国外计算机科学教材系列

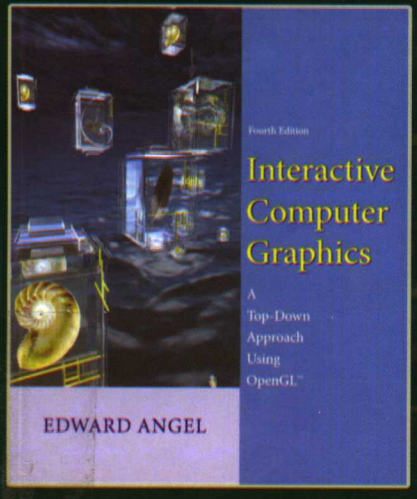
交互式计算机图形学

——基于OpenGL的自顶向下方法（第四版）

Interactive Computer Graphics

A Top-Down Approach Using OpenGL

Fourth Edition



英文版

[美] Edward Angel 著

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内容简介

本书是介绍计算机图形学的一本入门性教材，着重强调了图形学的应用编程。书中从OpenGL编程的角度，讨论了图形学的基本原理和基本算法。具体介绍了三维图形程序的开发环境、三维对象的表示方法、空间坐标变换、三维视图的生成过程等内容。并且探讨了光栅扫描、区域填充、画直线和画圆弧、裁剪及消隐等基本理论和基本算法。此外，涵盖了过程建模技术、可视化处理方法以及高级绘制方法等高层次主题。本书的特点是采用自顶向下方法，综合了知识性和实用性。多个完整而又灵活的OpenGL程序更有助于读者加深理解。

本书可作为计算机及相关专业本科生和研究生的计算机图形学教材，也适于作为相关程序员、工程技术人员及科研人员的参考书。

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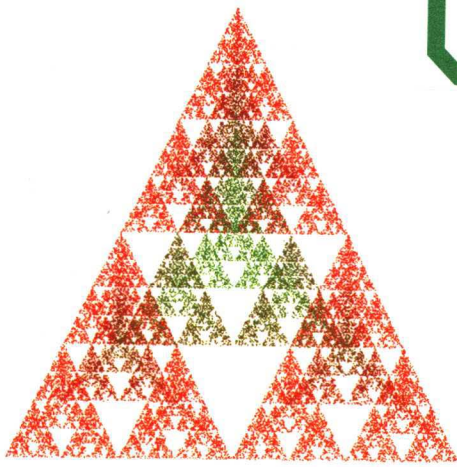
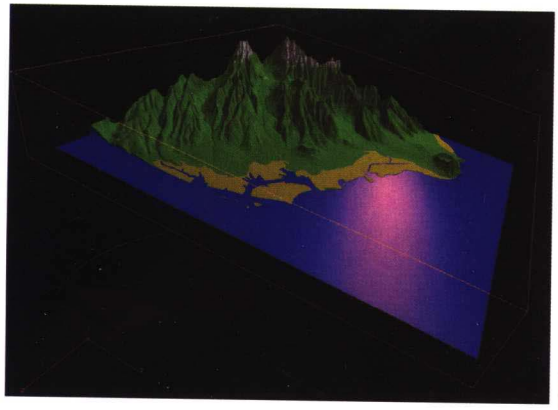
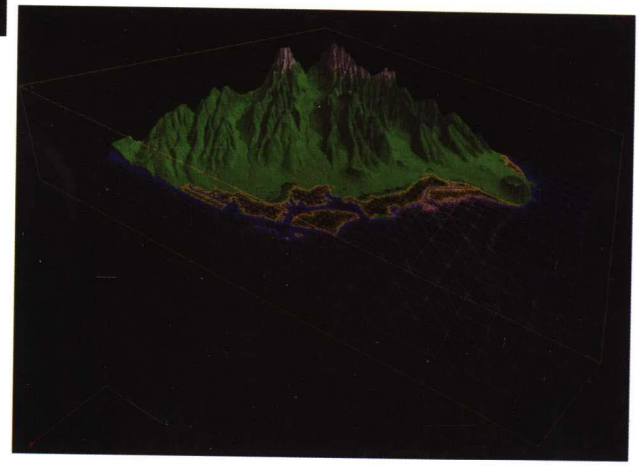


Front Plate 1 Three-Dimensional Sierpinski gasket computed with points.
(Courtesy of University of New Mexico.)

Front Plate 2 Three-Dimensional Sierpinski gasket computed by recursive subdivision of tetrahedral.
(Courtesy of University of New Mexico.)

