PIXEL CINEMATOGRAPHY

A Lighting Approach for Computer Graphics

John Kahrs, *Animation Director,*
Blue Sky Productions
Course Organizer

Sharon Calahan, *Lighting Supervisor,*
Pixar

Dave Carson, *Digital Effects Supervisor,*
Industrial Light and Magic

Stephen Poster, *A.S.C.*

Siggraph '96 Course #30

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SPEAKER BIOGRAPHIES

Sharon Calahan, *Lighting Supervisor* Pixar Animation Studios

As the creative Lighting Supervisor for Pixar's "Toy Story", Sharon Calahan has been a member of the technical team at Pixar for the last two years. Her background and education in art and design led her into advertising, broadcast TV, video production, and eventually computer animation. With a focus on lighting direction, Sharon has worked in computer animation for over ten years. Besides "Toy Story" and various commercial work, other accomplishments have been as the computer animation Lighting Director for Hanna-Barbera's "The Last Halloween" which won an Emmy for Special Effects.

Dave Carson, *Visual Effects Supervisor* Industrial Light & Magic

Dave Carson has been at ILM for over 15 years, beginning as a storyboard artist and model maker on the second and third Star Wars films. He has worked in various roles on many remarkable films, primarily as a Visual Effects Art Director and Visual Effects Supervisor. His work in the digital realm includes acting as a Digital Artist on "Hook", "Forrest Gump" and "Jurassic Park". He also contributed character design and animation on "Casper" where he was credited as Character Design Supervisor. His latest projects include supervising the updating of work in "Empire Strikes Back" and "Return of the Jedi" for their new film releases. He is currently scheduled to begin work as a Visual Effects Supervisor on the next film in the Star Wars series when it goes into production later this year.

John Kahrs, *Animation Director* Blue Sky Productions

John has been directing lighting and animation at Blue Sky Productions since 1990. The focus at Blue Sky has been on a classic approach to character animation, combined with the very best rendering techniques. At the core of the production system is a proprietary raytracer, for which John has written much of the user's manual. John has made a priority of refining Blue Sky's lighting techniques. His lighting and animation appears in several commercials for clients including Braun razors, Chock-full-O'-Nuts coffee, and Brother laser printers. John designed and constructed the Blue Sky web site. He also has outlined the lighting direction for the CG cockroaches in the upcoming feature film "Joe's Apartment". In 1993, John won a Golden Nica Award for his radiosity imagery at the Ars Electronica festival in Linz, Austria.

Steven Poster, A.S.C., *Cinematographer*

Stephen Poster has worked on dozens of films, including Ridley Scott's "Someone To Watch Over Me", "Big Top Pee-Wee" and most recently "Roswell," about the reported crash of a UFO in New Mexico in 1947. Originally from Chicago, Poster was called upon early in his career to shoot second unit photography on "Close Encounters of a Third Kind" and "Blade Runner".

COURSE INTRODUCTION

How do you "Teach" Lighting?

Software tools and complex lighting models for computer graphics are some of the most elegant, sophisticated technologies of our time, yet the attention paid to lighting and refining the images is often minimal, and sometimes practically nonexistent. Conversely, we also see subtle, beautiful, resonant images made with computers. What accounts for this disparity?

An answer may lie in the fact that some computer artists have a deeper understanding of light and material qualities, while others may not even consider lighting as an issue. They may not have trained themselves to see and understand how light works, especially with the often incomplete lighting model in computer graphics.

This course focuses on the craft of lighting for computer graphics. Using a hybrid approach of traditional cinematography and knowledge about composition, color, balance, and the behavior of light and materials, it offers a comprehensive approach for lighting specifically in the field of computer graphics.

I think the idea for a lighting course specifically for CG is very timely. It's almost to the point where it's hard to find a sizeable Hollywood film *without* some kind of digital effect of some sort. The medium of computer animation is, I think, entering a Golden age. Software tools more powerful than ever, and elegant in their sophistication. A beautiful film called *Toy Story* has been embraced in and outside the graphics community. To just watch the Siggraph film shows from the past decade is to see technology evolve into artistry. We hear a lot about how there's no ceiling, there's no end in sight, we're only just beginning, and all this limitless optimism can get on your nerves after a while, but the funny thing is that it's the truth.

Part of what inspired the idea for a course on lighting is the animation courses at Siggraph that seem to pop up every other year or so. I hoped to do for CG lighting what John Lasseter, Chris Wedge and others have done for computer animation. The influence of traditionally trained animators in the new medium reflected a sea change that was occurring in the late eighties: those who used the classic principles of animation applied them when using the new tools. This mood culminated in a 1987 Siggraph course: *3D Character Animation by Computer*, and more recently, 1994's *Animation Tricks*. Suddenly CG animation had grown up. The cliche of slow, computer-smooth motion became less prevalent. Now it was entertaining, exciting, and the entire medium was being taken more seriously. They succeeded because traditional techniques, hammered out over years of practical use and distilled down to a list of basic principles, were skillfully applied to a new medium.

I hoped that a similar approach could be applied to computer lighting: where the principles of traditional cinematography could be applied to the new tools. This is possible, but only to a certain extent. This is partly because, while there are many strong parallels, traditional techniques aren't so easily portable to computer techniques, as they are with animation.

As I wrote the course notes for my part of the talk, the idea of the course changed drastically. I had thought that the course speakers could teach lighting, plain and simple. I really thought, for some time, that in lighting too, much of the task could be distilled down to an essential list, and my ultimate model for such a list was "The Principles of Animation", a chapter in the indispensable book, *The Illusion of Life: Disney Animation*, by Frank Thomas and Ollie Johnston.

Then I was on the phone one day with Steven Poster, the cinematographer I asked to speak at the course to offer a look at lighting from a traditional angle. He said out loud what I had been sensing deep down more and more clearly. He said, "Oh, absolutely, no. No, you can't teach lighting. You can't teach someone how to light. You can only teach them about light and how it works, and you can give them a few guidelines, but you can't teach anyone how to light."

I realized my folly in presuming this. It was like figure drawing class in art school. No one could teach us how to draw. Only we, the students, could teach ourselves to draw better. The instructor was merely trying to get us to see more clearly: to observe and measure with our eyes and compare what we saw with what we had drawn. If the instructor was good, he was trying to teach us to see.

The process of computer graphics work is like working with a kind of complex diorama-machine. We're creating little worlds, and we can build everything almost as if from scratch, because the level of control can be so basic. There are so many different skills to be proficient in when we do this. We have to be Renaissance people.

This course isn't going to magically transform anyone's images into flawlessly refined pictures. All it can really do is offer a few guidelines, provide some important things to remember, and hopefully point you in the right direction with a solid footing about where to start.

The artistry of computer lighting has to come from your own vision and intuition about what you want to see. If it succeeds, it may help you see light in a way you hadn't before, and encourage you to teach yourself how to create truly great images.

So how to approach the task of lighting on the computer…

John Kahrs
New York, May 1996