

**Personal Data**

**Name:** *Daniel Arturo Barrero Ulloa*  
**Nationality:** Canadian / Colombian (Dual Citizenship)

**Origin:** Bogota, Colombia.

**Languages:** Spanish (mother tongue), English (fluent, 10+ years in Vancouver), French (bilingual, lived in France 4<sup>1/2</sup> years and 2<sup>1/2</sup> years in Montreal)

**Current location and address:** Vancouver, B.C., Canada  
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**Phone number upon request**

**Current Legal Status in Canada:** Canadian Citizen

**Academic Background****Postdoctoral Fellow on CFD (Computer Fluid Dynamics) and Scientific Visualization**

(September 2002 – February 2005), CERCA (Center for Research on Computation and its Applications) and the Ecole Polytechnique of Montreal, Montreal, Canada.

**Observations:** Conducted research at the department of Mechanical Engineering in the domain of CFD (computer fluid dynamics), Fire Simulation and Scientific Visualization in a joint project with the department of Computer Engineering.

**Ph.D. in Computer Science in the area of Computer Graphics**

(July 1997 - January 2001), IRIT - Université Paul Sabatier, Toulouse, France.

**Thesis Title:** *Simulation and Visualization of Natural Phenomena for Computer Graphics (From turbulence to combustion).*

**Observations:** Financed by a French government grant.  
Public Thesis defense took place on January 16<sup>th</sup> 2001.  
Thesis report written in French.

**D.E.A. Informatique de l'Image et du Langage (French equivalent to a MsCS in the area of Computer Graphics)**

(October 1996 - June 1997), IRIT- Université Paul Sabatier, Toulouse, France.

**Research Area:** *Modeling and Simulation of turbulence phenomena in the participating media.*

**Observations:** Financed by a French government grant.  
Since it was the first time someone from Colombia came to this university's research laboratory, I had to take the French MsSC partially (only research) as a test to confirm the quality of the Colombian MsSC education. Since then, new students coming from Colombia to this university's laboratory have now a more direct equivalence of their MsCS.

Final report written in French.

**Master of Science in Systems and Computer Engineering (equivalent to a MsCS/CE in Computer Graphics)**

(January 1994 - September 1996), Universidad de Los Andes, Bogota, Colombia.

**Thesis Title:** *Modeling and Simulation of Turbulence Phenomena for Virtual Reality Systems.*

**Observations:** Financed by university work and assistantships.  
Thesis report written in Spanish.

**Bachelor Degree in Systems and Computer Engineering (equivalent to a Bs in CS and Engineering)**

(January 1988 - January 1994), Universidad de Los Andes, Bogota, Colombia.

**Thesis Title:** *A Physically Based Modeling and Simulation System.*

**Observations:** Physics based modeling system using spring-particle models for soft objects.  
Thesis report written in Spanish.

**Additional Studies****Exchange student within the MsCS program**

(January 1995 - April 1995), Universidad Simon Bolivar at Caracas, Venezuela.

**Observations:** Followed the courses below:  
- *Special Topics in Artificial Intelligence.* Final project research subject: Simulation of an evolutionary behavior by the utilization of predatory practices and genetic mutations.  
- *Advanced Topics in Computer Graphics.* Final project research subject: Modeling of character movement based on physics models and neural networks as a behavioral control system.

## Work Experience

### Senior Graphics, Engine & Tools Programmer

(April 2005 – Current ), Relic Entertainment, Vancouver, Canada.

Description: **Graphics & tools Programmer for Dawn of War Winter Assault (RTS PC Title):** Implemented the weather system, campaign menu UI, improved graphics aspects of the game, FX system & shader system, Artist's tools support & development (3ds max plugins & scripted tools, improving in house tools, technical support to the art team). **Graphics programmer for The Outfit (Xbox 360):** responsible for the implementation of the water animation system, optimization and improvements for real time shadows and some graphics features and shaders, miscellaneous 360 memory & performance optimization tasks. **Graphics, Engine & Tools programmer for Company of Heroes (RTS/RTT PC Title):** Improvements to the water & shadows system, implementation of the in game LOD, and the automatic LOD generation tools, improvements to the shaders and shader pipeline support for pixel shaders 1.1, 2.0, & 4.0 (Vista & Dx10 support), miscellaneous game memory and performance optimization tasks and art pipeline optimization. **Graphics Engine & Tools programmer for Company of Heroes - Opposing Fronts:** Dx10 Vista support, artist tools support, dynamic weather system. **Graphics & Optimization Programmer for W40K: Dawn of War II:** Worked mostly on optimization (Graphics/General). **W40K: SpaceMarine:** Multi-Platform (Xbox360, PS3, PC) Core Engine & Rendering technology development and optimization. **Graphics, Engine, Optimization & Tools programmer - Company of Heroes 2 (RTS PC Title):** Rendering architecture updates: deferred renderer, winter technology: ice, snow, weather system improvements, DX11 features support, Engine & graphics high and low level optimization, art tools and pipeline software support and development.

