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# COURSE NOTES 42

## Global Illumination

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Paul Heckbert  
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# Global Illumination

SIGGRAPH '93 Course  
course organizer Paul Heckbert

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## Abstract for Course

This course investigates global illumination (light scattering in three-dimensional scenes) and current simulation algorithms, including both radiosity and ray tracing. Mathematical tools such as integral equations, finite element methods, and Monte Carlo techniques will be explained, and algorithms such as importance-driven radiosity, discontinuity meshing, shadow calculation, and luminaire sampling will be described.

## Table of Contents / Schedule

SPEAKER		CHAPTER	TIME
Paul Heckbert		Welcome	15 min
Jim Arvo	1	Transfer Equations in Global Illumination	90 min
	2	Linear Operators and Integral Equations in Global Illumination	
	3	An Importance-Driven Radiosity Algorithm (reprint)	
Paul Heckbert	4	Introduction to Finite Element Methods	90 min
	5	Finite Element Methods for Radiosity	
	6	Radiosity in Flatland (reprint)	
	7	Discontinuity Meshing for Radiosity (reprint)	
Tomoyuki Nishita	8	Lighting Simulation for Extended Light Sources	75 min
Peter Shirley	9	Monte Carlo Simulation and Integration	90 min
	10	Monte Carlo Techniques for the Direct Lighting Calculation (reprint)	
all		panel discussion of research topics in global illumination	30 min

## Speaker Biographies

Paul Heckbert is an assistant professor of Computer Science at Carnegie Mellon University. For his BS degree in Mathematics at MIT, he developed algorithms for color image quantization, and at the New York Institute of Technology and Pixar, he developed software for computer animation. Paul received Master's and PhD degrees in Computer Science from the University of California at Berkeley in the topics of texture mapping and global illumination, respectively. His research interests are computer graphics and image processing.

Jim Arvo is a member of the research staff of the Program of Computer Graphics, Cornell University. He has a masters degree in mathematics from Michigan State University and a masters in Computer Science from Yale University. He worked as a software engineer at Apollo Computer for 6 years.

Peter Shirley is an Assistant Professor of Computer Science at Indiana University. He received his Ph D in Computer Science from the University of Illinois at Urbana-Champaign in 1990. His research interests include realistic image generation and scientific visualization.

Tomoyuki Nishita is a professor in the department of Electronic and Electrical Engineering at Fukuyama University, Japan. He received his BE, ME and Ph D in Engineering in 1971, 1973, and 1985, respectively, from Hiroshima University. He was on the research staff at Mazda from 1973 to 1979 and worked on design and development of computer controlled vehicle systems. He joined Fukuyama University in 1979. He was an associate researcher in the Engineering Computer Graphics Laboratory at Brigham Young University from 1988 through March, 1989. He received a research award from the Information Processing Society of Japan. His research interests involve computer graphics including lighting model, hidden surface removal, and antialiasing.