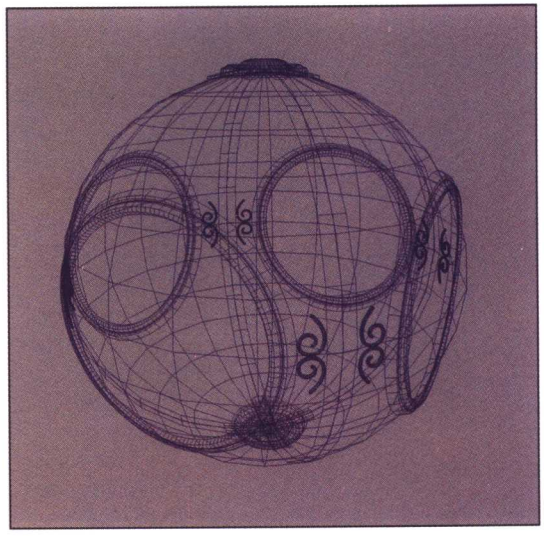


Front Plate 3 Elevation data for Honolulu, Hawaii displayed using a quadmesh to define control points for a Bezier surface.
(Courtesy of Brian Wylie, University of New Mexico and Sandia National Laboratories.)

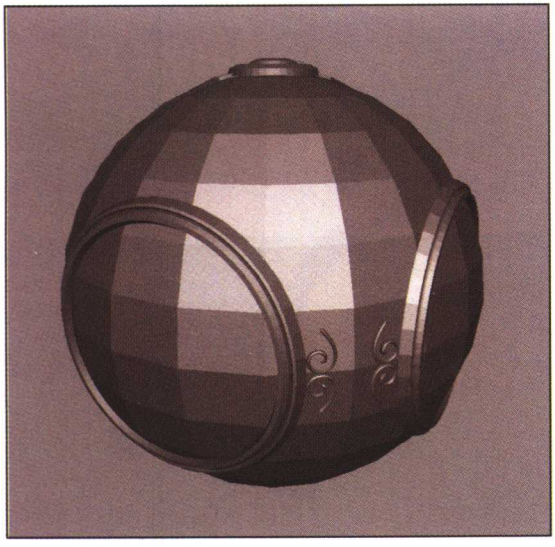


Front Plate 4 Wire frame of the quadmesh showing lower resolution in flat areas.
(Courtesy of Brian Wylie, University of New Mexico and Sandia National Laboratories.)

Color Plate 1 Image of sun object created using NURBS surfaces and rendered with bump mapping.
(Courtesy of Full Dome Project, University of New Mexico.)

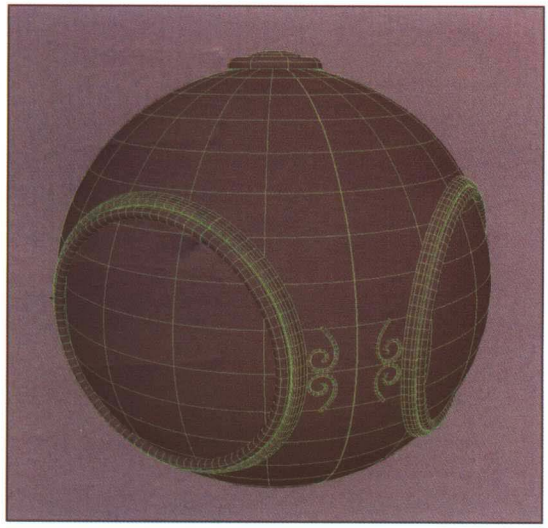


Color Plate 2 Wire-frame representation of sun object surfaces.
(Courtesy of Full Dome Project, University of New Mexico.)

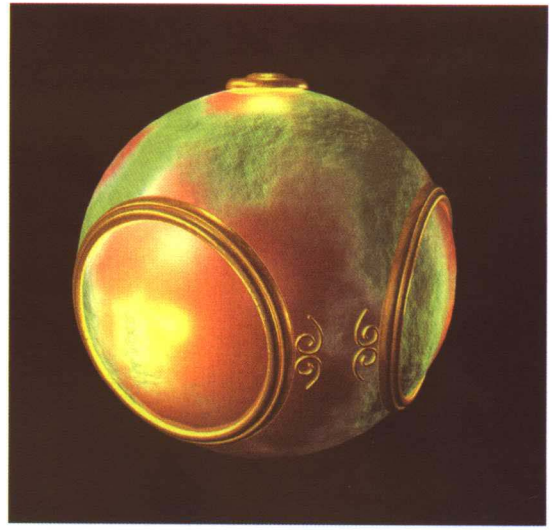


Color Plate 3 Flat-shaded polygonal rendering of sun object.
(Courtesy of Full Dome Project, University of New Mexico.)

Color Plate 4 Smooth-shaded polygonal rendering of sun object.
(Courtesy of Full Dome Project, University of New Mexico.)

