

SIGGRAPH 1990

**17th International Conference
On Computer Graphics and
Interactive Techniques**

**Dallas Convention Center
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COURSE NOTES

17

COMPUTER GRAPHICS IN VISUAL EFFECTS

Co-Chairs

Scott E. Anderson
Industrial Light & Magic
Jonathan P. Luskin
Industrial Light & Magic

Lecturers

Scott E. Anderson
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Lincoln Hu
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Douglas S. Kay
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Jonathan P. Luskin
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Dennis Muren
Industrial Light & Magic

**Industrial Light & Magic
A Division of LucasArts Entertainment**

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Course Introduction

Special or visual effects is an interesting and varied aspect of modern filmmaking. Visual effects, however, have been in existence for almost as long as movies themselves. Effects are used whenever scenes would otherwise be impractical, expensive, dangerous or impossible to film in any other manner. In recent years, computer graphics has complemented traditional techniques, enriching feature filmmaking with new imagery and expanding the realm of what is possible in visual effects.

Our goal is to introduce you to the world of visual effects, to the role of computer graphics in that world, and to share our experiences as technicians and filmmakers working in the industry today. The speakers will cover a broad range of subjects and experiences. The course begins with an overview of the effects process before moving into the realm of computer graphics. The discussion of computer graphics covers the basic components of a production environment and an introduction to the relationship between computer graphics and film technologies. After lunch the speakers will examine some specific applications of computer graphics in recent films.

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Reference Materials

A. Bibliographies and Resources

B. Kodak Film Fact Sheets

C. Cinefex – The Abyss

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F. Cinefex – Indiana Jones and The Last Crusade

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Chair Biographies

Scott Anderson

Scott is a Senior Technical Director at Industrial Light and Magic. He has worked on a number of theatric projects at ILM including *The Abyss* and *The Hunt for Red October*. He has also worked on a variety of television projects including a *Star Tours* commercial and a segment for an upcoming PBS series. Before joining ILM as an animator, Scott was a member of the Research and Development team at Pacific Data Images. Anderson graduated from Brown University with an A.B. in Semiotics and a Sc.B. in Computer Science.

Jonathan Luskin

Jonathan is a Senior Technical Director at Industrial Light and Magic. He has worked on a number of motion picture projects including *Star Trek IV*, *Willow*, *The Abyss*, *Back to the Future II* and *The Hunt For Red October*. He has also worked on a pilot for *Star Trek; The Next Generation* and on the *Body Wars* simulator ride at Disney's Epcot Center. Most recently, he has been working on commercial projects. Jonathan graduated from Cornell University with a B.A. in Political Science and a B.S. in Electrical Engineering.

Speaker Biographies

Lincoln Hu

Lincoln is a Senior Technical Director in ILM's Computer Graphics Department and has been with the group since its formation in 1986. He has worked as an animator, model builder, programmer and project supervisor on several feature films including *Star Trek IV*, *Empire of the Sun*, *Willow*, *The Abyss* and more recently, *Ghost*, *Arachnophobia* and the *Body Wars* simulator ride at Disney's Epcot Center. Lincoln was also a key member of the team that developed ILM's film to digital scanner technology. Lincoln graduated with a BS and a MS in Computer Science from Columbia University.

Douglas Kay

Doug is the computer graphics department technical manager. He has contributed to a number of motion picture projects including *Star Trek IV*, *Indiana Jones and the Last Crusade* and *The Abyss*. He received a Bachelor of Science degree in Computer Science and a Master of Science degree in Computer Graphics from Cornell University.

Dennis Muren, A.S.C.

Dennis is Senior Visual Effect Supervisor at Industrial Light and Magic. He is actively involved in the evolution of the company, design and development of new techniques and equipment, and is a major user of computer graphics in visual effects. Muren has received Academy Awards for his work on, *The Abyss*, *Innerspace*, *Indiana Jones and the Temple of Doom*, *Return of the Jedi*, *ET the Extraterrestrial*, and *The Empire Strikes Back*. His most recent credits include *Ghostbusters II* and *The Abyss*. He is a member of the American Society of Cinematographers and the Academy of Motion Pictures Arts and Sciences.

Course Schedule

8:30 – Course Chair

Introduction: an overview of the day introducing the materials and speakers. Also an introductory video segment or of visual effects.

8:45 – Dennis Muren

An overview of the effects process. How effects are planned and designed. How costs can and must come down. What the effects director looks for in the people he works with. How computer graphics imagery (CGI) fits into the traditional world of visual effects. What is good and bad about CGI. The battle between science and impressionism.

9:45 – BREAK

10:00 – Doug Kay

An overview of the system at ILM. Data flow of a "standard" CGI job. Data input, output and storage. A component approach to CGI. The need for flexible systems from commercial vendors. The division between general reusable code and job specific code. Where the bottlenecks are and what solutions are needed. How CGI compares in performance to traditional methods.

10:30 – Lincoln Hu

Film input and output. A brief explanation of the technical nature of film. A look at optical film technology and processes, and how they are analogous to what we do in computer graphics. CCD-based input scanning. Data storage issues. Output technologies (film recorder): laser and tube-based.

11:30 – All

Questions and morning wrap up.

12:00 – LUNCH

1:30 – Jonathan Luskin

Bluescreen matte extraction. Procedural animation in *Body Wars*. Development of the *Back to the Future II* shark sequence.

2:30 – Scott Anderson

Synthesis of a water creature, *The Abyss*. Facial animation in *The Abyss*.

3:00 – BREAK

3:15 – Scott Anderson

Underwater looks, uses of particle systems in *The Hunt for Red October*.

3:45 – Doug Kay

Invisible uses of computer graphics. Wire removal in *Back to the Future II, III*. Scratch Removal. Metamorphosis in *Indiana Jones and the Last Crusade* and *Willow*.

4:30 – All

Questions and the day's wrap up.