

Dr. Bruce Gooch

cat·a·lyst – An agent that provokes or speeds significant change or action

Physical Contact:

3476 Plymouth Road
Victoria, British Columbia V8P 4X4
Office Phone: 250-472-5758
Home Phone: 250-483-5941
Fax: 250-472-5708

Virtual Contact:

Webpage: www.TheGooch.org
Linkedin: www.linkedin.com/in/brucegooch
FaceBook: www.facebook.com/brucegooch
Cell Phone: 801-828-5037
Email: BruceGooch@gmail.com

Education

University of Utah, Salt Lake City, Utah

Doctor of Philosophy in Computer Science, May 2003.

Dissertation title: *Human Facial Illustrations: Creation and Evaluation using Behavioral Studies and fMRI*.

Advisors: Professor Richard F. Riesenfeld and Professor Peter Shirley.

Master of Science in Computer Science, December 2000.

Thesis title: *Artistic Vision: Painterly Rendering Using Computer Vision Techniques*.

Advisors: Professor Richard F. Riesenfeld and Professor Peter Shirley.

Bachelor of Science in Mathematics, June 1993.

Academic Employment



University of Victoria, Associate Professor
University of Victoria, Assistant Professor

February 2009–Present
August 2006–February 2009



Northwestern University, Assistant Professor

August 2003–August 2008



National Science Foundation, Graduate Research Fellow

August 2001–August 2003



University of Utah, University Teaching Fellow
University of Utah, Research Assistant

August 2000–August 2001
August 1996–August 2001

Start-Up Companies



Relevant Games LC, Founder and Board Member

April 2009–Present

Relevant Games LC specializes in the creation of casual games with socially relevant themes. Titles include "Save the Frogs" and "Spice Islands." Relevant Games are served using social media applications (Facebook, MySpace, Bebo and High5) and on mobile devices (iPhone, Symbian, Microsoft Mobile and Android).



Toon-FX LC, President and Founder

September 2006–Present

Toon-FX LC is a software company specialising in GPU accelerated video and image processing. Using proprietary compiler optimization technology for video and image processing, Toon-FX products enable users to automatically create abstract representations of their digital media in real time. Toon-FX has successfully licensed software to Adobe, Nokia, Samsung and Google.



Auryn Inc, Technical Advisory Board

July 2004–Present

Auryn Inc, founded by Hollywood veterans and top academics is a venture backed tech media company. Auryn is breaking new ground in the field of animated storytelling. Its one-of-a-kind patented technology makes possible visual styles deemed unfeasible with current animation technologies. With production facilities in India, the company has successfully produced three shorts sold at a variety of outlets.



SocialAds.com Inc, Technical and Business Advisor

Sept. 2008–Jan. 2009

SocialAds.com is a scalable social advertising platform for advertisers and publishers that provides demographic targeting and real time statistics. The goal is to give publishers added value through our powerful interface and high eCPMs, while allowing advertisers to target specific markets and accurately track results. SocialAds.com was acquired by Neverblue LLC for over 2 million dollars, Dr. Gooch was a consultant during the negotiation.



DJArts Games Inc, Technical and Business Advisor

Sept. 2008–April 2009

DJArts Games is a fast-growing young game development company focused on casual games for social platforms. Titles include, "Egg Breaker" a casual game where users crack open virtual eggs in search of prizes. DJArts Games last year earnings were in excess of 1.3 million dollars.



Starjazz Entertainment Inc, Technical Advisory Board November 2006–April 2009

Starjazz Entertainment is responding to the as-of-yet unanswered demands for an inter-active, alternative non-gambling games-entertainment website, StarJazzgames.com targets a clientele of diverse demographics utilizing unparalleled promotional incentives that are inclusive as monthly membership benefits set in a risk-free format, creating a solitary-niche in online game playing. Dr. Gooch served as a technical advisor and aided in procuring Alpha round funding for the company.



Ford, Bacon and Davis Inc, Mathematician

April 1995–August 1996

Dr. Gooch was an analyst and researcher on a start-up project to build probes that would find and predict the size of corrosion defects in gas and oil pipelines. He designed and built a probe evaluation test loop consisting of eight hundred feet of pipeline into which four hundred defects were machined. Dr. Gooch then wrote software to predict the size of defects based on three dimensional time dependent magnetic field data gathered during probe runs. The probe system was successfully sold to British Petroleum for 3 million dollars.



Figure 1: *The work of Dr. Gooch introduced techniques for automatically **retargeting** images and animations, that is, for adapting them for display at different sizes and aspect ratios while preserving the recognizability of important image features. Left) An image containing three areas of importance, the two boys, and the ball. Center) The source image retargeted to fit a PDA display. Right) The source image retargeted to fit a cell phone display. This technology resulted in one US patent, has been licensed to **Nikon**, and incorporated into a variety of products.*



Figure 2: Since the introduction of the desktop metaphor, the number of files that users manage has increased dramatically. File browsing methods, however, have only improved marginally. Dr. Gooch introduced **Semanticons** to enhance the representation of files in a GUI by offering symbols that are semantically and visually distinguishable. The goal of this work is to automatically generate icons that better reveal the meanings of a desktop files contents. Composing semantic images with icons from contemporary GUIs yields visual language that reflects the users thinking. Psycho-physical studies that use semanticons and standard desktop icons in visual search and memory tasks show that Semanticons yield significant improvements in human performance.

Patents

Student co-authors are underlined.

- [1] Bruce Gooch, Sven Olsen, and Holger Winnemoller. “Customizable and Non-Linear Image and Video Smoothing Filter.” United States Provisional Patent Application Serial No. Serial no. 60/962,872, September 2006.
- [2] Bruce Gooch, Sven Olsen, and Holger Winnemoller. “Method System and Business Model to Convert Images and Moving Picture Sequences Into Stylized Representations Via Several Image Processing Operations.” United States Provisional Patent Application Serial No. 60/962,871, September 2006.
- [3] Bruce Gooch, Sven Olsen, and Holger Winnemoller. “Process and Systems for Spatially Adaptive Pseudo-Quantization of Video Luminescence.” United States Provisional Patent Application Serial No. Serial no. 60/962,855, September 2006.
- [4] Bruce Gooch, Sven Olsen, and Holger Winnemoller. “Process and Systems for Transforming Video Input Into Abstract Animations.” United States Provisional Patent Application Serial No. 60/962,841, September 2006.
- [5] Bruce Gooch, Vidya Setlur, Michael Lee Gleicher, Saeko Takagi, and Ramesh Raskar. “Retargeting Images for Small Displays.” United States Provisional Patent Application Serial No. 194804, June 2004.