### Chief Technical Officer & Associate

(October 2002 - May 2004), AlkymiaSoft Products Inc., Montreal, Canada.

Description: Alkymiasoft was a company incubated at the CERCA. Its main goal was to offer R&D services for the movie and games industries. I was responsible for developing a physics based model for the simulation of long animal fur and help the interface team to explore the possibility of using Maya PaintFX for rendering (for Mokko Studio). Also developed a real time pseudo 3D water simulation tool using advanced CFD techniques (for Ubisoft Montreal).

### Postdoctoral Fellow

(September 2002 - August 2004), CERCA - École Polytechnique de Montréal, Montreal, Canada.

### Professor

(August 2001 - July 2002), Universidad de los Andes & Fundación Universitaria San Martin, Bogota, Colombia.

Description: Taught the following courses:

- “Real Time Animation and Simulation”, CS & Systems Engineering Program.
- “Computer Graphics & Virtual Reality”, Master's Degree in CS & Systems Engineering Program.
- “Computer Graphics”, CS & Systems Engineering Program.

### Coordinator of the “Digital Engineering, Three Dimensional Art and Design” Program

(September 2001 - June 2002), Universidad Militar “Nueva Granada”, Bogota, Colombia.

Description: Helped to redefine this new engineering program which is a combination between computer science and arts. Coordinated the simulation and animation areas and made technical decisions about software and hardware required by the program. Created and directed a computer graphics research and development group within the program.

### Freelance Programmer and Consultant

(March 2001 - August 2001), Skina Ltd., Bogota, Colombia.

Description: Developed Linux/Unix web, database, and custom software solutions.

### Research Assistant

(January 1994 - September 1996), DIGITAL project at the HIDRA group (Network Research Group), MOX Supercomputing Center & DFAC group (Computer Assisted Design and Manufacturing Group), Universidad de Los Andes, Bogota, Colombia.

Description: Research in the areas of client server tools, architectures, intercommunication of heterogeneous systems, computer graphics and visualization, terrestrial navigational systems and computational geometry. Web mastering and design, computer systems and network administration and maintenance, tools programmer.

### Lecturer

(January 1991 - December 1993), Universidad de los Andes, Bogota, Colombia.

Description: Taught the following courses:

- “Numerical Analysis”, Mathematics Department/Faculty.
- “Computer Graphics”, CS & Systems Engineering Program.

### Systems Analyst, Programmer, Network Administrator and Technical Support

(August 1992 - February 1993), Colpatria Financial Company, Systems Department, Bogota, Colombia.

### Miscellaneous freelance and consulting work: (1990 - 1996), Bogota, Colombia,

Description: Databases, RAD prototyping, multimedia programming and MS-Windows development.

## Additional Experience

- In August 2003, I helped developing the concept and realized part of the 3D content for an application used to introduce visitors of the August 2003 ExpoQuebec Fair to virtual reality. The application was showed on a Linux CAVE system built by the CERCA visualization team for this purpose. Also programmed a real time cloth dynamics and a volumetric fog system specifically for this application. The whole project was realized in less than 2 weeks. More information about this project can be found at: <http://www.polymtl.ca/rv/expoquebec/>
- From January to August 2002, I was involved on the construction of a series of prototypes of an electro mechanical **3D scanner** (touch probe) and a **full body, real-time motion capture exoskeleton**. I was responsible for the hardware interface design and multi platform (MS-Windows/Linux) software development; also collaborated on the mechanical design and construction of the device. This work was the base for the creation of a company: ExoCap Ltd. in Bogota, Colombia. The company currently builds custom electronics and mechanical devices for the specific needs of Colombian media companies (e.g. television and live shows, publicity).
- Collaborate sporadically with open source projects, submitting bug reports, small patches, and implementing new features. e.g.: **Implemented the point parameters & 3d textures extensions in Mesa ( Official Linux OpenGL Implementation)**, flide-flmake (fast & light programming ide), flews (extended widgets for FLTK).
- Founding and active member of the first and one of the biggest Colombian Linux User Groups: LinuxCOL (<http://linuxcol.uniandes.edu.co/>).
- Invited speaker at conferences to promote the use of Linux in Colombia:
  - *“Linux as a high end visualization and modeling platform”*, 1<sup>st</sup> Linux Congress in Colombia, 600 attendees, 45 min presentation, simultaneous live internet broadcast to all major universities in the country, May 2001, Manizales, Colombia.
  - *“High performance computer graphics applications for cinema and television”*. XXI Informatics Salon: Free Software at the service of business, 450 attendees, 50 min presentation, September 2001, Bogota, Colombia.
- Official technical advisor and translation corrector for the Spanish edition of the book *“Planning Extreme Programming”* (written by Kent Beck & Martin Fowler) for Pearson Education Colombia, June – August 2001. (Due to restructuring of Pearson’s Colombian division the Spanish version of the book is still pending publication).