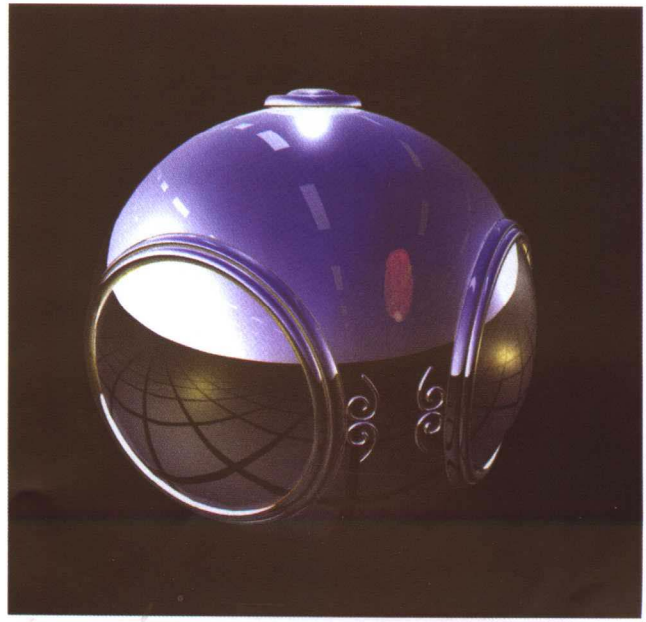


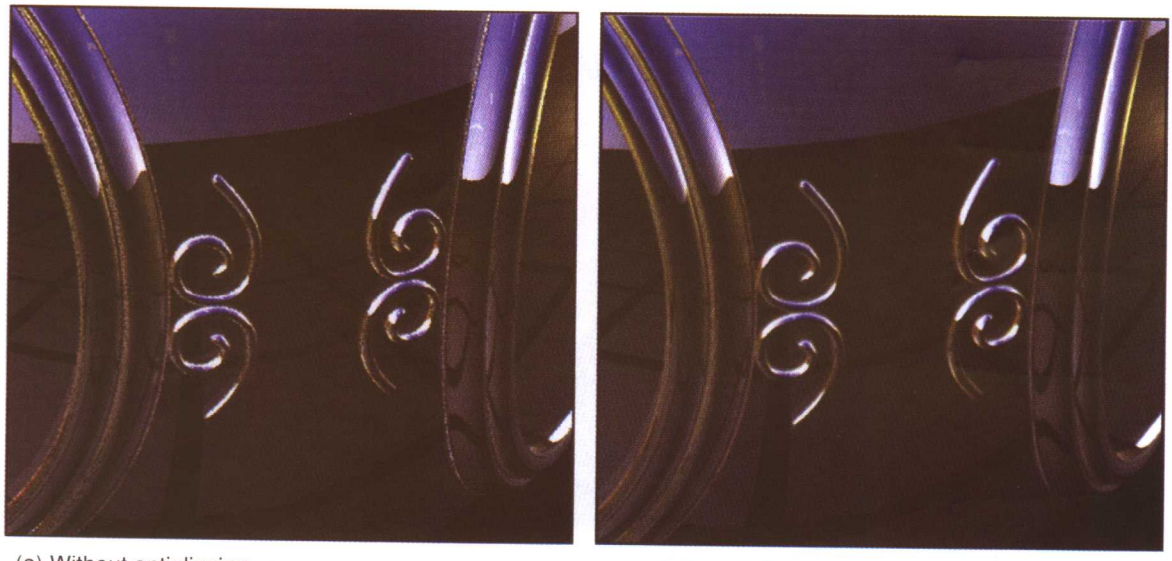
Color Plate 5 Wire-frame of NURBS representation of sun object showing the high number of Polygons used in rendering the NURBS surfaces.
(Courtesy of Full Dome Project, University of New Mexico.)



Color Plate 6 Rendering of sun object showing bump map.
(Courtesy of Full Dome Project, University of New Mexico.)

Color Plate 7 Rendering of sun object with an environment map.
(Courtesy of Full Dome Project, University of New Mexico.)

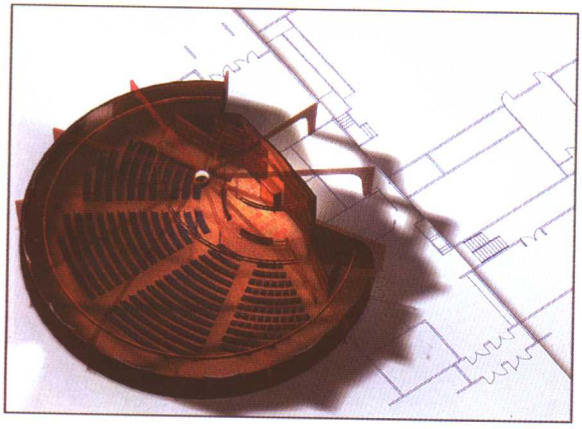




(a) Without antialiasing

(b) With antialiasing

Color Plate 8 Rendering of a small part of the sun object with an environment map.
(Courtesy of Full Dome Project, University of New Mexico.)



Color Plate 9 Axonometric view from outside of temple.
(Courtesy of Richard Nordhaus, Architect, Albuquerque, NM.)

Color Plate 10 Perspective view of interior of temple.
(Courtesy of Richard Nordhaus, Architect, Albuquerque, NM.)

Color Plate 11 Factory environment from video, "I Thought, Therefore I was."