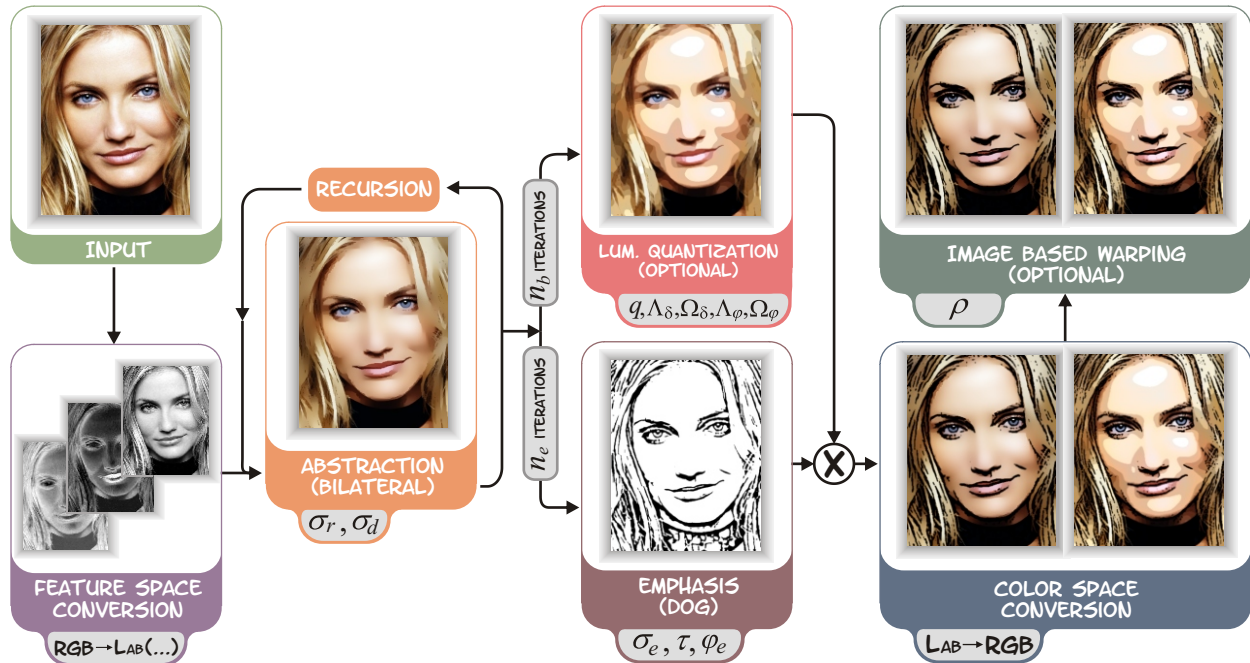


Figure 3: Dr. Gooch lead a team that created an automatic, real-time video and image abstraction framework that abstracts imagery by modifying the contrast of visually important features, namely luminance and color opponency. Abstracted images can optionally be stylized using soft color quantization to create cartoon-like effects with good temporal coherence. Each step lists the function performed, along with user parameters. The right-most paired images show alternative results, depending on whether luminance quantization is enabled (right) or not (left). The top image pair shows the final output. This technology resulted in five US patents and three products. (www.Toon-FX.com)

Research Interest: Non-Photorealistic Rendering

In the computer graphics community, *rendering* is the process by which data is converted into images. Photorealistic rendering denotes images based on physical simulations. The goal of photorealistic rendering is to create images indistinguishable from photographs of real world scenes. In contrast, non-photorealistic rendering (NPR) is concerned with images that are guided by artistic processes. The reasons for using NPR range from aesthetic and stylistic considerations to communicative advantages such as abstraction and symbolism. Dr. Gooch is the author of two books on NPR: *Non-Photorealistic Rendering*, published by A.K. Peters 2001; and *Illustrative Visualization*, to be published by A.K. Peters in 2009.

In his extensive body of non-photorealistic rendering work, Professor Gooch has explored a variety of computer based methods for producing illustrations including: optimization for scene layout [45], using silhouette and boundary edges to enhance form [9, 18, 48], as well as stippling, paint-strokes, and textures to indicate material properties [46, 47]. Dr. Gooch has also done work in creating digital oil paintings [39, 44].

In computer graphics the way that light interacts with objects is abstracted mathematically into a shading model. There are four local shading models in computer graphics, each named for the investigator who discovered it; Phong, Gouraud, Blinn and Gooch [20]. The Gooch shading model, discovered by Dr. Gooch, is widely used in academia for scientific visualization [37], as well and in movies and video games.

Professor Gooch has made contributions in color based image processing to enhance the appearance of digital images. He done work in color transfer between images [19] and in converting color images to grayscale in way that maintains color differences [15].

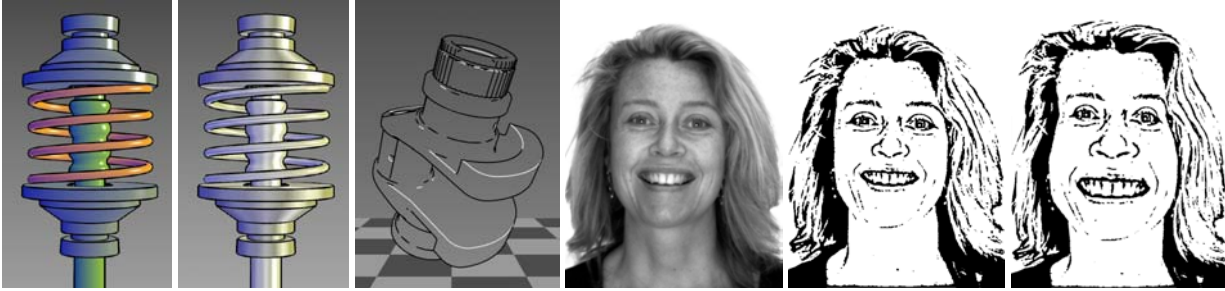


Figure 4: Professor Gooch’s research combines computer graphics techniques for creating artistic imagery with the evaluation methods of perceptual psychology to optimize visual communication using images, animations, and interactive applications. Images one through three show examples of technical illustrations from the prior work of Gooch. Images four through six show a photograph, illustration, and caricature. Behavioral studies, carried out by Dr. Gooch, demonstrate that learning tasks are faster with the illustrations or caricatures. His fMRI experiments demonstrate that more and different areas of the brain are active when decoding the the automatically generated facial illustrations than with photographs.

Research Interest: Perception and Graphics

Professor Gooch seeks to understand the effectiveness of computer-generated imagery using perceptual metrics and evaluation techniques. Empirical studies repeatedly find that design evaluations based on simple introspection and preference are poor predictors of user performance. Instead, Dr. Gooch looks to the methodology of perceptual psychology to carefully design experiments that use task based performance to evaluate computer generated imagery.