## Areas of Knowledge

- Computer graphics:
  - 2D/3D real time and photo realistic rendering techniques: DirectX/D3D, OpenGL, Ray Tracing, Radiosity, Particle Systems, GPU programming, GPGPU.
  - Experience developing specialized computer graphics software tools. Mostly in house R&D tools.
  - Some experience with: Renderman compliant renderers (BMRT, developed my own RIB parser and writer libraries (with limited shader support)), Maya (MEL Scripting), 3DS Max, Blender, Photoshop, Gimp.
  - Scientific Visualization.
- Multi-platform game development and optimization: PC, PlayStation 3, Xbox360
- Computer Animation and Simulation: physics based simulation and real time animation.
- Object Oriented Programming and Object Oriented Design (e.g. UML, Design Patterns).
- Extensive experience programming in C, C++, Perl, Unix shell and associated tools (awk, flex, yacc/bison, etc.).
- Experience programming in Python, Lisp/Scheme, Pascal, Java, Lua, C#
- GUI programming and design on MS-Windows, X-Windows (Xlib, FLTK, Gtk+, Qt, Motif).
- Numerical Analysis Programming (Finite Elements, CFD, PDE-ODE solvers, etc..)
- Network programming and Administration.
- Web design, programming (JavaScript/EcmaScript, PHP, mod\_perl, CGI scripting), and administration.
- Databases programming and development (MySQL, PostgreSQL, dbase/fox)
- Extensive systems administration and programming experience on different Unix flavors (Irix, OSF/1-2, Linux, Solaris, Ultrix, Unicos, FreeBSD) and MS-Windows (95-98-Me-2000-NT-XP-Vista - Win 7 – Win 10).

## Areas of Interest

- Computer Graphics: Scientific Visualization, Physically Based Modeling, Photo realistic Rendering, Real Time Rendering, Virtual Reality, Image Processing and Computational geometry.
- Computer Animation, Modeling and Simulation of complex systems and Natural Phenomena, A.I. and Artificial life techniques for Animation Control, Character Animation, Motion Capture systems.
- Film making and visual effects.
- GUI: programming and design, Artist Tools Programming.
- Real time and Games Programming
- Hardware input devices, electronics, robotics and animatronics, 3d printing and computer guided manufacturing.

## Awards

### Third place at the Colombian XI Programming Marathon (1993), Bogota, Colombia.

Observations: The Programming marathon is a competition that emphasizes on the speed, efficiency and quality of a 2 programmer team to solve a complex problem in less than 8 hours, from the problem formulation to the fully working solution. We finished in less than 5 hours (20 min after the first one, 1min after the second one, and 1:30h before the 4th). We received a special mention for the speed and quality of our heuristic.

