

SIGGRAPH 93
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on Computer Graphics and
Interactive Techniques*

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COURSE NOTES 60

An Introduction to Physically Based Modeling

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An Introduction to Physically Based Modeling

Co-Chairs

Andrew Witkin
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Michael Kass
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During the past few years, physically based modeling has emerged as an important new approach to computer animation and computer graphics modeling. Although physically based modeling is inherently a mathematical subject, the math involved needn't be any more difficult nor esoteric than the math that underlies many other areas of computer graphics. To date, however, most discussions of the subject have presupposed a specialized mathematical background that many members of the computer graphics community lack.

This course addresses the need to make the principles and methods of physically based modeling accessible to a broader computer graphics audience—those who are familiar with mainstream computer graphics and understand basic computer graphics math, such as vector/matrix manipulations, but whose first year calculus course is a dim recollection.

Course Schedule

8 45 am	Introduction	
9 00 am	Differential Equation Basics	Witkin
9 30 am	Particle Dynamics	Witkin
10 15 am	Break	
10 30 am	Energy Functions and Stiffness	Kass
11 15 am	Continuum Dynamics	Kass
12 00 pm	Lunch	
1 30 pm	Constrained Dynamics	Witkin
2 30 pm	Einstein Summation Notation	Barr
3 15 pm	Break	
3 30 pm	Rigid Body Simulation	Baraff
4 45 pm	End	

Course Speakers

Andrew Witkin is a Professor of Computer Science and Robotics at Carnegie Mellon University. He received his B.A. from Columbia College, and his Ph.D. from MIT. Prior to joining the faculty at Carnegie Mellon, he headed the perception and graphics group at Schlumberger Palo Alto Research. His research interests include computer animation, computer vision and simulation. He has taught three previous Siggraph courses on physically based modeling.

Michael Kass is a Principal Research Scientist with the Advanced Technology Group of Apple Computer. He received a B.A. in Artificial Intelligence from Princeton University, an M.S. in Computer Science from MIT, and a Ph.D. in Electrical Engineering from Stanford University. Before joining Apple Computer in 1988, he worked at Schlumberger Palo Alto Research in the field of computer graphics and computer vision. His research focus is on the use of physical simulation for computer graphics.

David Baraff is an Assistant Professor in Carnegie Mellon University's Robotics Institute, and School of Computer Science. He received his Ph.D. from Cornell University in 1992, where he was a graduate student in Cornell's Program of Computer Graphics and Department of Computer Science. He received his B.S.E. from the University of Pennsylvania in 1987. At Cornell, he was named an AT&T Bell Laboratories Ph.D. Fellow. His research work focuses on physical simulations with constraints. He has taught lecture courses on dynamic simulation at previous Siggraph conferences.

Alan Barr is a Professor of Computer Science and faculty member in the Computation and Neural Systems department at the California Institute of Technology. He received his Ph.D. in Mathematics from Rensselaer Polytechnic Institute in 1983, joining the Caltech faculty shortly thereafter. In 1988, he received the Siggraph Achievement award for his work in computer graphics modeling, particularly for physically based and teleological modeling.

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J	Quaternions	Shoemake
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