Professor Gooch is a pioneer in the perceptual evaluation of non-photorealistic imagery. He was the founding online editor of the *ACM Transactions on Applied Perception*. His research discoveries include finding increased learning speed using computer generated facial illustrations [13, 18], demonstrating enhanced depth perception in images via artistic matting [38], enhanced interfaces for detecting network attacks and misconfigurations [32], decision making in social contexts [27], detecting false captioning in images [14] and showing increased performance in memory and search tasks using modified GUI icons [17].

Dr. Gooch has also made contributions to computer graphics using computational models of the human visual system to solve known or novel problems. He has created methods for estimating light positions from digital photographs without the use of calibrated cameras [16]. Dr. Gooch’s introduced the use of computational models of the human visual system in creating three dimensional models from photographs or drawings [10, 24].

Dr. Gooch introduced techniques for automatically **retargeting** images and animations, that is, for adapting them for display at different sizes and aspect ratios while preserving the recognizability of important image features. The motivation for this work is the need for tools that allow us to author imagery once, and then automatically retarget that imagery for a variety of different display devices as needed. The problem is to retarget an image to a new size and/or aspect ratio in a manner that preserves the recognizability. To do this, the features of the image must be identified, their importance determined, and then the image needs to be re-arranged such that the important features are well-represented. Professor Gooch introduced the retargeting problem to the computer graphics community in a 2004 ACM Siggraph presentation and has published work in image retargeting [40], video retargeting [12] and flash animation retargeting [41].

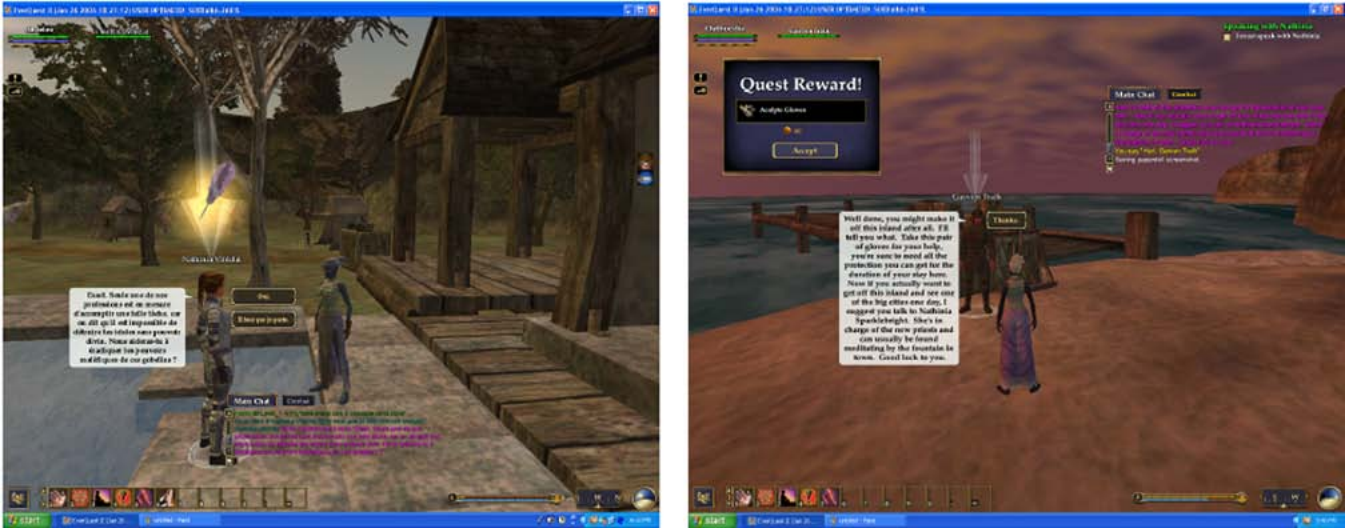


Figure 5: Dr. Gooch and his team have proposed and evaluated methodologies and scaffolding for second language learning in massive multi-player online role-playing games (MMORPG). **Right** Conversational Dialogue with Game Avatar. **Left** Role-playing character chatting with non-role playing character in English. MMORPGs accommodate active learners who assume the role of characters they have selected, create immersive environments that promote the development of conceptual knowledge and engage players in social interaction among a community of players. Since MMORPGs support social interaction between players, MMORPGs serve as the catalyst for fostering students language proficiency as students interact in a foreign language while playing the game. Based upon this premise, we introduce a game-language learning model and explore Sony Online Entertainments 3D game Ever Quest II as a pedagogical tool for students learning English as a second language.

Research Interest: Online Games and Learning

Learning is an active, personal experience that allows the student to reflect on what they know (e.g. beliefs, ideas, misconceptions, etc.) and how this knowledge shapes their understanding of the world and sense of self. Game-based learning refers to embedded instructional content in video games. Game-informed practices give students an opportunity to learn concepts in a situated manner. For example, students who play video sports games (i.e. football) learn about the rules of the game and the social practices (e.g. huddle to discuss strategy) associated with the game. Using a subset of game informed practices, Dr. Gooch has been studying the effect of the Massive Multiplayer Online Role Playing Game (MMORPG) Ever Quest 2 for second language acquisition [26, 34–36]. Dr. Gooch has also made contributions in computer science education using video games for affective learning in first year computer science courses [29–31].

Professor Gooch is recognized as a leader in the study of video games and learning by his peers in academia. He was the general chair of the ACM conference Interactive Three Dimensional Graphics and Games (I3D) in 2007 and Papers Co-Chair in 2008. Of the over 1200 journals and conferences in computer science I3D has been ranked by Cite-Seer as number 25 based on the impact of the conference papers. Dr. Gooch has been on the program committee for the Foundations of Digital Games conference for 3 years and currently serves as publicity chair. Dr. Gooch has also been recognized by industry as an innovator in games and learning. He has received \$160,000 in two research awards for the study of video games and learning from Microsoft Research. Last year he was invited to demonstrate his game technology at Microsoft Research TechFest. Dr. Gooch is one of only three academics invited to demonstrate at TechFest 2008, the other academic participants were from Brown and Columbia Universities.



Figure 6: *Inspired by Jackson Pollocks painting processes, Dr. Gooch lead a team that developed an interactive 3D painting system for creating digital abstract paintings. This figure shows a comparison between a painting by Jackson Pollock Number 13A, 1948.(Left) and one created by a novice user in 30 minutes with Dr. Gooch’s interactive 3D fluid jet painting system (Right). Pollock created his abstract paintings by throwing thinned household paint to create guided, semi-random patterns on his canvas. Since current 3D fluid jet simulation techniques are too computationally expensive to be used in realtime applications, Dr. Gooch developed a stable model with reduced dimensions. To model strokes interactively, two models of fluid jet dynamics are combined: a Navier-Stokes equation for an axisymmetric fluid column and a linked-mass system for the three dimensional motion of the jets axis line. A smooth paint trial based on the jet impact points with a surface is modeled and rendered using implicit surfaces. A second algorithm generates the two dimensional splatter patterns of high-speed droplet impact.*

Research Interest: Computational Aesthetics

Computational Aesthetics investigates the creation of tools that can enhance the expressive power of the fine and applied arts and furthers our understanding of aesthetic evaluation, perception, and meaning. Professor Gooch is a founder of Computational Aesthetics research. He was an organizer of the first ever Eurographics sponsored conference in the area (Girona Spain 2005), a Dagstuhl seminar (Germany 2006), the second conference at the Banff Centre (Canada 2007), and the third Eurographics sponsored conference (Lisbon Portugal 2008). Dr. Gooch also served as a guest editor of the IEEE journal "Computer Graphics and Applications" special issue on Computational Aesthetics in 2007. The fourth Eurographics sponsored conference on Computational Aesthetics will be held in Victoria Canada in 2009.