## Publications

- “*Company Of Heroes 2 Rendering Tech: The Cold Facts of recreating the hardest winter conditions of World War 2*”, Barrero D., Korea Game Conference 2013 (KGC-2013), September 2013, Seoul, South Korea.
- “*Relic's FX System: Making Big Battles Come Alive*”, Barrero D., Korea Game Conference 2012 (KGC-2012), October 2012, Seoul, South Korea.
- “*Rendering Tech of Space Marine*”, Barrero D., Kim Pope, Korea Game Conference 2011 (KGC-2011), November 2011, Daegu, South Korea.
- “*Porting Game Engines to Direct3D 10: Company of Heroes*”, Barrero D., Introduction to Direct3D 10 Course, SIGGRAPH 2007, San Diego, USA.
- “*Airflow Modeling and Fire Smoke Propagation in the new Ecôle Polytechnique Building*”, Barrero D., Petro E., Abanto J., Reggio M., 9<sup>th</sup> International Building Performance Simulation Association Conference and Exhibition, BS2005, August 2005, Montreal, Canada
- “*Serious Colorful! Dynamics in Fire Simulation*”, Barrero D., Abanto J., Hardy J-P., Reggio M., 43rd AIAA Aerospace Sciences Meeting and Exhibit, January 2005, Reno, Nevada, USA.
- “*Numerical Calculation of Fire and Smoke in Tunnels*”, Barrero D., Abanto J., Reggio M., Preto E., Ozell B., International Technical Congress on Computational Simulation Models in Fire Engineering and Research, September 2004, Santander, Spain.
- “*Computation and Representation of Fire and Smoke in Buildings*”, Barrero D., Staub V., Reggio M., Ozell B., Roomvent 2004, September 2004, Coimbra, Portugal.
- *Poster: “CFD and Realistic Visualization for the Analysis of Fire Scenarios”*, Barrero D., Hardy J-P., Reggio M., Ozell B., Poster Session - ACM-SIGGRAPH 2004, August 2004, Los Angeles, California, USA.
- “*Application of CFD Tools in Building Engineering and Fire Simulation*”, Abanto J., Barrero D., Reggio M., Hardy J-P., Ozell B., Simbuild 2004, August 2004, Boulder, Colorado, USA.
- “*3D Flame Front Tracking for Flamelet-based Models*”, Barrero D., Reggio M., Ozell B., CFD2004, May 2004, Ottawa, Canada.
- “*On Graphic Animation and Fire Simulation*”, Barrero D., Ozell B., Reggio M., CFD2003, May 2003, Vancouver, Cnd.
- “*Airflow Modelling in a Computer Room*”, Abanto J., Barrero D., Hallé S., Reggio M., CFD2003, May 2003, Vancouver, Canada.
- “*Modélisation et Simulation des Phénomènes Naturels pour la Synthèse d’Images, Representation de Fumée et du Feu*”, Barrero D., Paulin M., Journées de Collaboration Internationales ESTIA - Colloque Scientifique: “Simulation et Visualisation”, March 2001, ESTIA, Biarritz, France.
- “*Modélisation et simulation des Phénomènes Naturels pour la Synthèse d’Images*” (*Modeling and Simulation of Natural Phenomena for Computer Graphics*), Barrero D., December 2000, Ph.D. thesis dissertation, IRIT- Université Paul Sabatier, Toulouse, France.
- “*Simulating Turbulent Combustion*”, Barrero D., Paulin M., Caubet R., August 2000, Graphicon’2000, Moscow, Russia.
- “*A Physics Based Multi-Resolution Model for the Simulation of Turbulent Gases and Combustion*”, Barrero D., Paulin M., Caubet R., September 1999, EUROGRAPHICS CAS’99 (Springer-Verlag), Milan, Italy.
- “*Modélisation des Phénomènes de Turbulence dans les Milieux Participants*” (*Simulation of turbulence phenomena on participating media*), Barrero D., DaDalto L., Paulin M., Caubet R., December 1997, AFIG 97, Rennes, France.
- “*Modélisation des Phénomènes Turbulentes dans les Milieux Participantes*” (*Simulation of turbulence phenomena on participating media*), Barrero D., June 1997, Rapport DEA-2IL (MSc thesis report), IRIT - Université Paul Sabatier, Toulouse, France.
- “*Modelaje y Simulación de Fenomenos Turbulentos para Ambientes de Realidad Virtual*” (*Modeling of turbulence phenomena in virtual reality environments*), Barrero D., August 1996, MS Thesis in CS, Universidad de los Andes, Bogota, Colombia.
- “*Modelo para la Simulación de Fenomenos Turbulentos para Ambientes de Realidad Virtual*”, Barrero D., July 1996, Technical Report, CIFI - Universidad de Los Andes, Bogota, Colombia.
- “*Modelo para la Simulación de Fenomenos Turbulentos para Ambientes de Realidad Virtual*”, Barrero D., Hernández J.T., May 1996, Panel CLEI 1996, Bogota, Colombia.

- “*X-Windows como Herramienta de Programación Cliente Servidor Virtual* “ (*X-Windows as a virtual client server programming tool*), Barrero D., August 1994, Technical Report, CIFI - Universidad de Los Andes, Bogota, Colombia.
- “*Sistema de Modelaje y Simulación basado en Física*” (*A Physically based modeling and Simulation System by means of complex spring-particle systems*), Barrero D., January 1994, BSc Thesis in Computer Science and Engineering, Universidad de Los Andes, Bogota, Colombia.

### **Personal Interests**

Pencil Drawing/Sketching, Painting (to see some of my work: <http://danielbarrero.com/art.html>), Reading (Sci-fi, science books and journals), Role Playing Games and Video Games, Movies, Computer programming, Electronics & Robotics, Paragliding (French Paragliding Association B circuit competitor license), Roller skating.