. Springer-Verlag, pages 21–30, 1996
- Henrik Wann Jensen. “Rendering Caustics on Non-Lambertian Surfaces”. *Proceedings of Graphics Interface 96’*, pages 116–121, Toronto, May 1996

- Henrik Wann Jensen. “Importance Driven Path Tracing using the Photon Map”. In *Rendering Techniques '95*. Eds. P.M. Hanrahan and W. Purgathofer. Springer-Verlag, pages 326–335, 1995
- Henrik Wann Jensen and Niels Jørgen Christensen. “Efficiently Rendering Shadows using the Photon Map”. *Proceedings of Compugraphics'95*, pages 285–291, 1995
- Henrik Wann Jensen and Niels Jørgen Christensen. “Optimizing Path Tracing using Noise Reduction Filters”. *Proceedings of WSCG'95*, pages 134-142, Plzen, 1995
- Henrik Wann Jensen and Niels Jørgen Christensen. “Photon Maps in Bidirectional Monte Carlo Ray Tracing of Complex Objects”. *Computers & Graphics* vol. 19 (2), pages 215–224, 1995

Refereed SIGGRAPH Animations

- Henrik Wann Jensen, Steve Marschner, Marc Levoy, and Pat Hanrahan. “Rendering Translucent Materials”. *SIGGRAPH 2001 Electronic Theater*.
- Henrik Wann Jensen and Stephen Duck. “The Light of Mies van der Rohe”. *SIGGRAPH 2000 Electronic Theater*
- Henrik Wann Jensen. “Little Fluffy Clouds”. *SIGGRAPH 2000 Animation Theater*
- Henrik Wann Jensen, Charlotte Manning, Steffen Volz, and Per H. Christensen. “Underwater Sunbeams”. *SIGGRAPH'98 Electronic Theater*
- Per H. Christensen, Henrik Wann Jensen, and Steffen Volz. “The Cornell Box – Up in Smoke”. *SIGGRAPH'98 Animation Theater*

Misc. Publications

- Henrik Wann Jensen, Frank Suykens, Per Christensen, and Toshi Kato. “A Practical Guide to Global Illumination using Photon Mapping”. *SIGGRAPH 2002 Course #43*, July 2002
- Henrik Wann Jensen, Frank Suykens, and Per Christensen. “A Practical Guide to Global Illumination using Photon Mapping”. *SIGGRAPH 2001 Course notes #38*, August 2001
- Henrik Wann Jensen, James Arvo, Marcos Fajardo, Pat Hanrahan, Peter Shirley, Matt Pharr, and Don Mitchell. “State of the Art in Monte Carlo Ray Tracing for Realistic Image Synthesis”. *SIGGRAPH 2001 Course notes #29*, August 2001
- Henrik Wann Jensen, Simon Premoze, Peter Shirley, William Thompson, Jim Ferwerda, and Michael Stark. “Night Rendering”. Tech. Rep. UUCS-00-016, Computer Science Department, University of Utah, August 2000
- Henrik Wann Jensen and Niels Jørgen Christensen. “A Practical Guide to Global Illumination using Photon Maps”. *SIGGRAPH 2000 Course notes #8*, July 2000
- Tim Davis, Alan Chalmers, and Henrik Wann Jensen. “Practical Parallel Processing for Realistic Rendering”. *SIGGRAPH 2000 Course notes #30*, July 2000
- Henrik Wann Jensen and Brian Smits. “Global Illumination Test Scenes”. Abstract for *Dagstuhl Seminar on Image Synthesis and Interactive 3D Graphics*, June 2000
- Brian Smits and Henrik Wann Jensen. “Global Illumination Test Scenes”. Tech. Rep. UUCS-00-013, Computer Science Department, University of Utah, June 2000
- Henrik Wann Jensen and Niels Jørgen Christensen. “A Practical Guide to Global Illumination using Photon Maps”. Technical report, ISBN-87-90125-01-0. Dept. of Graphical Communication. Technical University of Denmark, April 2000
- Henrik Wann Jensen. “Global Illumination using Photon Maps”. Abstract for *Dagstuhl Seminar on Rendering*, page 18, June 1996

- Philip Dam Lind and Henrik Wann Jensen. “Reducing the Complexity of Medical 3D Surface Models for Interactive Analysis”. *Proceedings of CAR’96*, page 1011, 1996

Cover Images

- “Face Rendering”. The front-cover of National Geographic (Dutch edition), November 2002
- “Flame simulation”. The back cover of the proceedings of SIGGRAPH 2002
- “Face with translucent skin”. The back cover of the proceedings of SIGGRAPH 2002
- “Diana the Huntress” - a translucent marble bust. The front cover of the proceedings of SIGGRAPH 2001
- “The David” rendered for the digital Michelangelo project. The title cover (frontispiece) of the proceedings of SIGGRAPH 2000
- “Cornell box with smoke”. The back cover of the proceedings of SIGGRAPH’98
- “A caustic from a glass of cognac”. The front cover of ACM Computer Graphics, volume 30, 1996