Dr. Gooch’s vision is of tools that both engage and inform the artistic process. Recent mathematical analysis indicates that the fluid jet patterns of Pollock’s painting may be related to their fractal structure[11]. Pollock’s paintings contain self-similar patterns which contribute to the aesthetic quality of the work. Dr. Gooch’s Fluid jet painting system includes an evaluation tool which calculates the fractal dimensions of a user’s painting [33]. Unlike real-world paintings, the digital system makes users aware of fractal properties interactively, and they can compare the fractal characteristics their work to that of Pollock’s easily. This system was demonstrated to 30,000 attendees at the Siggraph conference in 2006. It has been on exhibition at the Kohl Children’s Museum and the Singapore Museum of Science.

Professor Gooch has also made contributions to the area of Computational Aesthetics research with his work on the artistic composition of models in a computer graphics scene [45], and on using artistic matting to increase perceived depth in digital images [38,42]. His most interesting contribution may be his gaze dependent facial expressions system [43]. Based on artistic methods used for manipulating perception, Dr. Gooch presented a technique that creates facial images with conflicting emotional states at different spatial frequencies.



Figure 7: Recent headlines demonstrate that forged images pose a real threat to the credibility of published work. The Rochester Institute of Technology estimates that about one in ten color photos in print have been altered. Dr. Gooch has created a visualization system to aid users in determining if a scene has been altered prior to image creation (false captioning). This figure shows the famous "Devils Den" sniper photographed after the battle of Gettysburg. The first three photos show the soldier where he fell in battle. The fourth shows the body "posed" for dramatic effect. Dr. Gooch's system identifies common objects across a corpus of images. Then determines if relationships between these objects change using AI common sense reasoning. By visually highlighting objects whose spatial relations change even a lay-person can quickly determine whether a given image is falsely captioned. The long-term objective of this work is the creation of an automatic online system.

Books Authored

- [6] Bruce Gooch, Amy A. Gooch, and Mario Costa Sousa. "Illustrative Visualization." A.K. Peters Ltd. Publishers 2009.
- [7] Bruce Gooch and Amy A. Gooch. "Non-Photorealistic Rendering." pages 345, ISBN: 1-56881-133-0. A.K. Peters Ltd. Publishers 2001.

Peer Reviewed Research Articles (Research Interest References)

To aid the reader in determining the academic impact of Dr. Gooch's publications three metrics are provided were available. The first is the estimated impact of the publication venue compared to all others in Computer Science, generated using the [CiteSeer](http://citeseer.ist.psu.edu/impact.html) database and the Digital Bibliography & Library Project. (citeseer.ist.psu.edu/impact.html) This metric is reported as ([CiteSeer](http://citeseer.ist.psu.edu/impact.html) Journal Rank: # *number* top *percentage* %) Where *number* is the rank out of the 1221 publication venues in Computer Science and *percentage* is *number*/1221. The second metric is the acceptance rate of the conference. The third metric, computed using [Google scholar](http://scholar.google.com), is the number of times that the work has been cited. To aid the reader in determining the intellectual contribution Dr. Gooch made to a particular work Student co-authors are underlined. Electronic versions of all publications are available online at www.TheGooch.org/publications.html.

Journal Articles

In computer graphics, a number of conference proceedings are now published as special issues of associated journals. For example, since 2002, SIGGRAPH proceedings have been published as a special issue of the ACM Transactions on Graphics (TOG). For such journal issues, both the associated [CiteSeer](http://citeseer.ist.psu.edu) conference impact metric and the conference acceptance rate are provided.

- [8] Vidya Setlur, Xing Qing Xu, Sam Rossoff, and Bruce Gooch. "Retargeting Vector Animation to Mobile Devices." Accepted by IEEE Transactions on Visualization and Computer Graphics (In Press), 2009.
- [9] Kristin Potter, Amy A. Gooch, Bruce Gooch, Peter Willemsen, Joe Kniss, Richard Riesenfeld, and Peter Shirley. "Resolution Independent NPR-Style 3D Line Textures." *Computer Graphics Forum*, 2008. ([CiteSeer](http://citeseer.ist.psu.edu) Journal Rank: #240 top 20.39%) ([Google scholar](http://scholar.google.com): Cited by 2)

- [10] Sangwon Lee, David Feng, Cindy Grimm, and Bruce Gooch. “A Sketch-Based User Interface for Reconstructing Architectural Drawings.” *Computer Graphics Forum*, 27(1):81–90, March 2008.
(CiteSeer Journal Rank: #240 top 20.39%)
- [11] Sangwon Lee, Sven C. Olsen, and Bruce Gooch. “Simulating and Analyzing Jackson Pollocks Paintings.” *Journal of Mathematics and Arts*, 1(2):73–83, 2007.
- [12] Vidya Setlur, Tom Lechner, Marc Nienhaus, and Bruce Gooch. “Retargeting Images and Video for Preserving Information Saliency.” *IEEE Computer Graphics and Applications*, 27(5):80–88, 2007.
(CiteSeer Journal Rank: #678 top 55.25%) (Google scholar: Cited by 5)
- [13] Holger Winnemöller, Sven C. Olsen, and Bruce Gooch. “Real-Time Video Abstraction.” *ACM Transactions on Graphics*, 25(3):1221–1226, July 2006.
(CiteSeer Journal Rank: #9 top 0.73%) (Conference Acceptance Rate: 21%) (Google scholar: Cited by 73)
- [14] Sangwon Lee, David A. Shamma, and Bruce Gooch. “Detecting False Captioning Using Common-Sense Reasoning.” *Digital Investigation*, 3(Supplement-1):65–70, 2006.
(Conference Acceptance Rate: 24%) (Google scholar: Cited by 3)
- [15] Amy A. Gooch, Sven C. Olsen, Jack Tumblin, and Bruce Gooch. “Color2Gray: Saliency-preserving Color Removal.” *ACM Transactions on Graphics*, 24(3):634–639, August 2005.
(CiteSeer Journal Rank: #9 top 0.73%) (Conference Acceptance Rate: 21%) (Google scholar: Cited by 65)
- [16] Holger Winnemöller, Ankit Mohan, Jack Tumblin, and Bruce Gooch. “Light Waving: Estimating Light Positions From Photographs Alone.” *Computer Graphics Forum*, 24(3):433–438, September 2005.
(CiteSeer Journal Rank: #240 top 20.39%) (Conference Acceptance Rate: 16%) (Google scholar: Cited by 10)
- [17] Vidya Setlur, Conrad Albrecht-Buehler, Amy A. Gooch, Sam Rossoff, and Bruce Gooch. “Semanticons: Visual Metaphors as File Icons.” *Computer Graphics Forum*, 24(3):647–656, September 2005.
(CiteSeer Journal Rank: #240 top 20.39%) (Conference Acceptance Rate: 16%) (Google scholar: Cited by 11)
- [18] Bruce Gooch, Erik Reinhard, and Amy Gooch. “Human Facial Illustrations: Creation and Psychophysical Evaluation.” *ACM Transactions on Graphics*, 23(1):27–44, January 2004.
(CiteSeer Journal Rank: #89 top 7.28%) (Google scholar: Cited by 80)
- [19] Erik Reinhard, Michael Ashikhmin, Bruce Gooch, and Peter S. Shirley. “Color Transfer Between Images.” *IEEE Computer Graphics & Applications*, 21(5):34–41, September/October 2001.
(CiteSeer Journal Rank: #678 top 55.25%) (Google scholar: Cited by 287)
- [20] Amy A. Gooch, Bruce Gooch, Peter S. Shirley, and Elaine Cohen. “A Non-Photorealistic Lighting Model for Automatic Technical Illustration.” In “Proceedings of SIGGRAPH 98,” Computer Graphics Proceedings, Annual Conference Series pages 447–452. July 1998.
(CiteSeer Journal Rank: #9 top 0.73%) (Conference Acceptance Rate: 14.9%) (Google scholar: Cited by 304)