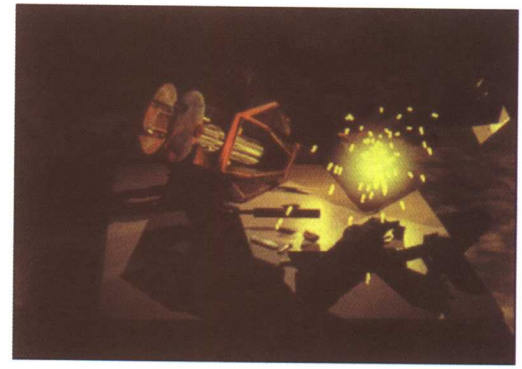
(Courtesy of James Pinkerton, Thomas Keller, Brian Jones, John Bell, University of New Mexico and Sandia National Laboratories.)

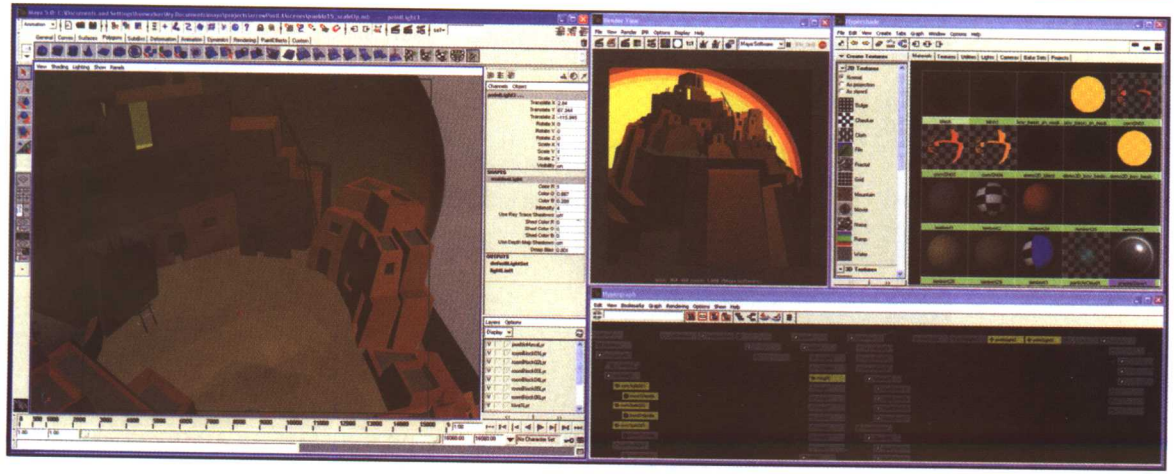
Color Plate 12 Color Plate 12 Robot "Ed" from video, "I Thought, Therefore I was."

(Courtesy of James Pinkerton, Thomas Keller, Brian Jones, John Bell, University of New Mexico and Sandia National Laboratories.)

Color Plate 13 Welding scene from video, "I Thought, Therefore I was."

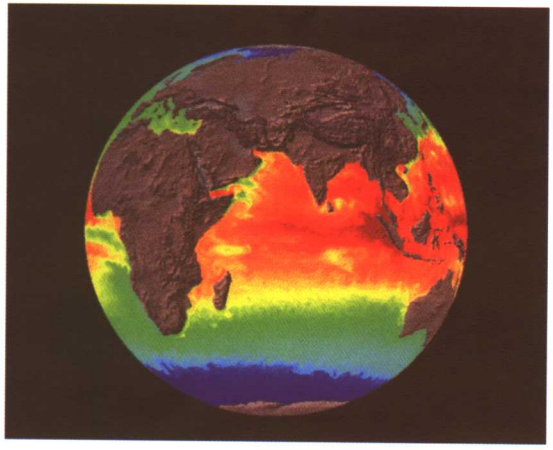
(Courtesy of James Pinkerton, Thomas Keller, Brian Jones, John Bell, University of New Mexico and Sandia National Laboratories.)



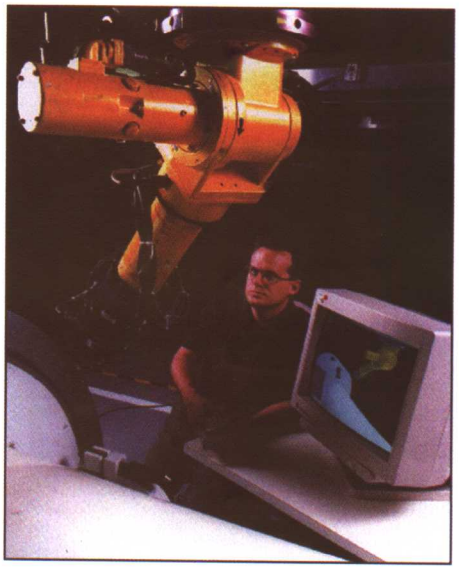


Color Plate 14 Interface for Animation using Maya

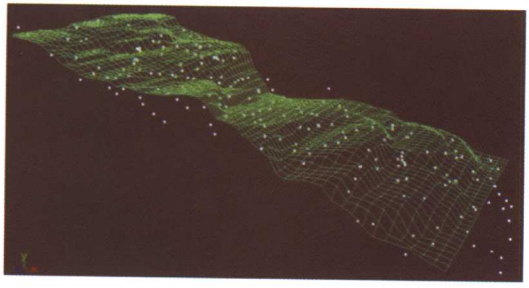
(Courtesy of Hue Walker, Arts Technology Center, University of New Mexico.)