Images in Books and Articles

- “Mies house” and “Diana the Huntress” marble bust. In “Fundamentals of Computer Graphics” by Peter Shirley, July 2002
- “Face rendered with our BRDF” and “Face rendered with our BSSRDF” in Computer Graphics World, October 2001, and in Wired, December 2001
- “Rising smoke” and “Smoke flowing past a sphere” in Computer Graphics World, September 2001
- “Three glasses of milk” on the cover of the Business section in The Los Angeles Times, Sunday, Aug. 12, 2001
- “Diana the Huntress”. The cover of the Business section in The Los Angeles Times, Sunday, Aug. 12, 2001, and in Computer Graphics World, October 2001
- “The David” rendered for the digital Michelangelo project. The cover of Science|Technology in San Jose Mercury News, Oct. 10, 2000
- Four images demonstrating “Weathering of a Granite Sphinx” in Scientific American, February 2000
- “Cornell box with smoke”. In “Inside Softimage 3D” by Anthony Rossano, page 700. New Riders Publishing, 1998
- “Dusty room with beams of sunlight”. In “The Computer in the Visual Arts” by Anne M. Spalter, page 258. Addison-Wesley Publishing Co., 1998.

SIGGRAPH Course Presentations

- Organizer for “A Practical Guide to Global Illumination using Photon Mapping”.
 - *SIGGRAPH 2002*. Lecturers: Per Christensen, Henrik Wann Jensen, Toshi Kato, and Frank Suykens.
 - *SIGGRAPH 2001*. Lecturers: Per Christensen, Henrik Wann Jensen, and Frank Suykens.
 - *SIGGRAPH 2000*. Lecturers: Niels Jørgen Christensen and Henrik Wann Jensen.
- Organizer for “State of the Art in Monte Carlo Ray Tracing for Realistic Image Synthesis”.

- *SIGGRAPH 2001*. Lecturers: James Arvo, Marcos Fajardo, Pat Hanrahan, Henrik Wann Jensen, Don Mitchell, Matt Pharr, and Peter Shirley.
- “Practical Parallel Processing for Realistic Rendering” .
- *SIGGRAPH 2000*. Lecturers: Alan Chalmers, Tim Davis, and Henrik Wann Jensen.

Major Conference and Workshop Talks

- “A Rapid Hierarchical Rendering Technique for Translucent Materials” (with J. Buhler). SIGGRAPH, San Antonio, July 2002
- “A Practical Model for Subsurface Light Transport”. SIGGRAPH, Los Angeles, August 2001
- “A Physically-Based Night Sky Model ”. SIGGRAPH, Los Angeles, August 2001
- “Modeling and Rendering of Weathered Stone” (with J. Dorsey). SIGGRAPH, Los Angeles, August 1999
- “Rendering of Wet Materials”. Eurographics Workshop on Rendering, Granada, Spain, June 1999
- “Efficient Simulation of Light Transport in Scenes with Participating Media using Photon Maps”. SIGGRAPH, Orlando, July 1998
- “Global Illumination using Photon Maps”. Eurographics Workshop on Rendering, Porto, Portugal, June 1996
- “Importance Driven Path Tracing using the Photon Map”. Eurographics Workshop on Rendering, Dublin, Ireland, June 1995

Selected Invited Talks

- Unilever, New York, December 2002, to appear
- Florida State University, “Computational Visualization Seminar”, November 2002, to appear
- SGI, Mountain View, November 2002, to appear
- Stanford University, invited lecture, November 2002, to appear
- NVIDIA, Santa Clara, November 2002, to appear
- 2002 National ACM Student Conference “Reflections Projections 2002” at University of Illinois Urbana Champaign, invited talk and workshop, October 2002
- Honda R&D Americas, Inc., Mountain View, September 2002
- Rhythm+Hues studios, Los Angeles, September 2002
- IT University of Copenhagen, Denmark, August 2002
- CAVI, Workshop on Realistic Graphics, Denmark, August 2002
- Disney Feature Animation, Los Angeles, August 2002
- Sony Imageworks, Los Angeles, August 2002
- University of Washington, Computer Science Colloquium, May 2002
- UC San Diego, Computer Science Colloquium, May 2002
- UC Berkeley Computer Science Dept., Distinguished Lecture Series, Apr. 2002
- Georgia Institute of Technology, GVU Center, Atlanta, Mar. 2002