Refereed Conference Articles

- [21] Anthony Estey, Amy Gooch, and Bruce Gooch. “Addressing industry issues in a multi-disciplinary course on game design.” In “FDG ’09: Proceedings of the 4th International Conference on Foundations of Digital Games,” pages 71–78. ACM, New York, NY, USA, 2009. ISBN 978-1-60558-437-9.
- [22] Yolanda Rankin, Chris Traagen, and Bruce Gooch. “Computer Science Students Engage in Critical Discourse.” Accepted by HCI International (In Press) , 2009.
- [23] Yolanda A. Rankin, Deidra Morrison, McKenzie McNeal, Marcus W. Shute, and Bruce Gooch. “Time Will Tell: In-game Social Interactions that Facilitate Second Language Acquisition.” In “FDG ’09: Proceedings of the 4th International Conference on Foundations of Digital Games,” pages 161–168. ACM, New York, NY, USA, 2009. ISBN 978-1-60558-437-9.

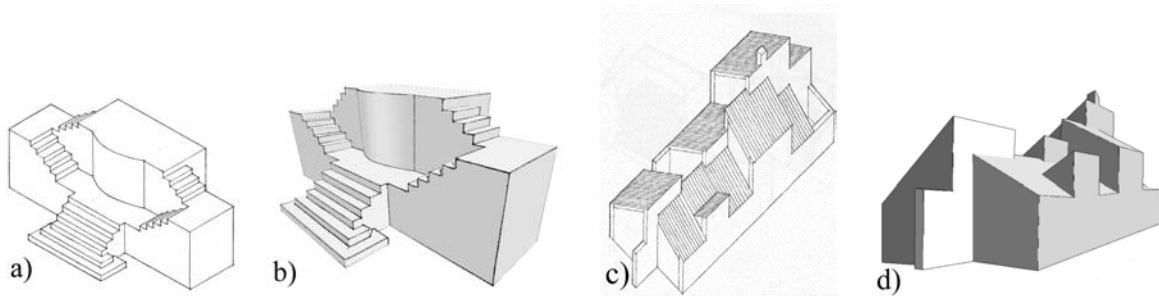


Figure 8: Dr. Gooch and his research team present a semi-automatic framework for construction of curved and polygonal 3D models from a 2D line drawing, such as architectural or mechanical drawings. Despite advances in image-based modeling, 3D modeling from a drawn image remains largely manual. In contrast, our method only requires the user to annotate the source image with a drawn cube. 3D models are then generated automatically. The automatic 3D model creation process based on perceptual constraints starting with a single line drawing. a) A 2D drawing with a curved surface. b) The automatically generated 3D model. c) A 2D drawing with texture lines. d) The automatically generated 3D model. The modeling process has four steps: camera calibration, a novel line detection algorithm for noisy input, line labeling to calculate polygon adjacencies, and a new incremental construction method that uses plane hinging-angle optimization to improve scalability over previous approaches. We also present algorithms for handling curved surfaces when they are part of a polygonal model that provides boundary conditions.