Color Plate 15 Ocean temperature distribution during El Nino. Data texture mapped to earth model.
(Courtesy of Allen McPherson, Advanced Computing Laboratory, Los Alamos National Laboratory.)



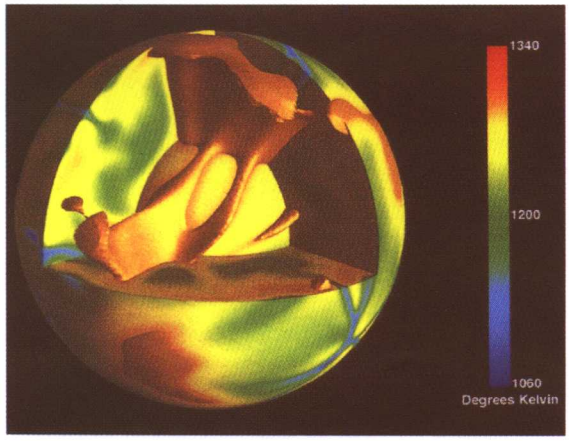
Color Plate 16 Physical robot and its graphical model. The graphical model is used for design, path planning, and simulation.
(Courtesy of Sandia National Laboratories.)



Color Plate 17 (a) NURBS surface representing surface of water and particles used to pull the NURBS control points to create successive images of moving water.
(Courtesy of Saty Raghavachary, DreamWorks Feature Animation.)

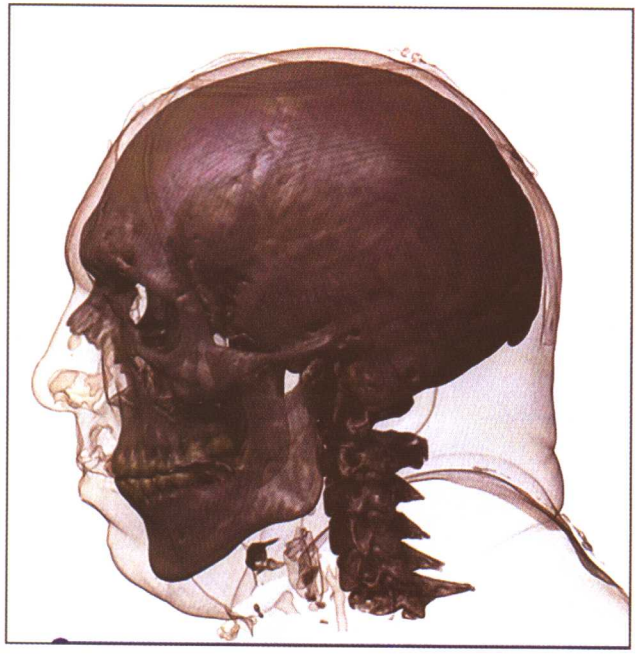
Color Plate 17 (b) Rendering of NURBS surface showing static water surface.
(Courtesy of Stay Raghavachary, DreamWorks Feature Animation.)

Color Plate 18 Rendering using particles showing moving water from "Spirit-Stallion of the Cimarron."
(Courtesy of Stay Raghavachary, DreamWorks Feature Animation.)



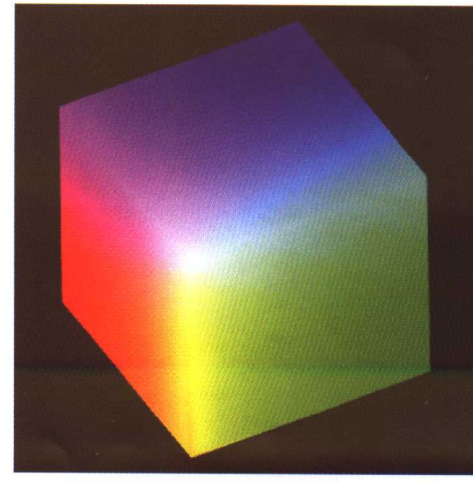
Color Plate 19 Fluid dynamics of the mantle of the Earth. Pseudocolor mapping of temperatures and isotemperature surface.

(Courtesy of James Painter, Advanced Computing Laboratory, Los Alamos National Laboratory.)



Color Plate 20 Volume Rendering of CT Data.

