

# Developments in Physically-Based Modeling

**SIGGRAPH 88**

**Course Chair:**

Alan H. Barr, California Institute of Technology, Pasadena, California

**Speakers:**

John F. Abel, Cornell University, Ithaca, New York ✓

Alan H. Barr, California Institute of Technology, Pasadena, California ✓

Ronen Barzel, California Institute of Technology, Pasadena, California

Donald P. Greenberg, Cornell University, Ithaca, New York ✓

John C. Platt, California Institute of Technology, Pasadena, California ✓

Craig W. Reynolds, Symbolics Inc., Westwood, California ✓

**COURSE #27**

# Contents

<b>1</b>	<b>Introduction to Physically-Based Modeling</b>	<b>A-1</b>
1.1	Introduction to Physically-Based Modeling, ( <i>Barr</i> ) . . . . .	A-1
1.2	Teleological Modeling, ( <i>Barr</i> ) . . . . .	B-1
1.3	Another Introduction to Numerical Analysis, ( <i>Platt</i> ) . . . . .	C-1
1.4	Structural Analysis by Finite Element Methods, ( <i>Abel</i> ) . . . . .	D-1
<b>2</b>	<b>Dynamic Constraints</b>	<b>E-1</b>
2.1	Controlling Rigid Bodies with Dynamic Constraints, ( <i>Barzel, Barr</i> ) . . . . .	E-1 ✓
2.2	Controlling Dynamic Simulation with Kinematic Constraints, Behavior Functions, and Inverse Dynamics, ( <i>Isaacs, Cohen</i> ) . . . . .	F-1
2.3	Not Bumping Into Things, ( <i>Reynolds</i> ) . . . . .	G-1
2.4	Flocks, Herds, and Schools: A Distributed Behavioral Model, ( <i>Reynolds</i> ) . . .	H-1
2.5	Computational Techniques for the Self Assembly of Large Space Structures, ( <i>Barr, Von Herzen, Barzel, Snyder</i> ) . . . . .	I-1
<b>3</b>	<b>Flexible Bodies</b>	<b>J-1</b>
3.1	Global and Local Deformations of Solid Primitives, ( <i>Barr</i> ) . . . . .	J-1
3.2	Elastically Deformable Models ( <i>Platt, Terzopoulos, Fleischer, Barr</i> ) . . . . .	K-1
3.3	Constraint Methods for Flexible Models, ( <i>Platt, Barr</i> ) . . . . .	L-1
3.4	Energy Constraints on Parameterized Models, ( <i>Wilkin, Fleischer, Barr</i> ) . . .	M-1
<b>4</b>	<b>Physically-Based Rendering</b>	<b>N-1</b>
4.1	Physically-Based Rendering Methods: A Radiosity Approach, ( <i>Greenberg</i> ) . .	N-1
4.2	The Rendering Equation, ( <i>Kajiya</i> ) . . . . .	O-1
4.3	A Radiosity Method for Non-Diffuse Environments, ( <i>Immel, Cohen</i> ) . . . . .	P-1