- [24] Sangwon Lee, David Feng, and Bruce Gooch. “Automatic Construction of 3D Models from Architectural Line Drawings.” In “SI3D ’08: Proceedings of the 2008 symposium on Interactive 3D graphics and games,” pages 123–130. ACM, New York, NY, USA, 2008.
(CiteSeer Conference Rank: 25# top 2.04%) (Conference Acceptance Rate: 42%) (Google scholar: Cited by 5)
- [25] Yolanda A. Rankin, Amy Gooch, and Bruce Gooch. “The Impact of Game Design on Students Interest in CS.” In “Foundations of Digital Games,” pages 31–35. ACM, New York, NY, USA, 2008.
(Conference Acceptance Rate: 22%) (Google scholar: Cited by 4)
- [26] Yolanda A. Rankin, McKenzie McNeal, Marcus W. Shute, and Bruce Gooch. “User Centered Game Design: Evaluating Massive Multiplayer Online Role Playing Games for Second Language Acquisition.” In “Sandbox 2008: Proceedings of the 2008 ACM SIGGRAPH Symposium on Video games,” pages 43–49. ACM, New York, NY, USA, 2008.
(Conference Acceptance Rate: 22%) (Google scholar: Cited by 4)
- [27] Deidra Morrison and Bruce Gooch. “ConnectDots: Visualizing Social Network Interaction for Improved Social Decision Making.” In Douglas Schuler, editor, “HCI (15),” volume 4564 of *Lecture Notes in Computer Science* pages 134–140. Springer, 2007.
- [28] Holger Winnemöller, David Feng, Bruce Gooch, and Satoru Suzuki. “Using NPR to Evaluate Perceptual Shape Cues in Dynamic Environments.” In “NPAR ’07: Proceedings of the 5th international symposium on Non-photorealistic animation and rendering,” pages 85–92. ACM, New York, NY, USA, 2007.
(Conference Acceptance Rate: 47%) (Google scholar: Cited by 2)
- [29] Yolanda Rankin, Amy Gooch, and Bruce Gooch. “The Impact of Game Design on Students Attitudes about CS.” In “Foundations of Digital Games,” ACM, 2007.
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- [30] Yolanda Rankin, Tom Lechner, and Bruce Gooch. “Extended Game Platform for Novice Programmers.” In “Eurographics Education Program 2007,” Eurographics, 2007.
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- [31] Yolanda Rankin, Tom Lechner, and Bruce Gooch. “Team-based Pedagogy for CS102 Using Game Design.” In “SIGGRAPH ’07: ACM SIGGRAPH 2007 educators program,” page 20. ACM, New York, NY, USA, 2007.
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- [32] Pin Ren, John Kristoff, and Bruce Gooch. “Visualizing DNS Traffic.” In “VizSEC,” pages23–30. 2006. (Conference Acceptance Rate: 25%) ([Google scholar](#): Cited by 5)
- [33] Sangwon Lee, Sven C. Olsen, and Bruce Gooch. “Interactive 3d fluid jet painting.” In “NPAR ’06: Proceedings of the 4th international symposium on Non-photorealistic animation and rendering,” pages97–104. ACM, New York, NY, USA, 2006. (Conference Acceptance Rate: 40%) ([Google scholar](#): Cited by 3)
- [34] Yolanda Rankin, Bruce Gooch, and Amy Gooch. “3D Role-playing Games as Language Learning Tools.” In “Eurographics Education Program 2006,” Eurographics, 2006. ([CiteSeer](#) Journal Rank: #240 top 20.39%) (Conference Acceptance Rate: 28%)
- [35] Yolanda Rankin, Amy Gooch, and Bruce Gooch. “3D Role-playing Games as Language Learning Tools.” In “Foundations of Digital Games,” ACM, 2006. (Conference Acceptance Rate: 24%) ([Google scholar](#): Cited by 5)
- [36] Yolanda Rankin, Rachel Gold, and Bruce Gooch. “Playing for Keeps: Gaming as a Language Learning Tool.” In “SIGGRAPH ’06: ACM SIGGRAPH 2006 Educators program,” page44. ACM, New York, NY, USA, 2006. ([CiteSeer](#) Journal Rank: #9 top 0.73%) (Conference Acceptance Rate: 21%) ([Google scholar](#): Cited by 2)
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- [38] Amy A. Gooch and Bruce Gooch. “Enhancing Perceived Depth in Images Via Artistic Matting.” In “Eurographics Symposium on Computational Aesthetics,” pages83–89. June 2005. (Conference Acceptance Rate: 20%) ([Google scholar](#): Cited by 4)
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- [43] Vidya Setlur and Bruce Gooch. “Is That a smile?: Gaze Dependent Facial Expressions.” In “NPAR 2004,” pages79–84. June 2004. (Conference Acceptance Rate: 22%) ([Google scholar](#): Cited by 6)
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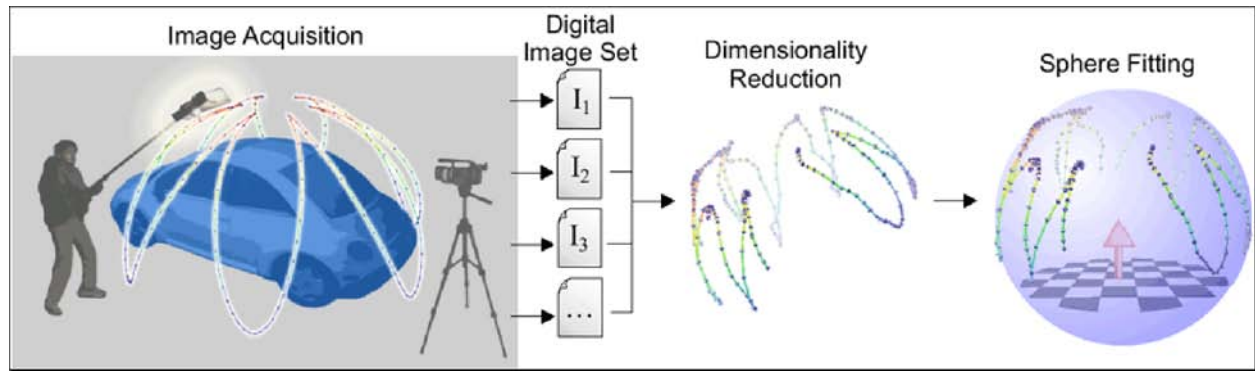


Figure 9: Dr. Gooch and his team presented an algorithm to compute three-dimensional light positions from an unordered set of images. Images are collected using a single stationary camera while manually moving a light source around an object. Rather than measuring light positions directly, the algorithm extracts a three dimensional manifold of positions from the images using dimensionality reduction techniques. This obviates the need for calibration and specialized equipment, making our approach inexpensive, portable and applicable to objects of almost any size.

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- [47] Matthew Kaplan, Bruce Gooch, and Elaine Cohen. “Interactive Artistic Rendering.” In “NPAR 2000 : First International Symposium on Non Photorealistic Animation and Rendering,” pages67–74. June 2000. (Conference Acceptance Rate: 23%) ([Google scholar](#): Cited by 63)
- [48] Bruce Gooch, Peter-Pike J. Sloan, Amy Gooch, Peter S. Shirley, and Rich Riesenfeld. “Interactive Technical Illustration.” In “1999 ACM Symposium on Interactive 3D Graphics,” pages31–38. April 1999. (CiteSeer Conference Rank: 25# top 2.04%) (Conference Acceptance Rate: 25%) ([Google scholar](#): Cited by 205)

Educational Publications

- [49] Bruce Gooch. “Realistic Image Synthesis Using Photon Mapping. By Henrik Wann Jensen.” *Siam Review*, 2002.
- [50] Bruce Gooch, Erik Reinhard, and Chris Johnson. “Computer Graphics.” *Encarta Encyclopedia*, 2002.

Research Papers Under Submission

- [51] Vidya Setlur, Sam Rossoff, and Bruce Gooch. “SemantaLynx: Using Semantic Icons for Navigation on Mobile Devices.” Submitted to IEEE Transactions on Visualization and Computer Graphics, 2009.
- [52] Sam Rossoff and Bruce Gooch. “ A Method for Synesthetic Game Design.” Submitted to ACM Sandbox, 2009.
- [53] Sven Olsen and Bruce Gooch. “Video to Victor via Abstraction.” Submitted to ACM Siggraph, 2009.
- [54] Brian Cornell, Vani Oza, Bob Adolph Sam Rosshoff, and Bruce Gooch. “YINX: a distributed Multi-user Windowing System.” Submitted to IEEE Transactions on Visualization and Computer Graphics, 2008.
- [55] Pin Ren, Deidra Mortensen, and Bruce Gooch. “Visualizing Document Keywords for Situational Awareness and Analysis.” Submitted to IEEE Transactions on Visualization and Computer Graphics, 2008.