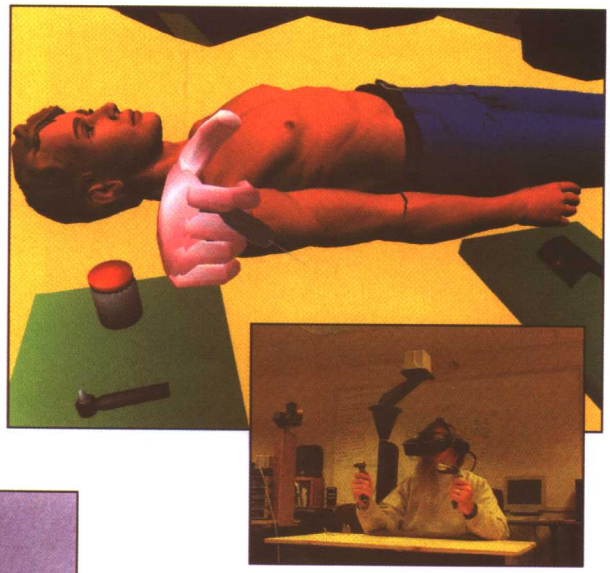
(Courtesy of J. Kniss, G. Kindlmann, C. Hansen, Scientific Computing and Imaging Institute, University of Utah.)



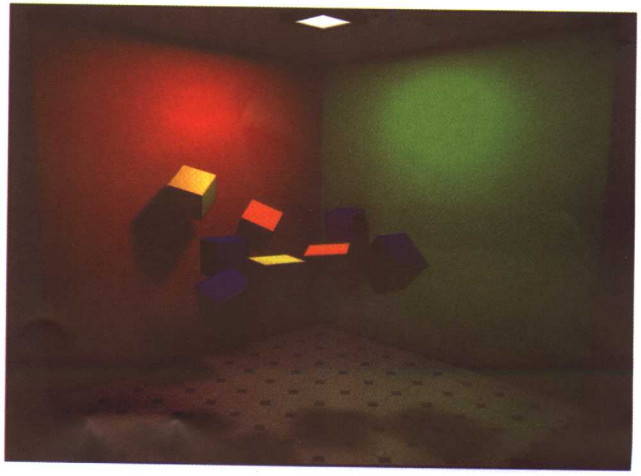
Color Plate 21 RGB color cube.

(Courtesy of University of New Mexico.)

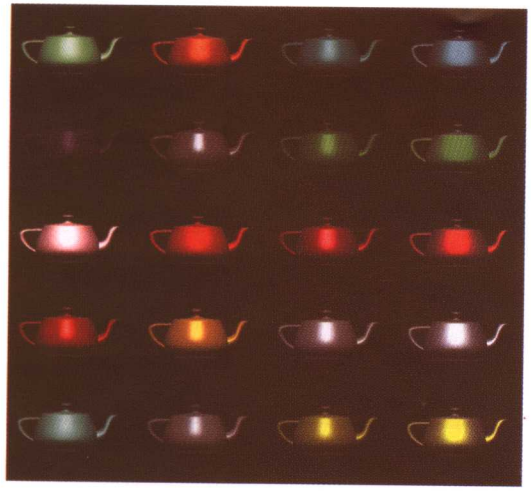
Color Plate 22 Avatar representing a patient who is being diagnosed and treated by a remotely located health professional (inset).
(Courtesy of Tom Caudell, Visualization Laboratory, Albuquerque High Performance Computing Center, University of New Mexico.)



Color Plate 23 Rendering using ray tracer.
(Courtesy of Patrick McCormick, University of New Mexico and Los Alamos National Laboratory.)



Color Plate 24 Radiosity rendering showing soft shadows and diffuse-diffuse refkections.
(Courtesy of A. Van Pernis, K. Rasche, R. Geist, Clemson University.)



Color Plate 25 Array of Utah teapots with different material properties.
(Courtesy of Silicon Graphics, Inc.)

(a) Using a vertex shader

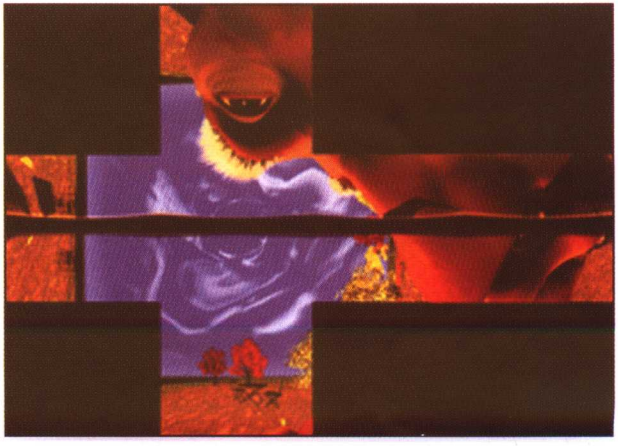
(b) Using a fragment shader

Color Plate 26 Phong shaded teapot
(Courtesy of Takeshi Hakamata, University of New Mexico.)

Color Plate 27 Isosurface mesh for lobster data set computed by a particle system of 40,000 particles.
(Courtesy of Patricia Crossno, University of New Mexico and Sandia National Laboratories.)