- MERL - Mitsubishi Electric Research Lab, Cambridge, Nov. 2001
- Massachusetts Institute of Technology, “Materials Seminar”, Nov. 2001
- Massachusetts Institute of Technology, Laboratory of Computer Science, Nov. 2001
- ESC Entertainment, Alameda, June 2001
- SquareUSA, Honolulu, June 2001
- Pixar, Emeryville, May 2001
- Industrial Light & Magic, Lecture Series, San Rafael, April 2001
- Digital Domain, Los Angeles, April 2001
- UCLA, IPAM, Institute for Pure and Applied Mathematics, Los Angeles, April 2001
- Disney Feature Animation, Los Angeles, April 2001
- Pacific Data Images, Palo Alto, April 2001
- Silicon Valley SIGGRAPH meeting, Santa Clara, February 2001
- Sonoma State University, Computer Science Colloquium, Oct. 2000
- Dagstuhl Seminar on Image Synthesis and Realtime Rendering, Germany, June. 2000
- UC Berkeley, Computer Science Dept., May. 2000
- University of Utah, Computer Science Dept., Oct. 1999
- Harvard University, “Computer graphics class lecture”, Dec. 1998
- Keynote talk. Tenth IMDSP Workshop in Alpbach, Austria, July 1998
- Industrial Light & Magic, San Rafael, August 1997
- Dagstuhl Seminar on Image Synthesis, Germany, June 1996
- Cornell University, Program of Computer Graphics, May 1996

Selected International Press & Media Coverage

- “Virtual Skin”. **National Geographic**, November 2002. Part of the cover feature on skin.
- “Fast Translucency”. **CG World**, Japan, October 2002
- “Fast Translucent Materials”. **Eizoshimbun**, Japan, September 2002
- “Fire”. **CG & Digital Video World**, Japan, July 2002.
- “The Race to Build a Perfect Face”. **Wired**, feature article, June 2002.
- “Volumetric Rendering”. **CG & Digital Video World**, Japan, May 2002. Describes volume photon mapping.
- “Rendering Translucent Materials”. **TechTV - Eye Drops**. Episode Four, April 2002. On the BSSRDF research.
- “Milk as a Challenge for Film” (Org. “Milch als filmische Herausforderung”). 5 minutes of interview and presentation in the science program **NANO** shown on national tv in Austria, Germany, and Switzerland. February, 2002. On the BSSRDF research.
- “New software makes PC-images look real” (Org. “Neue Software lässt PC-Bilder echt aussehen”). **Welt am Sonntag**. Germany, January, 2002. On the BSSRDF research.

- “Skin Deep”. **Wired**, December 2001. On the BSSRDF research.
- “Milk, Marble and Magic” (Org. “Mælk, Marmor og Magi”). **ComputerWorld**, Denmark, November 2001. On my research.
- “The Softening of Computer Graphics”. **Computer Graphics World**, October 2001. On the BSSRDF research.
- “Smoke Signals”. **Computer Graphics World**, September 2001. On the paper “Visual Simulation of Smoke”.
- “Making Graphics Soft”. **The Eizoshimbun**, Japan, September 2001. On the BSSRDF research.
- “Hollywood gets a major digital boost”. **The Times of India**, India, September 2001. On the BSSRDF research
- “Global Illumination”. **CG & Digital Video World**, Japan, August 2001. Describes my research on photon mapping.
- “White fantastic”. **New Scientist**, August 2001. On the BSSRDF research.
- “At Last, Computers Are Getting Milk”. On the cover of **Los Angeles Times**, Business Section, August 2001. Also on the backcover with the title “Milk: One Of The Last Computer Graphics Challenges”. On the BSSRDF research.
- “More Realistic Rendered Flesh”. **Slashdot**, July 2001. On the BSSRDF research.
- “A Festival of Animation, Animatedly”. **The New York Times**, July 2000. Describes the animation “The Light of Mies van der Rohe”.
- “Michelangelo in the Virtual World” (Org. “Michelangelo i den virtuelle verden”). **Børsen**, Denmark, June 2000. About my research at Stanford.
- “Double Play – Symmetrical Multiprocessing with Linux”. **c’t magazin für computer technik**, Germany, 13/98. Describes a fractal program I wrote for Linux.

Professional Activities

Program committee member of:

Eurographics Conference: 2002

Eurographics Symposium on Rendering: 2003

Eurographics Workshop on Rendering: 1998–2002

Spring Conference on Computer Graphics: 1996–2002

WSCG Conference: 1999–2003

Paper reviewing for:

ACM Journal of Graphics Tools

ACM SIGGRAPH

ACM Transactions on Graphics

Graphics Interface

I3D

IEEE Computer Graphics & Applications

IEEE Transactions on Visualization and Computer Graphics

International Journal on Computer Vision

Visual Computer

Member of ACM SIGGRAPH.

Other Interests

My other interests are mainly concentrated around sports. I enjoy cycling (road and mountain biking), swimming, and scuba diving.