Invited Speaking Engagements

	Mitacs Interactive Gaming Forum Talk Title: <i>What are the opportunities for Academic – Industry partnerships?</i>	May 2009
	University of British Columbia , Department of Computer Science Talk Title: <i>Video Games and Learning</i>	March 2008
	University of Utah , Department of Computer Science Talk Title: <i>Games and Exercise</i>	November 2007
	IEEE Visualization Course Title: <i>Medical and Scientific Illustration</i>	October 2006
	Eurographics Conference Course Title: <i>Medical and Scientific Illustration</i>	August 2006
	ACM Siggraph Conference Course Title: <i>Medical and Scientific Illustration</i>	July 2006
	University of Tübingen , CS Department and Max Plank Institute Talk Title: <i>Optimizing the Communication Content of Computer Generated Imagery</i>	May 2006
	Dagstuhl Seminar on Computational Aesthetics Talk Title: <i>The Future of Artistic Rendering</i>	May 2006
	Nvidia Inc Talk Title: <i>Optimizing the Communication Content of Computer Generated Imagery</i>	May 2006



Purdue University Department of Computer Science

April 2006

Talk Title: *Optimizing the Communication Content of Computer Generated Imagery*



College of William and Mary Department of Computer Science

March 2006

Talk Title: *Optimizing the Communication Content of Computer Generated Imagery*



University of Victoria Department of Computer Science

March 2006

Talk Title: *Optimizing the Communication Content of Computer Generated Imagery*



University of California at Santa Cruz Department of Computer Science

March 2006

Talk Title: *Optimizing the Communication Content of Computer Generated Imagery*



Purdue University Department of Electrical Engineering

October 2005

Talk Title: *Image Retargeting*



Cambridge University Department of Computer Science

June 2005

Talk Title: *Image Retargeting*



Oxford University Brasenose College

June 2005

Talk Title: *Image Retargeting*



Washington University St. Louis Computer Science Department

October 2004

Talk Title: *Non-Photorealistic Rendering*



ACM Siggraph Conference

July 2003

Course Title: *Non-Photorealistic Graphics: Algorithms, Methods, and Production Systems*



Brigam Young University Computer Science Department
Talk Title: *Non-Photorealistic Rendering*

April 2003



University of Iowa Computer Science Department
Talk Title: *Non-Photorealistic Rendering*

March 2003



Northwestern University Computer Science Department
Talk Title: *Non-Photorealistic Rendering*

March 2003



Notre Dame University Computer Science Department
Talk Title: *Non-Photorealistic Rendering*

February 2003



Drexel University Computer Science Department
Talk Title: *Non-Photorealistic Rendering*

January 2003



ACMSIGGRAPH

ACM Siggraph Conference
Course Title: *Perceptual and Artistic Principles for Effective Computer Depiction*

July 2002



Disney Feature Films
Course Title: *Non-Photorealistic Rendering*

July 2000



ACMSIGGRAPH

ACM Siggraph Conference
Course Title: *Non-Photorealistic Rendering*

July 1999

Research Funding

The following acronyms are used in the research funding tables: National Science and Engineering Research Council of Canada (NSERC); Undergraduate Student Research Awards (USRA); Collaborative Research Experience for Undergraduates (CREU); Collaborative Research Experience for Women (CREW); Research Teams: Fundamentals and Management (RTFM); Canada Foundation for Innovation (CFI); National Science Foundation (NSF).

Research funding obtained in support of Dr. Bruce Gooch's lab.				
Agency	Project Title	Dates	Type	Amount
	Parallel Algorithms	Sept. 2009 – Dec. 2009	Cash	\$4500
	Semantic Icons	Feb. 2009	Cash	\$8500
	Computer Generated Art	May 2009 – July 2009	Cash	\$9000
	Advanced Graphics Hardware Research	April 2009 – April 2010	Cash	\$35,000
	Animatronics Workshop	Jan. 2009 – April 2009	Cash	\$4500
	GPU Video Processing	Jan. 2009	In-Kind	\$3,500
	Educational Games for Zoo Exhibits	Sept. 2008 – Sept. 2009	Cash	\$9,500
	Uvic Learning Center; RTFM	May. 2008 – May. 2009	Cash	\$6000
	Dance Exercise Gaming	May. 2008 – Aug. 2008	Cash	\$4500
	The Future of Exercise	May. 2008 – May 2013	Cash	\$209,000
	Advanced Graphics Hardware Research	April 2008 – April 2009	Cash	\$35,000
	The Future of Exercise	May. 2008 – Aug. 2008	Cash	\$9000
	Parallel Video Processing	April 2008	In-Kind	\$23,000
	Video Games for Affective Learning	Feb. 2007	In-Kind	\$11,000

Research funding obtained in support of Dr. Bruce Gooch's lab.				
Agency	Project Title	Dates	Type	Amount
	The Future of Exercise	Feb. 2007	In-Kind	\$7,800
Microsoft 	Video Games for Affective Learning	Feb. 2007	Cash	\$80,000
	Digital Image Forensics	Mar. 2007 – Mar. 2012	Cash	\$85,000
	Gaming for Software Development	Sept. 2006 – Present	In-Kind	\$200,000
	Gaming for Language Learning	Oct. 2005 – Present	In-Kind	\$7,500
	Visualizing Uncertainty in Archeology	June 2004 – June 2005	Cash	\$3,500
Microsoft 	Games on Multiple Hardware Platforms	April 2004	Cash	\$80,000
	Retargetable Images and Video	Aug. 2004 – Aug. 2008	Cash	\$281,412.00
	Video Processing on Graphics Hardware	Aug. 2004	In-Kind	\$7,000
	Maya Complete Software Package	Sept. 2003 – Present	In-Kind	\$160,000

Dr. Gooch has received \$1,278,212 in funding, (\$858,412 in cash and \$419,800 in-kind). Note; Canadian funding is unique in two key ways 1) Grants to not incur overhead. 2) Industry donations receive 3-to-1 matching from federal and provincial sources. This means that Dr. Gooch has raised the equivalent of \$ 2,500,000 U.S. dollars.

Journal Editorships

Edition Editor: *IEEE Computer Graphics and Applications* (January 2008 Issue on Computational Aesthetics)

Founding Online Editor: *ACM Transactions on Applied Perception*

Conference Organization

The ACM conference on Interactive Three Dimensional Graphics (I3D) was ranked by Cite-Seer as number 25 (top 2%) of the more than 1200 journals and conferences in Computer Science based on the average citation rate of publications. (<http://citeseer.ist.psu.edu/impact.html>)

Dagstuhl Seminars in Computer Science are gatherings of top investigators in a given research area. Dr. Gooch organized the 2006 seminar on Computational Aesthetics. This means that both his peers and the seminar reviewers recognize him as one of the top researchers in this field in the world. The Dagstuhl Seminars are frequently described as being the most productive academic events that the participant researchers have ever experienced.