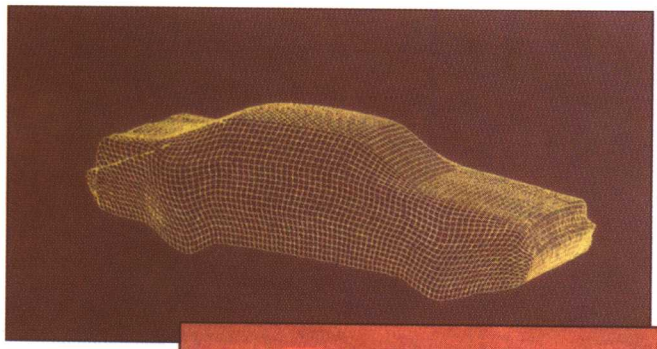
Color Plate 28 Interactively modeled and rendered volumetric procedural cloud.
(Courtesy of Joshua Schpok and David S. Ebert, Purdue University Rendering and Perceptualization lab.)

Color Plate 29 One frame from Pixar's "Geri's Game" showing refraction though reflections on Geril's glasses.
(Courtesy of Pixar Animation Studios.)

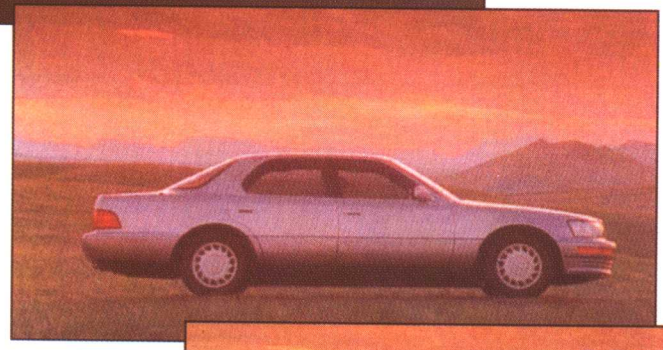


Color Plate 30 Reflection map from environment computed from the center of the lens on Grei's glasses. The reflection map is then mapped to the glasses as part of the rendering process.
(Courtesy of Pixar Animation Studios.)

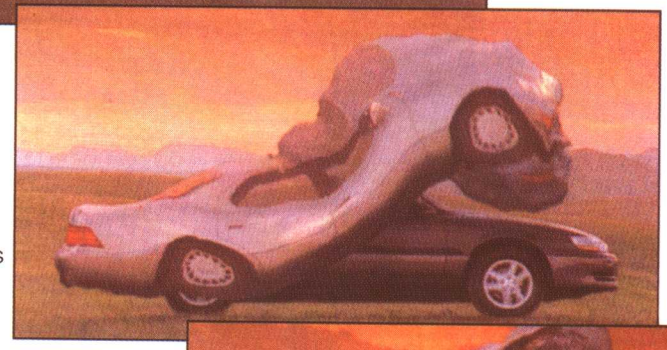
Color Plate 31 Particle system.
(Courtesy of Lexus and Rhythm and Hues.)