General Chair: *Non photorealistic Rendering and Animation* (NPAR) (July 2009 New Orleans, Louisiana)

General Chair: *Eurographics Workshop on Computational Aesthetics* (June 2008 Lisbon, Portugal)

Program Chair: *Interactive 3D* (I3D) (February 2008 Redwood City California)

General Chair: *Non photorealistic Rendering and Animation* (NPAR) (July 2007 San Diego, California)

General Chair: *Interactive 3D* (I3D) (April 2007 Seattle, Washington)

Organizer: *Dagstuhl Seminar on Computational Aesthetics* (June 2006 Frankfurt Germany)

Organizer: *Eurographics Workshop on Computational Aesthetics for Graphics, Visualization and Imaging* (May 2005 Girona Spain)

Organizer: *Midgraph* (November 2004 Northwestern University)

Conference Program and Steering Committees

Program Committee: *Pacific Graphics* 2009

Program Committee: *ACM Siggraph Sandbox* 2009

Steering Committee and Program Committee: *Foundations of Digital Games* (FDG) 2009

Program Committee: *Futureplay* 2008 and 2009

Steering Committee: Graphics Interface (GI), 2006 – Present

Program Committee: *Non-Photorealistic Rendering and Animation* 2003 – Present

Program Committee: *Eurographics* 2007

Program Committee: *Game Development for CS Education* (GDCSE) 2007 and 2008

Technical Programme Committee: *Third European Conference on Colour in Graphics, Imaging, and Vision* (CGIV) 2006

Program Committee: *Interactive 3D* (I3D) 2004 – Present

Training of Highly Qualified Personnel







Graduate and Post Graduate Training Over the last three years Professor Gooch has trained twelve graduate students, eight Ph.D. Students and four Masters degree students. He is currently supervising two Masters and two Ph.D. students. Professor Gooch has supervised three Post-doctoral fellows. Professor Gooch's reputation for excellence in graduate student training allows his students to intern with top companies and national labs. His students have interned at; Disney Feature Films, Pixar, Google, Nokia Research, Adobe Research, Microsoft, Electronic Arts, Lawrence Livermore National Laboratory, and Jet Propulsion Laboratories.

Dr. Gooch has advised three Post Doctoral students. All three were awarded prestigious Fellowships in National competitions in their home countries allowing them to study with Dr. Gooch.

Professor Gooch has supervised the Ph.D. studies of eight graduate students. Five of these students have completed their degrees and gone on to positions as Research Scientists or Senior Research Scientists at top industry laboratories. Sven Olsen and Jean-Luc Duprat are students at the Univeristy of Victoria, the others are students at Northwestern. (Please see table on following page.)

Professor Gooch has supervised the Masters degree studies of six graduate students. Three of these students have completed their degrees and gone on to industry positions. One, David Feng, went on to pursue a Ph.D. in the top graduate program in the world in computer graphics. David Whitaker and Sam Rossoff are students at the Univeristy of Victoria, the others were students at Northwestern University. (Please see table on following page.)













Post Doctoral Students

Post Doctoral Students Advised by Dr. Bruce Gooch				
Name	Date	Research Topic	Fellowship	Current Position
 Dr. Saeko Takagi	2004	Visual Communication	Japan	 Wakayama University
 Dr. Marc Nienhaus	2005	Perception and Graphics	DFG	 nVidia (Mental Images)
 Dr. Jan Fischer	2006-8	Programable Rasterizer	DFG	 University of British Columbia



Ph.D. Students

Ph.D Students Advised by Dr. Bruce Gooch			
Name	Year	Dissertation Topic	Current Position
 Dr. Vidya Setlur	2005	Optimizing Computer Imagery for Communication	 Nokia Research
 Dr. Holger Winnemoller	2006	Perceptually-motivated Non-Photorealistic CG	 Adobe Research
 Dr. Sangwon Lee	2007	Reconstructing 3D Models from Line Drawings	 Intel Research
 Dr. Pin Ren	2007	Data Stream Visualization in Network Security	 HBK Capital Management
 Dr. Yolanda Rankin	2008	Video Games as Spaces for Language Acquisition	 IBM Research
 Dr. Deidra Mortensen	2009	Visualization for Decision Making	 Clemson University
 Sven Olsen	Expected	Video to Vector via Abstraction	 Ph.D. Student
 Jean-Luc Duprat	Expected	Parallel Texture Synthesis	 Intel/Ph.D. Student

Masters Degree Students














Masters Degree Students Advised by Dr. Bruce Gooch			
Name	Year	Thesis Topic	Current Position
 Ed Wang	2005	Baysian Prediction on Graphics Hardware	 ECM Capital Management
 David Feng	2006	NPR and the Human Visual System	 Ph.D. UNC Chapel Hill
 Vani Oza	2006	Numerically Simulating Freely Swimming Fish	 Deloitte
 Tom Lechner	2007	An Ontological Basis for Scientific Visualization	 Morgan Stanley
 David Whitaker	2009	Video Games and Cognition	 DJArts Games
 Sam Rossoff	2009	Exertion Interfaces	 UVic Student

Honors Students

Undergraduate Honors Students Advised by Dr. Bruce Gooch			
Name	Graduation Year	Thesis Topic	Current Position
 Nathan Matsuda	2008	Computer Generated Special Effects	 Pixar

The Undergraduate Research Team

Computer science departments across North America suffer from low retention rates. Undergraduate students cite two main reasons for leaving the major: the failure to establish social networks and the failure to become academically involved in classes. However, students who work together on projects and course work are better able to form social networks, are more likely to be actively involved in the academic community, and, hopefully, will be more likely to graduate from computer science departments. Professor Gooch establishes a computer science culture that encourages peer-supported education and focuses on integrating meaningful research experience into the undergraduate curriculum through the Undergraduate Research Team. Undergraduates in small research teams led by graduate students or advanced undergraduate students receive practical experience in the field while gaining mentoring and leadership skills. As team leaders, these students act as catalysts for the peer-centered learning experience by interacting one-on-one and in small group settings with novice and intermediate students.

Some Former Members of Dr. Gooch's Undergraduate Research Teams			
Name	Project Topic	Graduate School	Current Position
 Dr. Greg Coombe	Digital Oil Painting	 <i>NVIDIA Graduate Fellowship 2003 and 2004</i>	
 Amy Williams	Silhouettes and Curves	 <i>NSF Graduate Research Fellowship</i>	
 Clairissa Tuttle	Silhouettes and Curves	 <i>NSF Graduate Research Fellowship</i>	
 Dr. Brian Budge	Silhouettes and Curves	 	
 Rachel Gold	Virtual Archeology		
 Sanna Bengali	3D Computer Interaction		