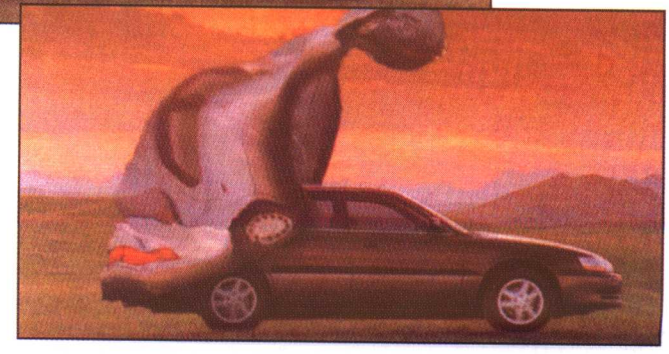
(a) Mesh of particles



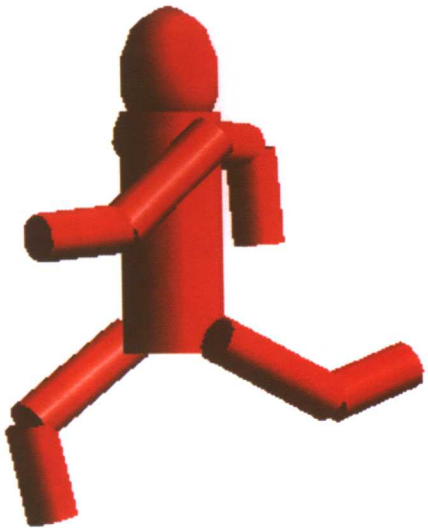
(b) Model of Lexus with surface



(c) Wind blowing mesh off Lexus

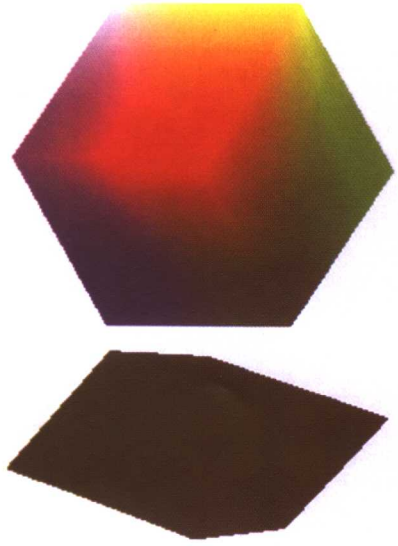


(d) Mesh blown away from Lexus



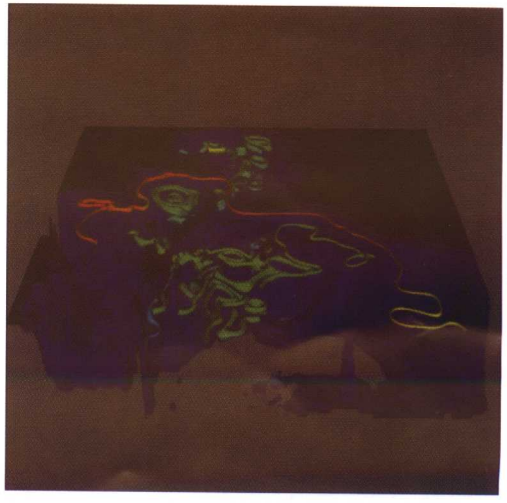
Back Plate 1 Rendering of hierarchical robot figure.
(Courtesy of University of New Mexico.)

Back Plate 2 Sphere computer by recursive subdivision of tetrahedron. Triangle colors assigned randomly.
(Courtesy of University of New Mexico.)



Back Plate 3 Shadows from a cube onto ground. Computed by two passes over the data with viewpoint shifted between viewer and light source.
(Courtesy of University of New Mexico.)

Back Plate 4 Visualization of thermohaline flows in the Carribean Sea using streamtubes colored by water temperature.
(Courtesy of David Munich, High Performance Computing Center, University of New Mexico.)



出 版 说 明

21世纪初的5至10年是我国国民经济和社会发展的重要时期，也是信息产业快速发展的关键时期。在我国加入WTO后的今天，培养一支适应国际化竞争的一流IT人才队伍是我国高等教育的重要任务之一。信息科学和技术方面人才的优劣与多寡，是我国面对国际竞争时成败的关键因素。

当前，正值我国高等教育特别是信息科学领域的教育调整、变革的重大时期，为使我国教育体制与国际化接轨，有条件的高等院校正在为某些信息学科和技术课程使用国外优秀教材和优秀原版教材，以使我国在计算机教学上尽快赶上国际先进水平。

电子工业出版社秉承多年来引进国外优秀图书的经验，翻译出版了“国外计算机科学教材系列”丛书，这套教材覆盖学科范围广、领域宽、层次多，既有本科专业课程教材，也有研究生课程教材，以适应不同院系、不同专业、不同层次的师生对教材的需求，广大师生可自由选择和自由组合使用。这些教材涉及的学科方向包括网络与通信、操作系统、计算机组织与结构、算法与数据结构、数据库与信息处理、编程语言、图形图像与多媒体、软件工程等。同时，我们也适当引进了一些优秀英文原版教材，本着翻译版本和英文原版并重的原则，对重点图书既提供英文原版又提供相应的翻译版本。

在图书选题上，我们大都选择国外著名出版公司出版的高校教材，如Pearson Education培生教育出版集团、麦格劳—希尔教育出版集团、麻省理工学院出版社、剑桥大学出版社等。撰写教材的许多作者都是蜚声世界的教授、学者，如道格拉斯·科默（Douglas E. Comer）、威廉·斯托林斯（William Stallings）、哈维·戴特尔（Harvey M. Deitel）、尤利斯·布莱克（Uyless Black）等。

为确保教材的选题质量和翻译质量，我们约请了清华大学、北京大学、北京航空航天大学、复旦大学、上海交通大学、南京大学、浙江大学、哈尔滨工业大学、华中科技大学、西安交通大学、国防科学技术大学、解放军理工大学等著名高校的教授和骨干教师参与了本系列教材的选题、翻译和审校工作。他们中既有讲授同类教材的骨干教师、博士，也有积累了几十年教学经验的老教授和博士生导师。

在该系列教材的选题、翻译和编辑加工过程中，为提高教材质量，我们做了大量细致的工作，包括对所选教材进行全面论证；选择编辑时力求达到专业对口；对排版、印制质量进行严格把关。对于英文教材中出现的错误，我们通过与作者联络和网上下载勘误表等方式，逐一进行了修订。

此外，我们还将与国外著名出版公司合作，提供一些教材的教学支持资料，希望能为授课老师提供帮助。今后，我们将继续加强与各高校教师的密切联系，为广大师生引进更多的国外优秀教材和参考书，为我国计算机科学教学体系与国际教学体系的接轨做出努力。

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